THE ECOSYSTEM APPROACH:

Healthy Ecosystems *and* Sustainable Economies

Volume III-Case Studies

REPORT OF THE INTERAGENCY ECOSYSTEM MANAGEMENT TASK FORCE

September 1996

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INTERAGENCY ECOSYSTEM MANAGEMENT WORKING GROUP
LIST OF ABBREVIATIONS

ADID	Advanced Identification of Disposal Sites
AWRC	Anacostia Watershed Restoration Committee
BARC	Beltsville Agriculture Research Center (U.S. Department of Agriculture)
BLM	Bureau of Land Management (U.S. Department of the Interior)
CENR	Committee on Environment and Natural Resources
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Corps	U.S. Army Corps of Engineers (U.S. Department of Defense)
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
DEP	Department of Environmental Protection
EA	Environmental assessment
EIS	Environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FACA	Federal Advisory Committee Act
FOIA	Freedom of Information Act
FWS	U.S. Fish and Wildlife Service (U.S. Department of the Interior)
FY	Fiscal year
ICPRB	Interstate Commission on the Potomac River Basin

MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NGO	Nongovernmental organization
NMFS	National Marine Fisheries Service (NOAA, U.S. Department of Commerce)
NOAA	National Oceanic and Atmospheric Administration (U.S. Department of Commerce)
NPDES	National Pollution Discharge Elimination System
NPFMC	North Pacific Fisheries Management Council
NPS	National Park Service (U.S. Department of the Interior)
NRCS	Natural Resources Conservation Service (U.S. Department of Agriculture)
O&C	Oregon and California
PGDER	Prince Georges County Department of Environmental Resources
RIEC	Regional Interagency Executive Committee
ROD	Record of Decision
SAMAB	Southern Appalachian Man and the Biosphere Reserve
SFWMD	South Florida Water Management District
TSCA	Toxic Substances Control Act
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USDA	U.S. Department of Agriculture
WRDA	Water Resources Development Act

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Chapter 1: INTRODUCTION

Vice President Gores National Performance Review recommended that federal agencies adopt "a proactive approach to ensuring a sustainable economy and a sustainable environment through ecosystem management." The link between a healthy economy and a healthy environment has highlighted the need to actively maintain our natural infrastructure before problems arise, as we do with our highways and bridges. The Interagency Ecosystem Management Task Force was established to implement an ecosystem approach to environmental management.

PRINCIPLES OF THE ECOSYSTEM APPROACH

An ecosystem is an interconnected community of living things, including humans and the physical environment in which they interact. The goal of the ecosystem approach is to restore and sustain the health, productivity, and biological diversity of ecosystems while supporting sustainable economies and communities. Many factors, such as interagency conflicts, incompatible data bases, a lack of research on ecosystem functioning, inconsistent planning and budgetary cycles, and differing agency organizational structures, have hampered development of a coordinated approach to actively restoring or sustaining the health of the ecosystems that are the cornerstones of viable economies.

Because ecosystems do not follow administrative boundaries, such as the borders of national parks and forests or political jurisdictions, working to restore or sustain ecosystem productivity involves a perspective that crosses those artificial boundaries. This entails a shift from the federal governments traditional focus on individual agency jurisdiction to a broader focus on the actions of multiple agencies within larger ecological boundaries. Just as collaboration is important, finding ways to increase voluntary cooperation with state, tribal, and local governments, as well as with nongovernmental organizations and the public, is key to an effective ecosystem approach.

THE CASE STUDIES

Seven ecosystems were selected by the Task Force for study, based on nine criteria: (1) ongoing interagency and intergovernmental management activities; (2) a mix of resource management and infrastructure agency involvement;

(3) a mix of geographic scales and efforts at various stages of development; (4) availability and accessibility of data on the ecosystem; (5) environmental importance of the area; (6) a variety of environmental, economic, and social issues; (7) public and private support of-and interest in-the ecosystem; (8) interagency support for the selection; and (9) geographic location.

There are many other ecosystems, in addition to the seven, with large-scale, integrated management projects that may also meet the above criteria. The Task Force chose to focus the learning process on a few areas that serve as case studies for the ecosystem approach. Limiting the focus of this learning process to the seven ecosystems does not mean that these ecosystems are the only areas in which the federal government will, or should, pursue the ecosystem approach.

The Interagency Ecosystem Management Task Force, acting through its Working Group, commissioned interagency survey teams to conduct the case studies in the summer and early fall of 1994. Primarily through interviews with interested parties in each ecosystem, teams identified opportunities for-and constraints to-interagency coordination of the ecosystem approach. Their focus was on identifying barriers to the ecosystem approach, and ways the federal government can help to overcome these barriers. The lessons learned provide guidance for natural resource managers as they devise (or revise) the ecosystem approach for these seven ecosystems and others across the nation. The information presented in these summaries was current as of early 1995. The findings and conclusions are still valid, although specific factual information may have changed.

Each survey team consisted of from six to eight representatives of federal agencies. Agencies represented on one or more survey teams included the U.S. Army Corps of Engineers, Army General Counsel, Council on Environmental Quality, Environmental Protection Agency, Federal Aviation Administration, U.S. Fish and Wildlife Service, U.S. Department of Agriculture (USDA) Forest Service, National Biological Service, National Oceanic and Atmospheric Administration, National Park Service, USDA Natural Resources Conservation Service (formerly Soil Conservation Service), Office of Science and Technology Policy, U.S. Department of Justice, and U.S. Department of the Interior. Although agency representation varied from team to team, it broadly reflected the makeup of the Interagency Ecosystem Management Task Force and its Working Group.

Environmental problems in all seven ecosystems chosen for this study include habitat degradation, loss of biodiversity, social and economic concerns, and diminished natural resource uses. Interagency efforts to implement the ecosystem approach are underway in all seven ecosystems. These efforts have a restoration focus or component, and most involve nonfederal collaborators (state, local, tribal, and nongovernmental entities) as essential partners in the process.

Anacostia River watershed. The Anacostia River watershed, located in the District of Columbia and Maryland, is an ecosystem of tidal marshes, rivers and streams, upland forests, and urban and rural environments. To varying degrees, the rich natural resources in this ecosystem have been degraded or destroyed over the past three centuries through the effects of agriculture and urban development. Components of this ecosystem are being restored through efforts coordinated by the Anacostia Watershed Restoration Committee (established in 1988 by state and local agencies), with federal assistance.

Coastal Louisiana. Each year, Coastal Louisiana suffers alarming losses of rich wetlands and barrier islands, primarily because natural processes of wetland accretion and replenishment have been disrupted by efforts to control the Mississippi River. Under the 1990 Coastal Wetland Planning, Protection, and Restoration Act, a task force involving federal agencies and the state of Louisiana is implementing projects designed to restore Louisianas coastal wetlands.

Great Lakes basin. The Great Lakes basin contains the worlds largest body of surface freshwater, and supports a variety of habitats in its waters, shoreline marshes, and surrounding forests. The combined effects of industrial pollution, urban development, and habitat change have devastated many Great Lakes resources. Through local initiatives establishing remedial action plans for areas of concern, and through lakewide management plans, local communities are collaborating with federal, state, and local agencies, and with tribal and nongovernmental organizations, to reverse the effects of pollution and habitat degradation in this ecosystem. Instrumental to the effort is the International Joint Commission, which facilitates coordination between Canada and the United States in ecosystem approach initiatives.

Pacific Northwest forests. In the Pacific Northwest, logging of old-growth forests has severely depleted

critical habitat, affecting a variety of species in this ecosystem, from the northern spotted owl to anadromous salmon. Based on the Clinton administrations 1993 Forest Plan for a Sustainable Economy and a Sustainable Environment, land management practices on federal lands in the Pacific Northwest are being jointly implemented by an interagency team, with participation from state and local agencies as well as tribal and nongovernmental organizations. The team is also coordinating an interagency effort to secure the long-term economic health of the region through funding for economic development.

Prince William Sound. In 1989, Alaskas Prince William Sound was devastated by the worst tanker oil spill in U.S. history when the Exxon Valdez ran aground. A relatively pristine ecosystem rich in fisheries and other natural resources remains seriously threatened in the aftermath of the disaster. A civil settlement with Exxon has made funds available for restoration. Funds are administered by a joint state/federal Trustee Council, with local, tribal, and community input.

South Florida. South Florida, renowned for its subtropical Everglades, has suffered steady declines in Everglades habitat, primarily due to regional development, which has led to water diversions and river channelizations that have disrupted the natural waterflow. An agreement reached after lengthy litigation paved the way for restoration efforts to begin, and the federal South Florida Ecosystem Restoration Task Force was established in 1993 to help coordinate an effort involving federal, state, and local agencies.

Southern Appalachians. Southern Appalachia, a mountain region extending from Virginia to Alabama, provides a wide variety of ecosystems, including high-elevation spruce-fir forests, forest wetlands in mountain coves, and rich oak forests at lower elevations. Regional problems, such as severe water and air pollution as well as forest fragmentation and degradation, are primarily due to the effects of development within the region and adjacent areas. Since 1988, through the Southern Appalachian Man and the Biosphere regional network of cooperators, federal, state, and local agencies and organizations have conducted various ecosystem management and restoration activities that focus on voluntary action at the community level.

In each of these seven ecosystems, survey teams assembled materials on the ecosystem and its history, as well as on economic development, interagency restoration initiatives, and other efforts to implement the ecosystem approach. Teams interviewed dozens of interested parties representing a broad array of stakeholders in the ecosystem. Interviewees included federal, state, and local officials, representatives of industry and agriculture, landowners and developers, tribal representatives, scientists and researchers of various affiliations, and members of nongovernmental organizations, resource management councils, and other groups.

In their interviews, survey teams focused on key issues in the ecosystem approach: budgets; institutional structures; public participation; science and information; and legal constraints and opportunities. Discussed at length in volume 2 of this series (see Interagency Ecosystem Management Task Force 1995), these issues are at the heart of recurring problems that must be resolved for the most benefits to accrue from an ecosystem approach. Legal and budgetary obstacles must be removed, activities must be based on sound science and monitoring (in conjunction with adaptive management), and the public must be involved and informed at every stage. None of this is possible without effective institutional teamwork at every level through partnerships among federal, state, and local agencies, in collaboration with tribal and nongovernmental organizations and residents of local communities.

Interviewees offered many observations on these and other issues pertaining to ecosystems and to efforts to manage and restore them. Their numerous valuable comments and criticisms constitute the bulk of this volume. At the close of each case study, there are recommendations for improving the ecosystem approach, both within the specific ecosystem addressed and across the nation. Largely based on suggestions from interviewees, these recommendations are intended to facilitate a broad discussion on improving the health of our ecosystems to ensure our human health and the economic prosperity of the nation as a whole.

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Chapter 2: ANACOSTIA RIVER WATERSHED

The Anacostia River Watershed Restoration, an urban river restoration initiative, illustrates a number of the components of an ecosystem initiative, providing useful ideas and valuable lessons for future ecosystem restoration and management. It includes cooperative efforts across political and jurisdictional boundaries, involving state, local,

and federal agencies, civic groups, and private individuals. The restoration effort has been driven primarily by state and local governments and the Metropolitan Washington Council of Governments, although there has been some federal involvement and use of federal grants, and a number of federal programs and projects have affected or influenced the initiative. An "Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay" was signed on July 14, 1994, by several agencies, agreeing to "give full support to the Anacostia River Demonstration Project as an opportunity to apply ecosystem management concepts in an urban environment." Preliminary coordination among the agencies has been established, though details of federal support for the project had yet to be worked out at the time of this study, and funding had yet to be found.

The study focuses on federal contributions to the Anacostia River Watershed Restoration initiative, identifying areas where, in retrospect, "things could have been done differently," or where federal involvement could be improved. Mention of deficiencies or problems (primarily by interviewees) is not intended to detract from accomplishments made through the various efforts. Based on interviewee comments, the survey team recommended ways of improving federal contributions to the Anacostia basin restoration initiative and to the ecosystem approach in general. Recommendations are presented at the end of this chapter.

The survey team interviewed representatives from federal, state, and local government agencies, government coordinating bodies, and nongovernmental organizations (NGOs) involved in the Anacostia restoration. The team conducted small-group, large-group, and individual interviews, supplemented by telephone interviews. The team also reviewed documents containing background information, results of studies, and recommendations. Some of these documents are listed in appendix A at the end of this chapter.

The survey team consisted of representatives from the Interagency Ecosystem Management Initiative issue subgroups (budget, institutional, public participation, science and information, legal, and policy). Team members were: Rosina Bierbaum, Office of Science and Technology Policy; Ann Hooker, Federal Aviation Administration; Joanne Jones, Army General Counsel; Ron Lauster, U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (formerly Soil Conservation Service); Rob Mangold, USDA Forest Service; Lynn Martin, U.S. Army Corps of Engineers; Mary OLone, Environmental Protection Agency; and Robert Reichardt, National Oceanic and Atmospheric Administration.

BACKGROUND

The Anacostia River watershed is a 170-square-mile subbasin of the Potomac River basin (figure 1). The watershed has nine major subbasins, all lying in the District of Columbia and in Montgomery and Prince Georges Counties in Maryland (figure 2). Tidal influence extends about 9 miles above the confluence with the Potomac River, which is a tributary of Chesapeake Bay. The entire Anacostia River system is freshwater.

The river drains one of the most densely populated sections of the Washington metropolitan area, with a population of more than 800,000 in 1990. Development activities have dramatically altered the population and basin. Tributaries are prone to flash flooding due to the steepness of stream valleys in the upper portions of the watershed, to natural imperviousness of the soils, and to imperviousness resulting from development.* The tidal portion is sluggish, and flushing time can range from 12 to more than 90 days.

Historical Ecosystem Setting

The Anacostia River basin once supported significant fish and wildlife habitat. In the early 1600s, visitors to the basin described dense hardwood forests with a great variety of wildlife, and wetlands supporting a wide range of fish, waterfowl, and wading birds.

Wetlands. The Anacostia River basin once contained extensive tidal and nontidal freshwater wetlands. From its mouth to the head of tide at Bladensburg, Maryland, the river supported about 2,600 acres of emergent tidal wetlands, an integral part of the watersheds self-cleansing system, providing key wildlife and waterfowl habitat. Wild rice, saw grass, lily pads, and several other species of marsh grasses covered the tidal flats. Tidal creeks 3 to 6 feet deep

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Figure 1.-Chesapeake Bay drainage. The Potomac River basin is a massive network of more than 100 rivers draining 14,670 square miles of land. It provides the Chesapeake Bay with almost 20 percent of its water supply. The Anacostia River is a Potomac tributary that drains 169.9 square miles of urban landscape.

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and 10 to 20 feet wide intersected the marshes, flooding them at high tide.
Aquatic resources. Approximately 100 species of fish resided in or migrated up the Potomac and Anacostia Rivers. Anadromous fish found extensive spawning and juvenile rearing habitat throughout the watershed. For centuries, fish such as menhaden, yellow perch, herring, and striped bass migrated annually from Chesapeake Bay into nontidal freshwater tributaries of the Anacostia to spawn.

Fish were so plentiful in the early 1600s, according to a report by the Interstate Commission on the Potomac River Basin (1988), that Captain John Smith (the Chesapeake Bays first explorer) and his men reportedly tried to catch them with frying pans. But commercial fisheries developed in the mid-1700s, and fish became a

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Figure 2.-The Anacostia River basin has nine subbasins, all in the District of Columbia or in Montgomery and Prince Georges Counties in Maryland. (Piped tributaries in the District of Columbia are not shown.) (Source: Metropolitan Washington Council of Governments.)
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supplemental food. "Concern about overfishing of the Potomac and Anacostia was expressed as early as 1817," according to the Commissions report. "By the end of the century, a number of fisheries began to decline. Overfishing in the Potomac was the inevitable result of immense exhausting sweeps of 1,600-fathom seines covering over 1,200 acres of bottom twice a day and the continual drifting of gillnets . . . and hundreds of poundnets."
Wildlife. Forests of oak, scrub pine, laurel, and hickory extended beyond the marshes. Forests and wetlands contained a great variety of birds and mammals, including the long-billed marsh wren, reed bird, red-winged blackbird, rail bird, marsh hawk, osprey, bittern, least tern, woodcock, and a variety of herons; and the squirrel, muskrat, otter, mink, raccoon, shrew, mole, and field mouse, among many others.

By the 1850s, as forests were cleared and agriculture (tobacco, corn, and cotton cultivation) was established, the Anacostia River basin was rapidly changing. The Maryland port of Bladensburg was silted in, and extensive mud flats formed in the river.

Current Ecosystem Setting

Many of the current problems in the watershed can be traced to high levels of imperviousness due to development. Though spared the effects of heavy industry, the Anacostia watershed has been subjected to substantial nonpoint source* pollution and stream degradation, typical of a watershed with agricultural, suburban, and urban land uses. Sediments, nutrients, toxic compounds, and water with elevated temperatures flow into the Anacostia and its tributaries, contributing to a number of water quality problems. However, portions of the upper reaches of some of the tributaries remain relatively undisturbed and contain unique environmental niches.

Wetlands. More than 98 percent of tidal wetlands were lost to filling/dredging operations and seawall construction, and nearly 75 percent of the watersheds freshwater wetlands have been destroyed by agriculture and urbanization. Today it is estimated that there are fewer than 100 acres of emergent tidal wetlands left. The largest remaining emergent tidal wetland is the newly restored Kenilworth Marsh, located on the east bank of the Anacostia River 6 miles upstream from its confluence with the Potomac River. Additional small wetlands of 10 acres or less lie on or adjacent to the river, primarily between Bladensburg and the East Capitol Street bridge in Washington, DC.

Aquatic resources. Dozens of miles of stream habitat have been severely degraded by uncontrolled stormwater runoff and past engineering projects. Urbanization has profoundly altered the flow, shape, water quality, and ecology of streams, leaving many with only a fraction of their original biological diversity. More than 25 barriers constructed along the lower Anacostia impede the annual migration of anadromous fish, eliminating much of their spawning range. Degraded water quality has reduced historical populations of fish and other aquatic organisms. Brown trout, chain pickerel, bullhead catfish, largemouth bass, and four species of sunfish can still be found in some parts of the river. For the most part, however, their populations are sparse due to poor water quality and lack of suitable habitat. Fish have been contaminated with PCBs and chlordane, and there is a fish consumption advisory for bottom-feeding fish in the tidal area.

Water quality. Water quality varies greatly in the basin. It ranges from good in the headwaters to severely degraded in the tidal river, which has some of the poorest water quality in the Chesapeake Bay system. There are few point source discharges in the Anacostia River basin; pollution comes from surface runoff after rainfall. Although

stormwater management has been required for new development for 15 years, much of the Anacostia basin was developed prior to stormwater regulations.

Severe sedimentation and high bacteria levels are common throughout the basin. Sources of sediment include streambank erosion, urban runoff, sand and gravel operations, agriculture, and construction sites. Many sediments contain hydrocarbons, heavy metals and other toxic compounds, and nutrients. Pollutant levels are 3 to 20 times higher during storms. Dissolved oxygen levels frequently fall below water quality standards, particularly in tidal areas. Debris from upstream is a serious problem.

Combined sewer overflows are a type of stormwater system found in many older cities on the east coast. During some storms, stormwater mixes with raw sewage and is discharged, untreated, into rivers and streams. Combined sewer overflows serve about one-third of the District of Columbia and drain directly into the Anacostia, exacerbating pollution problems.
Social and economic issues. The Anacostia River basin is very diverse socially and economically. The headwaters are in rural or suburban areas of Maryland with relatively low population densities but rapidly rising rates of development and population growth.

Economically, much of the upper basin in Prince Georges and Montgomery Counties is middle-income. Prince Georges County is the nations wealthiest county with an African-American majority, while Montgomery County is among the wealthiest counties in the nation, and contains the states largest and most rapidly growing immigrant population.

The tidal region is a densely populated urban area lying mostly in the District of Columbia, one of the nations largest cities with an African-American majority. The lower Anacostia River flows through some of the poorest neighborhoods in the District of Columbia, neighborhoods that are predominantly African-American. The lower Anacostia is considered by some to be one of the most polluted river sections in the nation, and fish contamination is considered a social issue because fish from the river are regularly eaten in some of the regions poorer neighborhoods. The Environmental Protection Agency (EPA) and the District of Columbias Department of Consumer and Regulatory Affairs have issued a health advisory on consumption of bottom-feeding fish from the tidal portion of the river, due to chlordane and PCB levels that exceed Food and Drug Administration limits. Elsewhere in the tributaries, recreational fishing is limited by poor water quality and fish habitat. The degradation and pollution of the river, with their high impact on low-income, minority communities and growing immigrant populations, have raised concerns about environmental justice, but this study did not investigate the substance of these concerns.

The Watershed Restoration Initiative

The Anacostia River Watershed Restoration was conceived by representatives of state and local jurisdictional areas over a period of several years, facilitated by the Metropolitan Washington Council of Governments. The Council is a regional organization of local governments in the Washington metropolitan area, which includes the District of Columbia and major counties and cities in suburban Maryland and northern Virginia. The Council provides a forum for cooperative resolution of regional problems and a vehicle for strategic planning, coordination, and implementation. Working closely with local governments, Council staff analyze regional needs and develop regionwide action plans for community and economic development, transportation, the environment, human services, and public safety.

The Metropolitan Washington Council of Governments has been involved in efforts to understand and improve conditions in the Anacostia River and its tributaries for a number of years. In 1979, the Councils Water Resources Planning Board identified the Anacostia as a priority watershed, critical to planning efforts for the Potomac River basin. In 1984, jurisdictions in the watershed signed the Anacostia Watershed Restoration Agreement, targeting two major pollutants-raw sewage from combined sewer overflows in the District of Columbia, and sediment runoff and erosion from Maryland. The agreement pulled together efforts underway in various jurisdictions, formulating a more comprehensive strategy. In 1987, a new regional Anacostia Watershed Restoration Agreement was signed, establishing goals for restoring the Anacostia. To guide the restoration process, the agreement called for formation of the Anacostia Watershed Restoration Committee to develop a restoration plan and coordinate implementation with dozens of local, state, and federal agencies. When first formed, the Anacostia Watershed Restoration Committee consisted of six members from the District of Columbia, the state of Maryland, and Prince Georges and Montgomery Counties. The agreement designated the Metropolitan Washington Council of Governments as lead agency, providing technical and administrative support to the Committee through its Department of Environmental Programs Anacostia Restoration

Team. The Interstate Commission on the Potomac River Basin was designated to coordinate and implement public education and participation activities and to develop a living resources restoration enhancement effort. In 1991, the U.S. Army Corps of Engineers (Corps) was invited to join the Anacostia Watershed Restoration Committee to represent federal agencies.

The Metropolitan Washington Council of Governments serves as technical consultant to the Anacostia Watershed Restoration Committee, often setting the agenda for discussions within the Committee. Individual and multijurisdictional issues are raised and deliberated by technical staffs from the Council and the various jurisdictions. Restoration goals are determined by consensus within the Committee, with input from the Council. The Council helps to prioritize recommendations and to assign their implementation to work groups or state, county, and other agencies. Specific projects are recommended by the Committee, but funded and implemented by individual jurisdictions, depending on budgetary constraints and political support.

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Important Dates in the History of the Anacostia Watershed Initiative

There have been a number of efforts over the past 25 years to evaluate the Anacostia River basin and to determine how agencies responsible for natural resources in the basin could best carry out their respective stewardship roles. The following is a list of significant milestones and formal agency coordination and cooperation agreements.

- 1979 The Metropolitan Washington Council of Governments Water Resources Planning Board designates the Anacostia as a priority watershed.
- 1984 Anacostia Restoration Strategy Agreement signed by District of Columbia and Maryland.
- 1984-5 Coordinated Anacostia Monitoring Program begun; first comprehensive report on water quality published.
- 1987 District of Columbia, State of Maryland, Prince Georges County, and Montgomery County sign (expanded) Anacostia Watershed Restoration Agreement.
- 1988 Anacostia Watershed Restoration Committee (AWRC) established; first annual work plan conducted.
- 1988 U.S. Army Corps of Engineers begins reconnaissance study of the Anacostia watershed, followed later by a feasibility study of various water quality improvement projects.
- 1991 Signatories to the agreement adopt Six-Point Action Plan to Restore the Anacostia River.
- 1991 The U.S. Army Corps of Engineers, Baltimore District, officially joins AWRC.
- 1992 AWRC publishes detailed Blueprint for implementing the Six-Point Action Plan during the next decade.

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Different county and state agency representatives are actively involved in various working groups addressing specific issues or areas of the basin. Their participation contributes to their understanding of the issues and the value of the resource, potentially influencing regulation of utility, transportation, and other projects to make them more compatible with protection and restoration goals. Agencies affected by recommendations under the ecosystem approach are invited to comment on, if not be involved in, restoration initiatives in order to avoid future conflict with their missions and possible misinterpretations of the intent of recommendations.
Several interviewees mentioned that different priorities must be carefully weighed and balanced, and that selection of one goal over another, or the balancing of goals and priorities related to land uses, transportation, economic development, and environmental protection, should be left to elected officials. Local and federal officials, as well as staff from the Metropolitan Washington Council of Governments, emphasized the importance of continuously implementing projects in order to maintain local support and appreciation for the restoration initiative and recognition of its problems and accomplishments. Most restoration projects are funded through local capital project budgets, and local governments use the restoration plan and its goals to help win grants. The more comprehensive and well conceived the plan, the better local governments do in competition for scarce grants.

Restoration goals. In 1991, the Anacostia Watershed Restoration Committee developed a six-point Action Plan for restoring the Anacostia watershed by the turn of the century ("A Commitment to Restore our Home River: A Six-Point Action Plan to Restore the Anacostia River"). It identifies agencies involved in restoration efforts and describes

proposed and completed projects, restoration problems, strategies, and challenges associated with achieving the following six goals:

1. Dramatically reducing pollutant loads in the tidal estuary to measurably improve water quality conditions by the turn of the century.
2. Restoring and protecting the ecological integrity of degraded urban Anacostia streams to enhance aquatic diversity and encourage a quality urban fishery.
3. Restoring the spawning range of anadromous fish to historical limits.
4. Increasing the natural filtering capacity of the watershed by sharply increasing the acreage and quality of tidal and nontidal wetlands.
5. Expanding forest cover throughout the watershed and creating a contiguous corridor of forest along the margins of streams and rivers.
6. Making the public aware of its role in the Anacostia cleanup and increasing public participation in restoration activities.

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Summary of Goals and Strategies for Restoring the Anacostia River Basin

GOAL 1: Dramatically reduce pollutant loads in the tidal estuary to measurably improve water quality conditions by the turn of the century. STRATEGY: Sharply reduce the number of sewage overflow events and stormwater pollutant loadings. Prevent increased stormwater loadings from new development. Remove trash and floatable debris now trapped in the estuary and its tributaries; prevent future trash and debris deposition.

GOAL 2: Restore and protect the ecological integrity of degraded urban Anacostia streams to enhance aquatic diversity and encourage a quality urban fishery. STRATEGY: Apply stream restoration techniques to improve habitat in the most degraded streams. Apply land-use controls and stringent stormwater and sediment practices at new development sites in sensitive watersheds.

GOAL 3: Restore the spawning range of anadromous fish to historical limits. STRATEGY: Remove key barriers to expand the available spawning range for anadromous fish. Improve the quality of the watersheds spawning habitat. Help anadromous fish "imprint" this newly reclaimed habitat so that future generations will return.

GOAL 4: Increase the natural filtering capacity of the watershed by sharply increasing the acreage and quality of tidal and nontidal wetlands. STRATEGY: Accept no further net loss of wetlands in the watershed. Restore the ecological function of existing degraded wetland areas. Create several hundred acres of new wetlands.

GOAL 5: Expand the forest cover throughout the watershed and create a contiguous corridor of forest along the margins of its streams and rivers. STRATEGY: Reduce the loss of forest cover associated with new development and other activities by local implementation of Marylands 1991 Forest Conservation Act. Reforest suitable sites throughout the basin, taking full advantage of existing resources. Reforest ten linear riparian miles by 1994; the ultimate goal is an unbroken forest corridor from the tidal river to the uppermost headwater streams.

GOAL 6: Make the public aware of its role in the Anacostia cleanup and increase public participation in restoration activities. STRATEGY: Raise public awareness of the problems of the Anacostia River and of the restoration effort. Educate the public about the watershed and its role in reducing urban pollution. Encourage a grassroots network of citizens to participate in a variety of ways, including the implementation of small-scale habitat improvement projects.

Source: Metropolitan Washington Council of Governments 1991.

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In 1992, the Anacostia Watershed Restoration Committee drafted a Blueprint describing more than 400 projects designed to implement the Action Plan ("A Blueprint for the Restoration of the Anacostia Watershed"). The Blueprint also identifies other projects that would contribute to restoring the Anacostia, including mine reclamation, combined sewer overflow abatement, dredging, and floatable debris removal. Approximately 70 projects proposed in the Blueprint are located on federal lands (although they are not necessarily proposed or supported by corresponding federal agencies). Blueprint proposals generally fall into the following categories:

Stormwater control. Retrofitting stormwater catchments and building new stormwater retention basins to improve the quality of urban runoff.

Stream restoration. Applying bioengineering measures to stabilize eroding banks and improve fish habitat.

Fish passage. Eliminating barriers to the migration of anadromous and resident fish.

Riparian reforestation. Reestablishing native forests within 300 feet of urban streams and the tidal river.

Wetland creation. Creating or restoring urban wetlands in tidal or freshwater areas.

Small Habitat Improvement Projects. Implementing small-scale environmental restoration projects by citizens, such as stream cleanups, stormdrain stenciling, wetland planting, and reforestation.

Public outreach. Developing a set of programs to inform and involve the public.

The Metropolitan Washington Council of Governments is currently assisting the Anacostia Watershed Restoration Committee in a study to refine the goals of the Action Plan, to develop a means to prioritize and budget for projects, and to measure restoration progress efforts. This study will address the problem of combined sewer overflows (not mentioned in the Committees Blueprint) and develop recommendations for long-term monitoring, improving analytical tools, and identifying indicators for measuring progress that can be used to inform the public. Efforts are underway to develop indicators of restoration success specific to each subwatershed.

Protecting viable cold water habitat in the basin is also one of the goals. Paint Branch, a tributary of the Anacostia River, supports the only self-sustaining trout population in the Washington area. But trout habitat is deteriorating in the Good Hope Tributary to Paint Branch, which accounts for more than 75 percent of annual trout reproduction in the watershed. At the request of the Anacostia Watershed Restoration Committee, an Upper Paint Branch Work Group was formed to identify strategies for protecting and restoring the watershed of the Good Hope Tributary. With members from local and state agencies as well as environmental organizations, this group prepared a comprehensive range of possible strategies to protect the trout and other watershed resources. Areas addressed in the groups report included watershed imperviousness and land use, stormwater management and water quality, erosion and sediment control, park acquisition and management, and resource management and monitoring. Recommendations were offered for consideration by local agencies during master planning, capital improvement, environmental impact assessment, and other processes of government.

The federal role. Anacostia watershed restoration efforts are conceived and driven primarily on the local level. However, the federal government influences these efforts, along with any future ecosystem approaches, in a number of ways. A 1994 Corps report on federal facilities contains a preliminary assessment of federal activities in the Anacostia River basin and describes ongoing or planned environmental restoration initiatives on federal lands (see appendix B at the end of this chapter). In addition, a number of programs, policies, and projects predating the restoration initiative or originally unrelated to it affect it in some way.

Programs and projects. The Corps has seven flood control and navigation projects in the basin and maintains a small fleet of boats on the river for collecting and removing drift debris that jeopardizes navigation. The Corps recently completed a feasibility study recommending a number of environmental projects, including wetland creation, stormwater management pond retrofits, and stream restoration at 13 sites in the basin. In addition, it is implementing several environmental restoration projects under authority of section 1135 of the Water Resources Development Act (WRDA) of 1986, as amended. Construction will start in mid-1995 for modification to fish blockages and aquatic and terrestrial habitat improvements. As part of its maintenance dredging program, the Corps participated with the National Park Service in the restoration of Kenilworth Marsh. Under section 404 of the Clean Water Act, as amended,

the Corps regulatory program governs discharges of dredged or fill material into wetlands and other waters in the basin. Section 114 of the WRDA of 1992 authorizes a feasibility study to identify and recommend measures to eliminate adverse impacts of federal facilities on the Anacostia watershed, although the soonest this study could be funded is in fiscal year (FY) 1996. Section 219(c)(1) of the WRDA of 1992 authorizes technical, planning, and design assistance for measures to alleviate the adverse effects on water quality of stormwater discharges from federal facilities in the Anacostia watershed. Discussions have been initiated with the District of Columbia, the state of Maryland, and Prince Georges and Montgomery Counties regarding this assistance.

Under the Clean Water Act, EPA regulates other discharges into the river through the National Pollution Discharge Elimination System of issuing permits. EPA also provides many of the grants used by local governments in restoration activities and education efforts. Most of these grants are under Clean Water Act authority or through EPAs Chesapeake Bay Program. EPA and other federal agencies, as well as the District of Columbia and the states of Maryland, Virginia, and Pennsylvania, are signatories to Chesapeake Bay Agreements in 1983 and 1987 to plan and implement restoration of the Chesapeake Bay. Much of the work to restore the Anacostia River basin has grown out of these agreements and the Chesapeake Bay Program. In 1992, EPA submitted a report to Congress assessing the extent to which Anacostia pollution was harming the Bays ecosystem, and documenting current and future steps to restore the Anacostia River through various agencies. EPA has also funded many efforts, including planning studies, citizens education, and habitat restoration.

Landholdings and facilities. The federal government owns or operates facilities on 15 percent of the land in the Anacostia basin and has a significant impact on the health of the watershed. Most public park land in the District of Columbia-including the banks on both sides of the tidal Anacostia-is managed by the National Park Service, giving the federal government an important stake in restoration initiatives. Other federal agencies that manage land or maintain facilities in the basin include the USDA Beltsville Agriculture Research Center and the U.S. Department of Defense. A number of them have implemented environmental restoration or enhancement efforts.

Technical expertise and program assistance. Throughout the federal government, there is technical expertise and programmatic interest that can be useful in restoration efforts, augmenting the technical capabilities of state and local agencies. Federal agencies that may be able to provide technical expertise and assistance include the Corps, Department of Defense, Forest Service, National Marine Fisheries Service, Natural Resources Conservation Service (formerly Soil Conservation Service), and U.S. Fish and Wildlife Service. Other agencies that may be able to provide resources for specific types of projects include the U.S. Department of Transportation and National Civilian Conservation Corps.

The Federal Agencies Committee was established in 1984 to assist federal agencies in complying with the original Chesapeake Bay Agreement. It consists primarily of representatives of federal agencies with missions or activities affecting the Bay, including EPA, the National Oceanic and Atmospheric Administration (NOAA), and various agencies of the Departments of the Interior, Agriculture, and Transportation. The Federal Agencies Committee provides a forum for information exchange among federal agencies on programs that affect the Bay.

ISSUES AND CONCERNS

Interviewees expressed a variety of concerns regarding federal involvement in the Anacostia restoration initiative. Although issues discussed were interrelated, they can be organized into the following general categories:

Federal agency role
Regulatory programs and permits
Corps activities
Funding
Science and information
Public participation

The first four categories of concerns related to a range of budgetary, institutional, legal, and policy issues.

Federal Agency Role

How federal agencies manage their lands and facilities, and how they address restoration problems and opportunities, are viewed as measures of federal commitment to the restoration of the Anacostia, and possibly to ecosystem

restoration in general.

Stewardship. Some feel that federal agencies that manage land in the watershed are not committed to stewardship responsibilities or restoration goals. This perception is based on knowledge or suspicion that federal facilities contribute to pollution or fail to fund efforts to clean it up. The community reaction is, "If the federal government doesnt care, why should we?" A lack of appropriations to clean up pollution caused by federal agencies is viewed as evidence that the federal government does not view pollution as a serious problem.

EPA, through the Chesapeake Bay Program, has begun an assessment of nutrient management problems on federal facilities to help agencies identify specific restoration needs and opportunities on their lands. Having this information will help federal agencies understand the levels of effort needed for restoration projects and provide them with justifications for budgeting the needed funds. In addition, the Chesapeake Bay Agreement signed in July 1994 demonstrates a multiagency commitment to restoring the Anacostia River watershed, and the development of a biennial workplan should help build confidence in the federal commitment to restoration efforts.

Vision. Key to a successful ecosystem approach in the Anacostia watershed is a clear overall vision shared among all stakeholders. Interviewees commented that the Anacostia Watershed Restoration Committees Six-Point Action Plan provided a good initial framework for action, but was not comprehensive enough in terms of planning, coordinating, monitoring, and evaluating to provide a vision for restoring the watershed. Federal agency participation on the Anacostia Watershed Restoration Committee was not included until 1991; therefore, federal perspectives may not be adequately represented in the Action Plan. Early federal, state, and local agency participation in setting goals is vital in getting agency managers and other stakeholders to embrace a vision broad enough to realize restoration. Long-term federal support, however, may help maintain the momentum of restoration despite changes in local administrations.

Implementation of the vision is especially challenging when there is no jurisdiction or agency with overall responsibility. Projects are implemented by each jurisdiction independently, and support for the overall vision is subject to changing priorities of jurisdictional heads and administrations. Therefore, institutional structures such as the Anacostia Watershed Restoration Committee and the Metropolitan Washington Council of Governments are important in formulating and coordinating regional plans. Comprehensive plans are needed to steer local efforts so that a vision for the watershed can be agreed upon and shared by all leaders, jurisdictions, and agencies involved, as well by those responsible for implementing projects.

Missions. Differences of opinion were expressed with regard to agency missions. To some, federal agencies appeared too narrowly constrained by their stated missions, ignoring opportunities to participate in restoration efforts. For example, the National Park Service was criticized for narrowly focusing on recreation and resisting use of its land to restore the Kenilworth Marsh. And the largest federal owner of land in the basin, the Agriculture Research Center in Beltsville, conducts agricultural research on its 7,000 acres, but failed-in the opinion of some interviewees-to practice the ecosystem approach in a manner consistent with basin restoration goals.

Coordination. Although federal programs and activities were praised for supporting and facilitating basin restoration, there was repeated criticism that federal restoration initiatives lacked coordination. The Corps, as federal representative on the Anacostia Watershed Restoration Committee, is charged with coordinating federal involvement in Committee restoration efforts. One interviewee recommended that the Corps establish a committee for coordinating federal agencies to facilitate broader federal input into restoration activities, particularly from agencies with land in the basin. Another recommended that a member of this committee be assigned to the Metropolitan Washington Council of Governments part-time. The Technical Oversight Committee of the Anacostia Watershed Restoration Committee discussed giving federal agencies other than the Corps an observer role on the Committee, but this proposal was not adopted. The July 1994 Chesapeake Bay Agreement reinforced the leadership role of the Corps in coordinating federal agency efforts in support of Anacostia restoration goals. Lack of budget authority has severely limited the Corps ability to devote resources to coordination efforts. After funding is received, the Corps can move forward with this effort.

There appears to be a tension between, on the one hand, the desire and need for coordinated federal expertise, participation, and funding for the Anacostia restoration effort, and, on the other hand, a fear that federal involvement could overwhelm or derail local efforts. Some interviewees wanted more federal agencies to participate in basin restoration activities, but not to dominate the Anacostia Watershed Restoration Committee. Although the Federal Agencies Committee has not specifically been involved with the Anacostia restoration initiative, it considers the river a priority tributary to the Bay, so in pursuing the Chesapeake Bay Program, it may be able to facilitate improved federal input and coordination for Anacostia Watershed Restoration Committee initiatives.

Regulatory Programs and Permits

Environmental restoration in the Anacostia basin affects resources that are regulated for their protection by federal, state, and/or local government agencies. An array of permits may be required for implementation of a restoration project, including:

- Clean Water Act section 404 permits issued by the Corps and the Maryland Department of Natural Resources
- Local government wetland permits
- Clean Water Act section 401 Water Quality Certifications
- Local grading, stormwater management, and sediment and erosion control permits
- Soil Conservation District 378 Small Pond Approvals
- Waterway Construction Permits
- Forest Conservation Act Permits
- Maryland Historic Trust Reviews
- National Pollution Discharge Elimination System Stormwater Permits
- Several interviewees recommended that a clearinghouse of information on permits be created. The potential for an automated, online system for one-stop permit information, with appropriate "real person" backup for complex situations, could be explored. In addition, interviewees suggested streamlining the permit process or delegating it to local authorities.

Interviewees commented that regulators appeared to be uninformed about restoration projects and unfamiliar with the benefits to be gained from them. For example, one local government agency reportedly faced difficulty in obtaining section 404 permits from the Corps for discharges of fill material into wetlands for the purpose of environmental restoration. Interviewees called for regulatory personnel at all levels to better understand the purpose and benefits of environmental restoration projects so that permitting does not conflict with regional restoration.

In the District of Columbia, most open spaces are federally owned, and usually not available for mitigation when development projects affect wetlands such that compensatory mitigation is required. Other urbanized areas likely experience similar problems. However, in the Corps Anacostia feasibility study and the section 404 regulatory program, planning efforts were coordinated and regulatory mitigation requirements were examined in light of restoration objectives.

A cooperative planning and regulatory mechanism might be developed to streamline permitting for restoration efforts. Small restoration projects, such as those in the upper drainage in Prince Georges and Montgomery Counties, may not need the same level of review as larger projects. In addition, projects that are more experimental could be given special consideration and required to provide feedback for future projects.

Army Corps of Engineers

The Corps was commended by state and local governments for identifying and coordinating information on federal agency restoration initiatives. But it was also criticized for not doing more.

Role on the Anacostia Watershed Restoration Committee. Several interviewees commented that the Corps is restricted to activities that have been specifically authorized and appropriated, and was therefore slow to meet its obligations as federal representative on the Anacostia Watershed Restoration Committee. Corps activities are primarily funded by line item, and the relationship between all activities and line items must be accounted for. Interviewees thought that the Corps was not able to adequately perform its federal coordination and outreach functions because there was no appropriation for them.

The 1994 Chesapeake Bay Agreement assigned the Corps the lead in developing "a coordinated biennial federal workplan beginning in FY 1995, in concert with the Anacostia Watershed Restoration Committee." This agreement states that federal agencies agree to "give full support to the Anacostia River Demonstration Project as an opportunity to apply ecosystem management concepts in an urban environment." Funding has been requested in the FY 1995 Corps budget to meet Corps obligations under the agreement, specifically those pertaining to the Anacostia restoration project. A workshop was held in September 1994 to initiate preliminary coordination under the agreement.

Planning duration and costs. Several interviewees complained that the Corps takes too long to plan and construct environmental restoration projects, and that they cost too much. It took 4 years for the Corps and local sponsors to agree to a cost-sharing arrangement and to conduct the feasibility study for environmental restoration efforts in the Anacostia River basin. It can take almost as many years to obtain the congressional authorization and appropriation needed to begin construction. Furthermore, the restoration initiative is a major project with significant shared costs, and interviewees often had the impression that the Corps put no more effort into large-scale projects than into small-scale ones.

Policy requirements. Some interviewees complained that the Corps will not approve a project unless it provides monetary benefits, and that this policy hinders environmental restoration. These complaints point to confusion regarding Corps policy on environmental restoration projects. Unlike plans in other benefit categories, plans for environmental restoration projects are not required to contribute to economic development under the National Economic Development plan. Environmental restoration projects are justified through description and evaluation of net benefits from the recommended plan, using monetary and nonmonetary units of measurement, as appropriate. Although benefits from environmental restoration projects are difficult to measure in monetary terms, their cost-effectiveness must be evaluated and justification for them provided. Still, there is no requirement that environmental benefits be expressed in dollars, or that a benefit-cost ratio be used to justify environmental restoration projects.

Environmental mission. Distinctions between Corps water resources planning and Corps regulatory roles in broader watershed restoration efforts were confusing to interviewees. Some complained that the Corps focuses its efforts on "individual project studies, as opposed to applying its capabilities to broader watershed restoration needs and opportunities." The Corps water resources development program (which includes environmental restoration projects, such as those proposed in the Corps Anacostia feasibility study) appeared to interviewees to be totally separate from the section 404 regulatory program. Nonfederal interviewees thought that there was no programmatic relationship between decisions made on section 404 permit applications and the Corps study and planning process.

Several interviewees also complained that the Corps environmental restoration mission is restricted to habitat and requires linkage to existing projects. Although hydrology and water quality are critical to habitat, the Corps has not used these parameters in defining fish and wildlife habitat, and in positing habitat restoration as a project purpose. Moreover, the Corps requires a link between environmental projects and existing flood control and navigation projects, making it difficult for it to participate in basinwide restoration studies.

Corps policy is evolving to allow participation in environmental projects that are not linked to existing projects, and to allow greater participation in basinwide restoration studies. In developing its new policy, the Corps is taking an ecosystem approach to restoration and management, as well as to water resources development. In its environmental restoration studies, the Corps will address not only habitat, but also the structural components of ecosystems (such as hydrologic functions and water quality).

Section 22 authority. Interviewees commented that alternative applications of the Corps authority under section 22 of the Water Resources Development Act of 1974 (comprehensive planning cooperation and assistance to states) could be explored to identify more opportunities for the Corps to support efforts to implement the ecosystem approach.

Funding

Interviewees expressed a variety of concerns about funding the Anacostia restoration initiative, from federal grant availability to interagency cost sharing.

Grant availability. Several interviewees commented that state and local governments are not always able to take advantage of federal grants because they are unaware of them. They recommended establishing a federal clearinghouse to inform state and local governments of federal grants and other programs for environmental restoration.

Grant scope. Grants tend to be too limited in scope to address the restoration needs of regional watersheds like the Anacostia. Typically, EPA grants and other forms of financial assistance for ecosystem restoration are tied to specific environmental media, confounding the process of restoring multiple components of ecosystems. Moreover, grants are awarded to individual states, making it difficult to plan regional restoration activities unless all affected states receive grants for the same purpose at the same time. Finally, grants for site-specific restoration projects tend to address symptoms rather than root causes. For example, unregulated discharges, such as nonpoint source runoff, pose recurring problems that cannot be eliminated through site restoration efforts.

Matching fund requirements. A number of local entities recommended the elimination of the matching fund requirement for many frequently used grants, especially for ongoing projects. Financially strapped communities may be forced to terminate worthy restoration projects if they can no longer match federal funds. This happened to numerous projects identified as near-term priorities in the Anacostia Watershed Restoration Committees Blueprint for the Restoration of the Anacostia Watershed. One interviewee suggested the possibility of in-kind matching.

Project operation and maintenance. State and local governments noted that even if they are able to develop environmental restoration projects, they often lack the funds to operate and maintain them. For example, the District of Columbia has 26,000 stormwater catch basins designed to reduce the amount of trash in the river. Unfortunately, the District does not have the funds to keep them free of floating debris and maintain them on a regular basis. Moreover, because many restoration projects involve novel techniques, it is difficult to forecast how much funding will be necessary to maintain them.

Interagency cost sharing. The Chesapeake Bay Program provides for interagency funding of restoration projects throughout the region, including the Anacostia River basin. However, few Anacostia projects have taken advantage of this. Several reasons were given by those surveyed: federal agencies have higher priority projects; federal involvement in Anacostia restoration projects is smaller than elsewhere; and there is a lack of awareness of the need for interagency funding of Anacostia projects.

District of Columbia special status. Under the Coastal Zone Management Act of 1972, 16 U.S.C. §§ 1451 et seq., the Secretary of Commerce may make annual grants to coastal states for the purpose of developing and/or administering a management plan for the land and water resources in their coastal zones. Because the District of Columbia is not considered a state for purposes of the Coastal Zone Management Act, the District is not eligible for these grants. District representatives identified this as an impediment to their environmental restoration efforts.

Public Participation

Most public participation efforts are managed and implemented by state and local governments, with assistance from the Metropolitan Washington Council of Governments and the Interstate Commission on the Potomac River Basin. Federal agencies implementing projects in the basin, such as the Corps or the National Park Service, have also initiated public participation efforts in the basin. EPA has, and continues to support, a number of public outreach efforts through grants and other funds.

Types. Public participation associated with the Anacostia watershed restoration falls into two general categories: public education and outreach, and public involvement.

Public education. A number of interviewees commented that public education was crucial to restoration efforts because it generates a constituency aware of and informed about resources and projects. Cultivation of local support and enthusiasm will go a long way toward maintaining projects and ensuring funding, particularly in the long term.

Public education and outreach programs in the Anacostia watershed are numerous, with cooperative and independent efforts undertaken by Prince Georges County, Montgomery County, the state of Maryland, the Interstate Commission on the Potomac River Basin, and the District of Columbia. These programs are designed to target not only the general public, but also the legislators and government agencies in the watershed.

Over the years, the focus of public outreach initiatives has changed with the priorities of restoration programs. Many early restoration efforts in the Chesapeake Bay Program focused on discharge cleanup rather than prevention, and on agricultural pollution sources. Currently, more emphasis is placed on urban and suburban land use within the watershed, and on lifestyle changes that complement restoration objectives. Public outreach efforts in the Anacostia basin must address these issues.

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Examples of Public Education and Outreach Techniques Used in the Anacostia Watershed General public education:

- The Interstate Commission on the Potomac River Basin (ICPRB) sends a quarterly newsletter on the Anacostia restoration initiative to more than 15,000 individuals.
- Subbasin coordinators for the ICPRB have been funded in five of nine subbasins in the watershed to help people get involved in basin issues. Each coordinator lives in a particular subbasin and has explored most of

its tributaries. Coordinators make contact with the public and report problems on a regular basis.
- The ICPRB has published special reports for particular subbasins for coordinators to use in informing the public.
- A directory of watershed groups was issued by the ICPRB.
- Focus groups of local leaders help agencies take the community pulse.
- The Bayscapes Program, part of the Chesapeake Bay Program, provides information and fact sheets on how to reduce pollution through landscaping and yard care techniques.
- Urban geology tours provide the public with a context for better understanding the watershed.
- A videotape developed by Prince Georges County on Anacostia River restoration activities has been shown on PBS.

School-based programs:

- In 1991, the Chesapeake Bay Foundation began an environmental education program on the tidal Anacostia and the Chesapeake Bay that reaches several thousand District of Columbia students each year.
- The District of Columbia opened the Aquatic Education Resource Center in 1991 in Anacostia Park, which conducts aquatic education programs for students during summer and the school year.
- The Chesapeake Bay Program is developing a speakers bureau targeted at urban schools.The Chesapeake Bay Program Office in the District of Columbia is piloting Champions for the Chesapeake, a program to strengthen students math and science skills through classroom and field activities centered around environmental protection of the Anacostia watershed. Anacostia High School, in conjunction with the University of the District of Columbia and the city government of the District of Columbia, has been awarded a grant through EPAs Public Private Partnerships Program and the Chesapeake Bay Program Office to develop a model lesson plan and a 6-week summer enrichment program that can ultimately be transferred to other schools in the Anacostia watershed.
- Montgomery County has developed a program for training teachers and helping them incorporate Anacostia restoration and other environmental material into various curricula in the county schools (such as math, computers, and science).
- Through the Chesapeake Bay Program, EPA has provided grant money for "teacher institutes" designed to help teachers learn how to teach kids about the Anacostia and to "reach parents by reaching kids" who participate in the Students Taking Action for Rivers Program.
- The University of the District of Columbia, through its Water Resources Center, recently entered into an agreement with the National Park Service for a stream gauge. With a computer modem, schools can be hooked to it through the telephone. Students can take readings, tracking the health of the river and developing meaningful statistics on it. This program works to build a link between science and the public.
- The University of the District of Columbia is planning to use a recently closed high school as a new campus. Laboratories in the school will be used for field studies and as public learning centers. The universitys Water Resources Center also sponsors symposia and seminars.

Public Involvement Activities in the Anacostia Watershed

· Small groups organize stream restoration efforts, such as cleanups, tree planting, and stream walks. Canoe and boat rides on the Anacostia contribute to public understanding and appreciation of the river.

· The Municipal Washington Council of Governments, with the support of other agencies, has developed a Small-Habitat Improvement Program for implementation by citizen volunteers. More than 30 small-scale projects have been completed.

· Crews from the Maryland Conservation Corps have removed more than 50 tons of scrap metal and debris from lower Beaverdam Creek, along with more than 20 tons of tires, leaking containers, and other debris.

· Under education guidelines established by the National Pollution Discharge Elimination System, the Montgomery County Department of Environmental Protection (DEP) sponsors a volunteer monitoring program that encourages monitoring of county streams by both citizens and schools and conducts a water quality education program for citizens. School curricula are being developed to connect environmental field activities with school-based science, and students on Stream Teams monitor streams and participate in restoration. The DEP coordinates the Stream Teams with the Audubon Naturalist Societys citizen monitoring program. All volunteer data is submitted annually to DEP in the form of watershed reports. Volunteers interact with and provide input to the countys stream monitoring program.

· A coalition calling itself the Lower Beaverdam Task Force has established the Palmer Park Initiative on Lower Beaverdam Creek. Monthly meetings produced the following key accomplishments in the first 2 years:

- Presentations and articles in the Palmer Park Citizens Association newsletter, along with a Chesapeake Bay Foundation boat tour, were used to educate Palmer Park residents and government representatives.
- Residents embraced the project. The Prince Georges County Department of Environmental Resources (PGDER) posted signs identifying Palmer Park as a community that cares about the environment.
- A survey of Palmer Park residents was completed by PGDER. Almost 80 percent of respondents said they were willing to help improve their neighborhood.
- A service station was found that was willing to accept residents used motor oil, and recycling was then promoted.
- Floating trash was reduced through a stream adoption program, a stream cleanup, placement of trash cans in litter hot spots, and public education about illegal dumping.

Public involvement. The public often takes an active role in restoration efforts, either through hands-on participation in projects (sometimes called volunteer projects), or by providing input into planning and decision-making processes. Activities with public participation, including monitoring, tree planting, trash cleanup, wetland restoration, and small habitat improvement, are sponsored by the Metropolitan Washington Council of Governments, state and local governments, the Interstate Commission on the Potomac River Basin, and environmental and other NGOs. Public involvement in the Anacostia initiative has ranged from developing visions for local restoration projects to presentations on final project plans.

The Anacostia Watershed Restoration Committees Six-Point Action Plan for restructuring the Anacostia River watershed included public education, outreach, and participation. But in May 1994, the Committee drafted a more detailed "Strategic Plan Proposal for Anacostia Restoration Outreach" to specifically address public education and participation. The Plan called for:

1. Increasing elected official participation and developing a clearer understanding of the key role of officials in Anacostia restoration efforts.
2. Increasing opportunities for citizen participation in Anacostia Watershed Restoration Committee restoration activities.
3. Increasing public awareness and understanding of the Anacostia and its restoration.
   Establishing a formal mechanism for providing greater citizen input into Anacostia Watershed Restoration Committee activities.

Establishment of a citizens council is planned, as a formal mechanism for providing advice and guidance to the Anacostia Watershed Restoration Committee and to increase opportunities for citizen involvement in, and stewardship of, projects in the watershed.

Concerns. Interviewees raised various concerns regarding public involvement in the Anacostia restoration initiative and offered suggestions for dealing with them.

Public input. Although several programs involve the public in restoration initiatives through volunteer efforts, public involvement in planning and decision making appears to be less prevalent. Some interviewees complained that agencies do no more than inform the public of decisions made, and do not seek public input into the decision-making process from the outset. Presentations that notify citizens of efforts planned or underway constitute public information rather than public involvement.

Federal interviewees reported that efforts to involve the public in a study or process often meet with an apparent lack of interest that they find frustrating, particularly when opposition then suddenly arises late in the process. Agencies find it difficult to know when to present information to the public and how much to present, because seeking input at early conceptual stages or for regional studies often fails to stimulate public interest. Although public input has been more vigorous on local projects, interest often remains relatively slight, yet presentation of a fully developed project makes the public feel left out of the process.

Interviewees complained that public participation efforts were poorly conceived. For example, public meetings are ineffective unless the audience and information presented are appropriate; often, insufficient effort is made to identify all stakeholders and public interests and to include them in the decision-making process. This requires considerable planning and research, which has not always been forthcoming.

It was suggested that public forums be designed for exchanging information and providing public input to studies or analyses. Interviewees emphasized that public participation must be institutionalized in order to ensure that it is continuous rather than a reaction to ad hoc proposals. Moreover, agencies should determine what the public expects from restoration efforts and be more specific as to what they, for their part, expect from the public. Defining these roles and expectations can help in development of consensus with regard to goals, objectives, and strategies among the agencies, the public, and stakeholders.

Low-income community involvement. Interviewees reported that little effort was made to involve the watersheds low-income communities in the restoration effort. Newsletters from the Interstate Commission on the Potomac River Basin, for example, were viewed as designed for more highly educated audiences. Interviewees noted that the low-income, largely minority neighborhoods in which many projects are located face pressing problems of homelessness, unemployment, and crime that compete with environmental issues for the attention of community members. According to a 1992 EPA study, "Community policing in Prince Georges County has revealed the degree of community concern for the amount of litter in low-income neighborhoods. Cleaner communities have been linked to greater self-esteem, and this is likely associated with environmental stewardship, a goal of the Anacostias restoration and protection program."

Studies conducted over the past 15 years have found that minority and low-income communities have a disproportionate share of the nations environmental problems. In February 1994, President Clinton signed Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations") directing federal agencies to make environmental justice a part of their missions. The order was designed to focus federal attention on environmental and human health conditions in minority and low-income communities, and to promote nondiscrimination in federal programs that substantially affect human health and the environment. It was also intended to provide these communities with access to public information on, and an opportunity for public participation in, matters relating to human health or the environment (section 5-5 of Executive Order 12898).

A suggestion was made that agencies provide employment to Anacostia watershed residents or opportunities for local volunteers to participate in restoration projects and other efforts. Because of contracting constraints, the Corps did not follow this suggestion in restoring Kenilworth Marsh. One interviewee remarked that "the Corps missed an opportunity not only to make the local community feel like a stakeholder in the marsh, but also to invest in people who live around the marsh, an area of high unemployment."

Technical jargon. Several interviewees commented that communities need help understanding technical documents so that they can comment on them. Complicated documents such as Environmental Impact Studies are often complex and contain technical jargon. "If agencies value intelligent community feedback," one interviewee said, "they should make an effort to translate such documents into plain language." Agencies might create forums to explain documents and provide expert advice and counsel, perhaps through technical grant programs.

Program complexity. It is often difficult for the public to understand the variety of programs and agencies involved in restoration activities. Moreover, it is difficult for citizens to attend multiple meetings that address small components of the restoration effort (such as wetlands restoration or tree planting). A more coordinated approach for communicating with the public on projects involving interrelated programs would be helpful.

Local government representatives stated that clarification of public outreach requirements for federal programs and guidance on how to implement them would be useful. Local governments are not sure how to meet the requirements and would like suggestions on how to do so.

Because ecosystem restoration efforts involve multiple agencies and jurisdictions, joint development of public information tools and presentations covering a range of topical areas (e.g., basic science and technical information, the impact of lifestyle on the environment, and how citizens can help) was recommended. Expenses could be shared among agencies, and consistency of the materials developed would be assured through a joint effort.

Interviewee suggestions. According to interviewees, effective public participation depends on:

1. Selecting appropriate messages and audiences. The first information presented is often key to sustaining public interest.
2. Helping the community to conceptualize and value restoration of the local stream, river, or watershed and the changes it will bring.

3. Overcoming inertia or doubts regarding working with government.
4. Helping the community see that it has an influential role to play in restoration.
5. Helping people modify personal or household behavior detrimental to restoration efforts.
6. Providing opportunities for public participation. Public involvement (e.g., monitoring or participating in restoration projects) promotes awareness of the impact of human activities on ecological processes.
7. Providing a forum for public input into project plans. Public involvement in decision making can help head off conflict over project implementation.
8. Assuring support for long-term public participation.
9. Tailoring information and outreach efforts to residents of low-income neighborhoods where projects are located. Integrating restoration efforts with needs in low-income areas, such as relief from crime, would help residents to better relate to the river and the watershed.
10. Involving the Anacostia Watershed Restoration Committees proposed Citizens Advisory Committee in addressing problems in low-income neighborhoods, in coordination with the Citizens Advisory Committee established by the Mayor of the District of Columbia. These committees could advise and assist federal agencies in their public outreach efforts in low-income communities.
11. Ensuring that the subbasin coordinator positions for the District of Columbia are filled in the near future. Lack of funding has made this a problem.
12. Using Anacostia watershed issues and efforts as part of math, science, and other curricula in local high schools, and involving students in field activities dealing with watershed restoration and protection (a concept being pursued by individual jurisdictions).
13. Utilizing the technical expertise, talents, and public education programs of local universities.

Science and Information

Interviewees identified various science-related issues concerning the Anacostia basin restoration initiative, ranging from information access to the need for adaptive management.

Information access and management. The Corps, EPA, Fish and Wildlife Service, NOAA, National Park Service, USDA, U.S. Department of the Interior, and U.S. Geological Survey all have responsibilities for developing science in areas that could be relevant to the Anacostia restoration effort. Often, relevant information is developed across several agency programs. But many nonfederal interviewees complained that it was difficult to locate scientific and technical expertise in federal agencies or academia. Interviewees from technical groups feared having to "reinvent the wheel" for lack of opportunities to learn from the experience of other urban restoration and nonpoint source pollution management efforts. Scientific problems and technical difficulties encountered on Anacostia restoration projects must be similar, interviewees felt, to problems in other northeastern urban watersheds. But they were unaware of any centralized information on urban ecosystem restoration initiatives or any ready means to access it.

Interviewees recommended establishing a central location for information on restoration activities, such as best management practices, technological advances, resolution of conflicting issues, and successes and failures in similar efforts by agencies around the country. It was suggested that federal agencies, such as the Corps and EPA, could facilitate sharing this information.

One interviewee suggested establishing a hotline for information on restoration activities in the Anacostia watershed and how one can get involved. Another suggested a hotline for reporting environmental problems in the watershed.

Information and technology needs. The Technical Oversight Committee of the Anacostia Watershed Restoration Committee identified a lack of technical information on effective riparian restoration techniques, and a lack of design criteria for stream restoration and stormwater retrofit projects. The Technical Oversight Committee looks to federal agencies for help in some of these technical areas.

Information on how to properly deal with contaminated sediments and on the fate of contaminants (from contaminated sediments) in the food chain is also lacking. Technical expertise on whether and how the sediments can or should be cleaned up is needed. Interviewees commented that federal agencies have expertise in dealing with toxic sediments and should be able to help with contaminants in the Anacostia. Assistance is needed in quantifying the extent of the problem and identifying "hot spots" and alternative solutions.

A better foundation for the science of the ecosystem approach is needed. This basic research is beyond most local government capabilities in the basin and requires collaboration among agencies. In addition, there is no complete inventory of flora and fauna for the Anacostia watershed, and it was suggested that perhaps federal agencies could assist in developing an ecosystem-based inventory for evaluating resources and assessing management and restoration options. Ideally, this would include systems information, such as hydrology, geology, and meteorology. Several interviewees commented that the many universities and colleges in the region could contribute to the basic research and expertise needed in the Anacostia restoration effort.

Not all areas of the Anacostia watershed are ecologically "equal." The identification of particular areas of rich biodiversity, as well as highly threatened areas, is needed to help in prioritizing and evaluating restoration efforts.

Because human impacts on the ecosystem will continue, technology to better mitigate the impacts of land uses is needed. Green technologies (e.g., reuse of stormwater) and low-impact technologies for development and other land uses are needed.

Technology is needed to control and manage nonpoint source pollution, in particular the financing of research and development of technology to address combined sewer overflows. A comment was made that local governments, especially the east coast cities that have combined sewer overflows, cannot afford to remove and replace them. Several interviewees representing local jurisdictions requested that the EPA and other federal agencies look into the possibility of providing assistance.

The Anacostia Blueprint for the Restoration of the Anacostia Watershed was described by some as a scattered "shotgun" approach, although they acknowledged that it was an essential first step in developing a better understanding of the problems in the basin and what it will take to clean them up. Initially, most projects were approached as equally important, with priorities set according to logistical, political, or institutional expediency rather than on a purely scientific basis. However, with its growing understanding that more information on ecological relationships and processes is needed, the Technical Oversight Committee acknowledges a need for more prioritization-in terms of both time and space.

One interviewee suggested that federal agencies could form watershed "SWAT teams" to assist local governments in developing ecosystem approaches and to provide information, technology, and resources.

The development by the Technical Oversight Committee of "ecological indicators" of ecosystem improvement will help in assessing project effectiveness and in setting priorities. Because there is no clear endpoint toward which ongoing efforts are headed, it will be hard to know whether they succeed (as many interviewees pointed out). However, the development of indicators of water quality, habitat, anadromous fish, wetlands, and forest health provides important qualitative tools to assist in monitoring the success of the Anacostia restoration.

Several new federal efforts may help to address deficiencies in information and technology for ecosystem restoration. The President has recently established a National Science and Technology Council to coordinate the federal research effort. Through two subcommittees of the Committee on Environment and Natural Resources, research will be coordinated on species sensitivity to environmental change, on restoration and translocation technology, and on the design and effectiveness of protective buffer zones. As part of these efforts, agencies are inventorying, collecting, and assessing existing data sets for a range of environmental and natural resource issues. The working group of the Committee on the Environment and Natural Resources might consider using the Anacostia as a regional pilot for aggregating such data and identifying gaps. One interviewee suggested that the Anacostia be identified as an urban watershed restoration demonstration in the Chesapeake Bay Program, for demonstrating technologies and receiving increased support from the Chesapeake Research Consortium to address scientific problems.

Analytical tools. Several interviewees commented that the lack of a comprehensive watershed analysis or modeling effort for the Anacostia has limited the broader understanding of the scope, priorities, and effectiveness of restoration in the watershed. It was pointed out that both the Potomac River and Chesapeake Bay cleanup efforts benefited from early modeling exercises to help identify and prioritize regional problems as well as identify possible solutions. But it was also emphasized that continued administrative and public support for restoration initiatives requires the visibility of "on-the-ground projects." There is greater political and public appreciation for completed projects than for studies and computer models. If funding and time are limited, it may be best to move toward implementation in order to help assure continued interest and support. Surrogate (or "quick and dirty") assessment techniques are needed.

Analytical techniques are needed to assess the relationship between ecosystem structure and function, and to find ways to measure improvement and the effectiveness of restoration projects. Specifically, improved understanding is needed of how changes in hydrology relate to changes in water quality and biology in order to better measure the effectiveness of restoration projects.

Improved access to geographic information systems would be helpful in planning and decision making. A geographic information system would provide the ability to synthesize existing scientific data with those currently being collected throughout the basin. Data from an extensive monitoring program for the watershed, the Coordinated Anacostia Monitoring Program, are used to develop annual reports and to support planning, decision making, and other research endeavors. This program provides one type of information that could be included in a geographic information system.

Remote sensing data could prove useful to the restoration effort by providing detailed information about land cover, gradients, water turbidity, and topography. Knowledge of the Landsat data sets available as well as their scales and costs would be helpful.

Adaptive management. Several interviewees noted that because of the scientific and technological uncertainties associated with ecosystem restoration, many restoration efforts are based on intuition. As more is learned about ecosystem structure and processes and about the effectiveness of restoration measures, adjustments to decisions or projects need to be made. Changes in social values and preferences may also demand that future efforts be carried out differently.

Because the sum effect of individual restoration projects is unknown, it is important to monitor the effects of projects underway. In lieu of predictive modeling, this kind of "learn as you go" approach (known as "adaptive management") is seen as the best way to implement an integrated ecosystem approach.

Interviewees noted that it was difficult to obtain monies required for long-term monitoring, although monitoring is essential to measure the effectiveness of project measures and rationale. Information derived from monitoring can be used to make midpoint corrections in accordance with adaptive management.

CONCLUSIONS AND RECOMMENDATIONS

Based on its study of the Anacostia restoration initiative, and on concerns raised and suggestions made by interviewees, the study team developed recommendations on the ecosystem approach in general, and in areas of concern addressed by interviewees: the role of federal agencies in the Anacostia restoration initiative; regulatory programs and permits; funding; public participation; and science and information.

Ecosystem Approach

The ecosystem approach is defined in volume 1 of this series (Interagency Ecosystem Management Task Force 1995) as "a method for sustaining or restoring natural systems and their functions and values. It is goal-driven, and it is based on a collaboratively developed vision of desired future ecosystem conditions that integrates ecological, economic, and social factors." The Anacostia River Watershed Restoration initiative implements several key components of the ecosystem approach, including:

1. A partnership of private interests (such as businesses and NGOs) with federal, state, and local public interest representatives to carry out the initiative.
2. A common set of goals refined into measurable objectives and used as a basis for developing restoration and management alternatives.
3. Attempts to integrate management of human and natural resources, including all natural media (waters, air, and living resources).
4. Use of science to set goals and measure progress.
5. A signed agreement affirming commitments of most parties to the goals.
6. Cooperative programs to leverage resources and mobilize the widest range of available expertise.
7. Efforts to inform and engage citizens and elected officials in restoration efforts.

Other ecosystem approach initiatives should consider incorporating these or similar elements into their programs.

Integral to a successful ecosystem approach is a vision shared among leaders of agencies and organizations involved in restoration efforts. For the Anacostia initiative, the Anacostia Watershed Restoration Committees Six-Point Action Plan serves this purpose, outlining a common vision. Statements of vision must be living documents, flexible enough to accommodate evolving priorities and new scientific knowledge. In order to realize the vision, all stakeholders must ascribe to common goals, understanding and acknowledging their respective responsibilities.

Goals of the ecosystem approach can be incorporated synergistically into local and regional planning, taking advantage of the complementary competencies and capabilities of agencies at each level. In keeping with basinwide restoration goals, one of the jurisdictions in the Anacostia watershed created a development plan designed to buffer streams. For the past 28 years, development has progressed according to the plan: commercial, industrial, and heavy residential land uses have been confined to transportation corridors extending outward from the metropolitan area. In addition, measures for controlling stormwater from new community development form the basis for protecting the watershed from future urbanization.

A forum is essential for establishing goals, resolving differences, and deciding priorities. For the Anacostia initiative, the Anacostia Watershed Restoration Committee has this function on the state and local level. An additional forum is needed on the technical and working level to focus and coordinate various study and implementation efforts and concerns. For the Anacostia initiative, the Metropolitan Washington Council of Governments plays this role, serving as technical arm of the Anacostia Watershed Restoration Committee and helping to coordinate efforts among various jurisdictions that might otherwise be at odds. The Council also helps to assure continuity and maintain momentum when there are changes in local administrations.

Federal Agency Role

Many federal agencies have programs that affect any given ecosystem, and an ecosystem approach provides a means for integrating diverse federal activities to ensure that they reinforce rather than conflict with one another. Even agencies responsible for programs and facilities not specifically related to natural resources (such as housing or transportation) should develop and manage their programs in a way consistent with sustainable ecosystem objectives.

In observing their legislative mandates, federal agencies should be flexible enough to contribute to the ecosystem approach. Although agency missions are codified by federal statute, their interpretation usually provides leeway for agencies to support other congressional and Administration priorities and policies. Had federal agencies quickly joined restoration efforts as stakeholders in the Anacostia watershed initiative, playing a more active role in developing the restoration vision, there might have been less initial reluctance on the part of federal staff to work with the Anacostia Watershed Restoration Committee on restoration projects on federal lands.

Restoring a site may not be worthwhile if its degradation has not been eliminated or at least curtailed: the source of the problem must be addressed before a site-specific restoration project gets underway. This makes it virtually impossible for a single agency to solve all restoration problems. Interagency coordination is vital to the success of almost any restoration effort.

Regulatory Programs and Permits

Regulatory programs should be tied more closely to planning efforts for the Anacostia basin. Planning should take permitting concerns into account, and permitting should reinforce planning goals. This would improve the quality of permit decisions and avoid regulatory conflict with basinwide goals. Federal regulators should be more aware of, and responsive to, broad planning goals established by various jurisdictions in regions in which they are active. In this way, permitting can help reinforce and support objectives established during planning.

Implementation of restoration projects requires flexibility and coordinated support from the regulatory community. Permit writers might assist in restoration projects through mitigation, offset, or waiver conditions. Mandated monitoring through permits can contribute to the information base (by providing information, for example, on specific discharges from regulated facilities). Improved information makes for better planning decisions, which in turn can be used to establish more realistic regulations.

Innovative means for satisfying compensatory mitigation requirements for urban areas should be explored by the federal agencies most closely involved with mitigation review and approval. Federal agencies could make suggestions in this regard, providing technical or procedural guidance.

Funding

A nationwide clearinghouse could be developed to help states and local jurisdictions identify grants and other funding available from federal agencies for environmental restoration projects. The clearinghouse could help state and local entities find funding for specific types or combinations of ecosystem approaches, watershed restoration, and pollution cleanup, and it might help identify areas where funding is lacking or redundant.

Block grants for broad restoration projects could be proposed where appropriate. Recurring problems that contribute to degradation but are difficult to eliminate could be examined more closely, and agencies responsible for regulating or otherwise addressing these problems could take or recommend appropriate action.

Where time and funding are constrained, local entities have found it advantageous to implement well-conceived projects rather than to wait for finalization of a comprehensive plan or model. Continued administrative and public support for the Anacostia restoration initiative requires visible results, particularly in view of stiff competition for limited state and county resources. On the local level, political and public appreciation is greater for completed projects than for studies and computer models. It may be similar for regional federal initiatives.

Public Participation

Public education, outreach, and participation are vital to the success of restoration initiatives and should be less ad hoc and intuitive. Instead, these efforts should be thoughtfully planned, and federal, state, and local agencies and entities should collaborate in developing a plan for them. Suggestions made by interviewees for effective public participation should be considered in developing this program, and specialists with hands-on experience in dealing with public participation problems and approaches should participate in its development. At the same time, experts in other disciplines, such as scientists, engineers, and project managers, should understand the need for an effective and productive public participation program, and an awareness of what it takes to conduct one.

Agencies must allocate the resources needed to develop and implement an effective public participation program, and because such programs take time to develop and mature, long-term resources must be committed. Public awareness and trust built over the course of one project can serve as the basis for an effective public participation program for other projects in the same region.

Public meetings can be useful in providing public input, but not every project manager is adept at facilitating public meetings. A trained facilitator should conduct such meetings, one who can focus discussion and maintain continuity. Mailing, phone, and contact lists must be maintained and updated. Methods used to generate interest and seek input should be tailored to the intended audience and the purposes of the outreach effort.

President Clintons Executive Order 12898 on environmental justice directs federal agencies to ensure that "public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible." Federal agencies are directed to translate these documents "for limited-English-speaking populations," where practicable and appropriate. Accordingly, federal agencies should provide minority and low-income populations in the Anacostia basin with readily accessible, understandable information about their environment, enabling them to participate in shaping government policies that affect the health of their communities. Because the immigrant population in the Anacostia basin is large and growing, translations of advisories on fish consumption may be appropriate.

Science and Information

Technology is needed to minimize the impact of human uses and lifestyles on the natural environment. Green and low-impact technologies are being developed to recycle stormwater, for example, or to reduce the environmental impact of construction. Incentives to develop and use these technologies and to make supporting lifestyle changes could be provided by federal agencies.

The Anacostia restoration effort is applying successful agricultural programs for nutrient management to urban areas. This will benefit the Chesapeake Bay Program, and other urban areas may profit by employing similar techniques.

Planning for ecosystem restoration projects should incorporate principles of adaptive management. Where appropriate, decision making should allow for sequential adjustments in response to new insights and scientific understanding. Obstacles to adaptive management-such as budget processes and management schedules that cannot

accommodate adjustments based on new insights, or technical uncertainties that make cost estimation and project planning difficult-should be identified and carefully examined.

Federal agencies could support locally driven efforts to implement the ecosystem approach by providing easier access to tools and information on natural resources and activities. Agencies might provide:

- Clearinghouses for information on monitoring, analytical tools, best management practices, public participation techniques, urban restoration initiatives, and other matters related to the ecosystem approach.
- Access to information from programs such as NOAAs habitat restoration program, the Natural Resources Conservation Services erosion abatement programs, the Forest Services urban tree programs, and the Fish and Wildlife Services restoration programs, as well as data from remote sensing systems, the National Biological Service, National Water Quality Assessments, and other monitoring initiatives.

Evaluating the Social and Economic Aspects of the Ecosystem Approach

By definition, the ecosystem approach takes social and economic factors into account, along with ecological considerations. In retrospect, this study was weak in assessing social and economic aspects of the Anacostia restoration initiative. Although some of these aspects were considered in connection with programs overseen by elected officials and with public participation and outreach efforts, little in-depth analysis was done explicitly on these issues. Future ecosystem evaluation initiatives might develop ways of assessing information related to sustainable economic development and other social and economic aspects of the ecosystem approach.

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Appendix A:

SELECTED DOCUMENTS REVIEWED

African-American Environmentalist Association; National Association of Neighborhoods; National Wildlife Federation. June 1994. Our Unfair Share: A Survey of Pollution Sources in Our Nations Capital.

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Appendix B: PRINCIPAL FEDERAL PROGRAMS AND AUTHORITIES RELEVANT TO THE ANACOSTIA INITIATIVE

Approximately 70 projects named in the Metropolitan Washington Council of Governments "Blueprint for the Restoration of the Anacostia Watershed" are located on federal lands. These projects have been proposed by the Council for implementation, although they are not necessarily sponsored or supported by the affected federal agencies. The U.S. Army Corps of Engineers "Anacostia Federal Environmental Restoration Report" of February 1994 contains a preliminary assessment of these projects, summarized below by federal agency.

Army Corps of Engineers

The Corps has been actively involved with local sponsors in the study and construction of several environmental restoration projects in the Anacostia River basin. This involvement is made possible through specific study authorities, section 1135 of the Water Resources Development Act of 1986, Beneficial Uses of Dredged Material, Support for Others Program, and the Clean Water Act section 404 regulatory program. Most of these authorities require a nonfederal cost-share of 25 percent of implementation costs. All operation and maintenance costs are borne by the nonfederal sponsor.

Specific study authority. In 1988, Congress directed the Corps to undertake a reconnaissance study of the Anacostia watershed. The study was designed (1) to review water-resource-related problems in the basin, (2) to develop and evaluate plans to address these problems, (3) to demonstrate whether there was a federal and nonfederal interest in proceeding into a feasibility phase, and (4) to estimate the cost of conducting the feasibility phase. Completed in December 1990, the study identified ways to restore lost fish and wildlife habitat, eliminate in-stream barriers to fish migration, restore and create wetlands, revegetate streambanks, and modify stream channels.

A cost-shared feasibility study was initiated in January 1992. The six nonfederal sponsors for the study are: Prince Georges County; Montgomery County; the District of Columbia; the Metropolitan Washington Council of Governments; the Interstate Commission on the Potomac River Basin; and the state of Maryland. Initially, 120 sites were considered for restoration. Through a preliminary site-screening process, 13 sites were identified and considered for formulation and evaluation of alternatives. The projects include, among other things, wetland creation and

restoration, stream restoration, and stormwater retrofit construction. The Corps plans to seek authorization for these 13 projects in the Water Resources Development Act of 1994. Construction of these projects is expected to commence in 1997, and will proceed on a cost-share basis (75 percent federal and 25 percent nonfederal).

Section 1135. Section 1135 of the Water Resources Development Act of 1986, as amended, authorizes structural or operational modifications to existing Corps projects for purposes of improving the environment. Through the Continuing Authorities Program, section 1135 provides yearly appropriations for a number of smaller scale environmental efforts. In the Anacostia River basin, projects are cost shared (75 percent federal, 25 percent nonfederal). Two modification reports have been completed under this authority, recommending removal of three fish passage barriers and habitat restoration in the basin.

Beneficial use of dredged material. The material collected by the Corps in normal maintenance dredging operations can often be used beneficially. The restoration of Kenilworth Marsh is one such effort, identified during coordination of normal dredging in 1992. The Corps, U.S. Fish and Wildlife Service, National Park Service, and other agencies discussed the opportunity for this restoration. A comparative assessment of using the material for Kenilworth Marsh versus depositing it at an upland site concluded that the environmental benefits of restoring 32 acres of wetlands and the reduced costs of maintenance dredging justified disposal of the dredged material at Kenilworth Marsh. A formal authority for these efforts was provided by section 204 of the Water Resources Development Act of 1994, which authorizes the restoration or creation of wetlands in connection with dredging for construction, operation, or maintenance of authorized navigation projects, provided that the environmental, economic, and social benefits of the project, both monetary and nonmonetary, justify the costs.

Support for Others Program. This program allows the Corps to utilize its technical expertise in accomplishing civil, military, or environmental engineering projects for federal, state, and local agencies outside of the U.S. Department of Defense on a cost-reimbursable basis. Through this program, the Corps and National Park Service signed a Memorandum of Agreement to provide technical support for the seawall rehabilitation project in the District of Columbia. Under the Memorandum, the Corps has accomplished investigations of seawall foundation conditions and prepared preliminary designs and plans for rehabilitating some portions of the seawall.

Section 404 regulatory program. Section 301 of the Clean Water Act prohibits the discharge of dredged or fill material into U.S. waters. As part of the section 404 program, the Corps reviews applications for and issues permits for discharges of dredged or fill material by other agencies and the private sector into waters, including wetlands. In evaluating applications, the Corps considers the need for the activity as well as extent and duration of its adverse effects, its extent and possible alternatives to it, and its impact on fish and wildlife, water quality, flooding, recreation, historical and cultural values, and other factors.

Federal agency ecosystem approach in the Chesapeake Bay. On 17 July 1994, representatives of federal agencies and state and local governments signed an agreement to manage the Chesapeake Bay watershed as a cohesive ecosystem, and to work together to achieve the goals of the Chesapeake Bay Agreement. Signatories agreed to support "the Anacostia River Demonstration Project as an opportunity to apply concepts under the ecosystem approach concepts in an urban environment, through a coordinated biennial federal workplan beginning in FY 1995, in concert with the Anacostia Watershed Restoration Committee." The Corps was assigned the leading role in this effort.

Environmental Protection Agency

The Environmental Protection Agency (EPA) has various programs for funding and regulation of pollution control in the Anacostia watershed.

National Pollution Discharge Elimination System program. Under the National Pollution Discharge Elimination System program, EPA develops permitting requirements for stormwater discharges from industrial facilities and from separate municipal storm sewers serving populations greater than 100,000. All of the jurisdictions in the Anacostia watershed are regulated under the program as separate municipal stormwater systems. Each municipality must submit a comprehensive, two-part application that focuses on the development of a systemwide stormwater management program.

Section 319 grants. Section 319(h) of the Clean Water Act provides for grants to states to assist in the implementation of nonpoint source management programs. A nonfederal match of at least 40 percent is required. These grants can also assist states in carrying out groundwater quality protection activities that are part of the states nonpoint source pollution control program. Examples of such activities include research, ground water assessments, demonstration

programs, enforcement, technical assistance, education, and training to prevent groundwater contamination from nonpoint sources of pollution.

Section 106 grants. Section 106 of the Clean Water Act provides for grants to states and interstate agencies to assist in the administration of programs for preventing, reducing, and eliminating pollution, as well as for enforcement.

Section 104(b) grants. Section 104(b) of the Clean Water Act provides for grants to state water pollution control agencies and other agencies or individuals, including nonprofit private agencies, for (among other things) conducting research, investigations, training, and studies relating to the causes, effects, prevention, and elimination of pollution. The District of Columbia received a grant under this section to implement programs for floating-debris removal.

Section 117 grants. Section 117 of the Clean Water Act provides for grants to states to implement management mechanisms in support of the Chesapeake Bay Programs interstate management plan. A 50-percent match is required.

Grants for public education. The Metropolitan Washington Council of Governments received an EPA education grant to increase public awareness of the potential environmental hazards created by routine maintenance. This grant has a matching requirement.

Chesapeake Bay Program. The Chesapeake Bay Program operates with an annual budget of $20 million. Of this, $10 million are set aside for use by federal agencies, which can submit project proposals each fall to the Federal Agencies Committee of the Chesapeake Bay Program. Projects sponsored by several agencies are encouraged and viewed more favorably by the Federal Agencies Committee. Under this program, EPA was directed to conduct a study of the Anacostia River to analyze the extent to which pollution in the Anacostia River is harming the Chesapeake Bays ecosystem, the steps needed to restore the Anacostias water quality, a timeline for taking these steps, potential roles for EPA and other federal agencies in the Anacostia cleanup, and an inventory of activities currently underway to restore the river.

Fish and Wildlife Service

The Fish and Wildlife Service provides technical assistance for various activities. Recently, for example, it conducted a joint study with the District of Columbia to collect fish and sediment from the Potomac and Anacostia Rivers and to test them for contamination. The agency has also investigated problems associated with oil spills within the basin, and has worked with the Corps and National Park Service on the Kenilworth Marsh restoration project. The Partners For Wildlife Program restores and protects fish and wildlife habitat on private lands through alliances established by the agency with other organizations and private landowners.

Forest Service

Several U.S. Department of Agriculture (USDA) Forest Service programs have been utilized in restoration efforts in the Anacostia basin. For example, the Anacostia Riparian Reforestation Program was implemented by the Metropolitan Washington Council of Governments and financed with $50,000 from the Urban Forestry Special Project funds. This program is designed to reforest more than eight acres of riparian corridors in the basin. EPA and the Forest Service signed an interagency agreement to provide funding to the local Cooperative Extension Service to implement the Anacostia Watershed Community Reforestation Outreach Project. This project aims to reforest inner city communities in the Washington metropolitan area with public participation. Residents are provided with information, resources, and technical assistance. In the District of Columbia alone, proposed funding under the Urban Forestry Five-Year Plan is $400,000 for FY 1994, and $500,000 for FY 1995.

National Civilian Community Corps

Federal agencies managing land in the Anacostia basin have proposed a number of projects to be undertaken by volunteers of the National Civilian Community Corps. These volunteers perform 1 year of service constructing environmental and community improvement projects across the country. Currently, there are 250 National Civilian Community Corps volunteers at Aberdeen Proving Ground.

National Oceanic and Atmospheric Administration

Programs developed by the National Oceanic and Atmospheric Administration (NOAA) provide information, research, and management services for the nations ocean, coastal, and estuarine resources. Technical assistance is available for resource management restoration activities in the Anacostia basin, particularly for those associated with

habitat restoration, fish passage, endangered species, and fisheries management. Funding provided by NOAA usually involves the Coastal Zone Management programs, Sea Grants, and the Chesapeake Bay Program. For example, NOAA contributions to the Chesapeake Bay Program in 1992 amounted to more than $12 million.

National Marine Fisheries Service. NOAAs National Marine Fisheries Service is responsible for protecting and managing the nations living marine resources, including anadromous fish (such as striped bass and American shad) that historically spawned in the Anacostia.

National Park Service

The National Park Service is the second largest landowner in the basin. Much of the land it manages lies along the Anacostia and its tributaries and is open for public visitation. The National Park Service has employed volunteers to clean up streams and install check dams, and it has been actively involved with the Corps and other agencies in the Kenilworth Marsh restoration project and in the proposed project for Kingman Lake (recommended as part of the Anacostia River and Tributaries feasibility study). The agency is working in conjunction with several other agencies on environmental restoration projects on park lands. Streambank erosion caused by high stormwater flows from developed areas, and large volumes of sediment from stormwater outfalls along the Anacostia cause problems on park lands. The National Park Service has also been involved in the design and implementation one of the Metropolitan Washington Council of Governmentss blueprint projects, although it is reluctant to provide park lands for stormwater management to control flows originating outside park lands. The agency seems likely to take an advisory and review rather than a leading role in environmental restoration projects.

Natural Resources Conservation Service

The USDA Natural Resources Conservation Service (formerly Soil Conservation Service) has authority to assist other agencies under the Watershed Protection and Flood Prevention Act (P.L. 83-566). This act authorizes the Natural Resources Conservation Service to provide technical and financial assistance to local organizations in planning and carrying out such watershed projects as preventing damage from erosion, floodwater, and sediment, furthering the conservation, development, utilization, and disposal of water, and conserving and properly using land. Upon request from a local sponsor, the Natural Resources Conservation Service develops a comprehensive plan to consider all natural resource concerns in a watershed, formulating alternative solutions to the problems identified. Typically, the agency provides 100 percent of the technical assistance and up to 50 percent of the construction costs for such projects.

The Natural Resources Conservation Service also provides technical assistance to individuals and communities under its Conservation Operations, Resource Conservation Development Program, Urban Initiative, and other programs. Various conservation incentive programs are proved through the USDA. The USDA Beltsville Agriculture Research Center, the largest landowner in the basin, has embarked on a joint effort with the Natural Resources Conservation Service to produce a Soil and Water Conservation Plan for the Agriculture Research Center, and to implement a demonstration project on Center land. This project will demonstrate environmentally safe practices involving field crops, ponds, woodlands, and wetlands.

U.S. Department of Defense

The Department of Defense accounts for 2,190 of the 15,860 acres of federally owned land in the Anacostia River basin. Army installations include the Adelphi Laboratory Center, Army Reserve Center Riverdale, Fort McNair, Beltsville Agricultural Reserve Site, and Laurel National Guard Site. Navy installations include the Naval Surface Warfare Center, Anacostia Naval Station, and the Navy Yard. The Marine Barracks and part of Bolling Air Force Base are also located in the basin.

The Department of Defense Legacy Program, created in 1991 by a Department of Defense Appropriations Act, was designed as a long-range program for identifying, protecting, and maintaining natural, cultural, and geophysical resources on all lands under Defense Department jurisdiction or influence in the United States. This program enables the Department to take a critical and sustained look at what it might take to better integrate conservation of these resources with the maintenance of national defense capability. The Legacy Program has $50 million allocated for various projects in FY 1994.

U.S. Department of Transportation

The Department of Transportations Surface Transportation Program, established by the Intermodal Surface Transportation Efficiency Act of 1991 (P.L. 102-240), provides grants to states and localities. Ten percent of the Surface Transportation Program funds apportioned to a state each fiscal year must be used for transportation enhancement, such as landscaping and other scenic beautification as well as mitigation of water pollution due to highway runoff. Typical projects that could be funded with Program funds include stormwater drainage improvements along roadways or reforestation along a highway. Opportunities and priorities are set by the individual state transportation departments. The federal share of project costs is normally limited to 80 percent. The state of Marylands share of these funds is expected to average $5 million per year from 1992 to 1997. The Maryland Department of Transportation has proposed constructing a biking/greenway trail within the Anacostia River basin using Surface Transportation Program funds.

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Chapter 3: COASTAL LOUISIANA

Coastal Louisiana is one of seven ecosystems identified for study of the ecosystem approach activities by the Interagency Ecosystem Management Task Force. Coastal Louisiana was selected in part because ongoing interagency activities there may provide valuable lessons for broader application in ecosystems elsewhere across the country.

In August 1994, an interagency survey team from Washington spent a week in Louisiana conducting interviews with federal and nonfederal parties. During the week, the survey team met with nearly 70 individuals representing federal and state agencies, parish and levee governing bodies, academic scientists, private land owners, environmental groups, and other interests. The team consisted of seven individuals from five federal agencies: Jeri Berc from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (formerly Soil Conservation Service), Val Chambers from the USDA Forest Service, Roger Griffis from the National Oceanic and Atmospheric Administration (U.S. Department of Commerce), Joanne Jones from the U.S. Army (U.S. Department of Defense), Doug Norton from the Environmental Protection Agency (EPA), Albert Sherk from the National Biological Service (U.S. Department of the Interior), and Molly Whitworth from EPA.

This report is based on interviews conducted, phone calls made, and written material collected by the survey team. It includes observations made by interviewees organized by issue, and a set of summary observations and recommendations from the survey team.

BACKGROUND

Coastal Louisiana (figure 1) is one of the richest regions of the world in wetlands, with 2.5 million acres of fresh, intermediate, brackish, and saline marshes, 637,400 acres of forested wetlands, and about 40 percent of the coastal marshes in the coterminous United States. Bordering the entire Gulf of Mexico shoreline and extending inland in some places for more than 60 miles, these coastal wetlands form one of the most productive ecosystems on earth.

Value of the Ecosystem

The productivity and structure of Louisianas coastal wetlands directly and indirectly fuel the regions economy. Louisianas coastal wetlands support a commercial harvest of fish and shellfish comparable in volume to that of the entire Atlantic seaboard, with a market value averaging almost $1 billion annually. Recreation on Louisianas coastal wetlands amounts to more than 3 million user days per year, valued at approximately $50 million annually. Income in the region from ecotourism exceeds $250 million per year. The coastal wetlands and barrier islands protect one of the nations largest commercial-industrial complexes of ports, shipping waterways, and natural gas and petroleum refining facilities from losses and destruction caused by storms from the Gulf of Mexico. These facilities account for 25 percent of domestic natural gas production. These commercial and industrial activities represent a combined capital investment of more than $100 billion within the Louisiana coastal zone. The region also supports a unique culture and way of life molded by interaction of local residents with their coastal wetland environment during the past two centuries.

Today, the communities, physical structure, and all of the productive functions of Louisianas coast are seriously threatened by rapid loss of the barrier islands and coastal wetlands. Disturbing the natural equilibrium between wetland gain and loss, human activity in the region currently produces a net loss of 25-35 square miles of coast per year, accounting for 80 percent of all coastal wetland losses in the coterminous United States. Although the

deteriorating coastal ecosystem remains highly productive today, the long-term prospect is for catastrophic decline in economic and ecological coastal values, and a shoreline moved far inland from where it is today. At current rates, half of Louisianas coastal wetlands will disappear over the next 100 years, with serious social, economic, and ecological implications not only for the region, but for the nation as a whole.

Formation of Coastal Wetlands

Louisianas coastal zone is made up of two physiographic units: the Deltaic Plain on the east, formed by sediments from the Mississippi and Atchafalaya Rivers, and the Chenier Plain on the west, formed from the westward movement of reworked former delta sediments combined with sediments from adjacent active Mississippi River distributaries. The deltaic coastal wetlands were formed from enormous amounts of sediment eroded from the interior of North America and deposited in deltaic lobes where the Mississippi River enters the Gulf of Mexico.

Every thousand years or so, the river established a new, more efficient route to the gulf after annual floods helped carve new paths bypassing the enlarged delta. As the new route developed, less water and sediment passed down the old river channel, and the old delta began to lose land through subsidence and the effects of tides, waves, and currents. Concurrently, a new delta began growing at the mouth of the new river channel. For the last several thousand years, these natural processes were in approximate equilibrium, creating a composite coastline made up of wetlands in all stages of formation and devolution, and an ecosystem of tremendous diversity and productivity.

Disruption of Wetland Formation

Human activity has severely impacted the natural processes that create and sustain the coastal wetlands of Louisiana. When the commercial navigation and flooding potential of the rivers became apparent in the 19th century, Congress authorized actions to clear and maintain the Mississippi for navigation, and to construct levees to keep the river within its banks. In the 20th century, oil and gas exploration, land reclamation, and construction of ports and channels along Louisianas coast further developed the economic potential of Louisiana at the expense of its coastal wetlands.

Flood control projects such as levees ensured that most sediment bypassed the areas where it would naturally build and nourish wetlands during flood and nonflood periods.

As a result, sediment deposits no longer compensate for the effects of natural coastal subsidence. Coastal wetlands are increasingly flooded, resulting in mortality of wetland plants and changes in vegetation. These conditions are compounded in many locales by infusions of saltwater into normally fresh or brackish wetlands through channels dredged for navigation or oil and gas exploration. In other areas, urbanization, highways, and spoil banks from channel dredging disrupt natural drainage and sediment distribution. The net result has been functional and physical loss of hundreds of thousands of acres of wetlands as the natural vegetation, stressed by changes in hydrology or salinity, dies and sediment erodes away. Even where there is no land loss, valuable ecological functions are sacrificed whenever changes in hydrology, salinity, and plant and animal communities cause wetlands to disappear.

Peaking in the 1960s, erosion rates have since declined to the current rate of 25-35 square miles per year. Today, only a small fraction of annual wetland losses stems from new human activity in the coastal zone. Actions taken by the state of Louisiana, private landowners, and industry have slowed the loss of coastal wetlands due to permitted development from 3,000 acres per year in 1980 to less than 200 acres per year today (Kemp 1993). But land in the coastal zone continues to subside, the barrier islands continue to erode, and the sea continues to invade fragile wetlands at an alarming rate. The vast majority of coastal wetland losses result today from ongoing long-term effects of actions taken decades earlier that disrupted the natural hydrologic and sedimentological processes critical to sustaining and increasing Louisianas coastal wetlands. Documented causes of wetland loss (Governors Office 1994; Boesch 1994) include:

- Natural processes. Fires, storm-whipped waves, wildlife grazing, and shifts in river channels cause erosion of barrier islands and loss of wetlands. Under natural conditions, damage from these sources was often only local or temporary, and it was offset by wetland growth elsewhere over time.
- Flood protection and navigation works. Construction of flood protection levees and navigation improvements along the Mississippi River and its principal distributaries have stopped overbank flooding, the natural process for building land and nourishing wetlands. Active distributary channels, such as Bayou Lafourche, were blocked at their confluence with the Mississippi, cutting off vast wetland areas of the Deltaic Plain from their life-sustaining supply of freshwater and transported sediment. Jetties

and deep navigation channels at the mouths of active distributaries direct sediment into deeper waters of the gulf, impeding deltaic growth.

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Figure 1.-Coastal zone of Louisiana, showing the Mississippi Deltaic Plain, Chenier Plain, nine hydrologic basins, and wetland salinity zones. (Source: Adapted from Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993.)

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- Reduction in transported sediment. Changes in management of the river and its tributaries have reduced the amount of sediment transported by the Mississippi in recent decades, slowing deltaic growth.
- Subsidence and sediment deficit. The natural process of land sinking is not offset by sediment deposition and land building (aggradation). Inundation occurs and the land reverts to open water.
- Marine tidal invasion. The combined result of accelerated subsidence and an extensive artificial canal network has been massive wetland dieback, expansion of tidal channel networks, and erosion of poorly consolidated organic soils. Some scientists estimate that together these factors account for a relative sea level rise of as much as 1 cm per year.

Without aggressive action to reverse these trends, the current rate of coastal wetland loss in Louisiana is expected to continue, with serious consequences for the region and the nation. If current losses are not reduced, another 167,000 acres of wetlands will disappear or be converted by the year 2000 (U.S. Department of the Interior 1994). According to predictions, these losses will push the gulf shoreline inland as much as 33 miles in some areas, jeopardizing public and private investments and potentially shifting waters under state jurisdiction to federal control as lands under them are reclassified as outer continental shelf. By the same token, private lands that are inundated may fall under state control. Some 1,200 businesses, residences, camps, schools, storage tanks, electric power substations, water control structures, and pumping stations will require protection or relocation (U.S. Department of the Interior 1994). The U.S. Army Corps of Engineers (Corps) estimates that by the year 2040, without action to reverse projected wetland losses, commercial fish and shellfish harvests will decline by 30 percent. Continued loss of Louisianas coastal wetlands could produce major nonmonetary cultural and ecological losses, and loss of income and assets worth billions of dollars.

Strategies to Halt Loss of Coastal Wetlands

More than 20 years ago, high rates of coastal erosion and deterioration were noted, along with the potentially serious consequences (Gagliano and van Beek 1970, 1975). Basic management approaches were developed for slowing and preventing further losses on both barrier islands and wetlands.

Curbing development. Initial responses to the problem took the form of state and federal regulatory programs aimed at reducing wetland loss resulting from new dredge and fill activities and hydrological modification. These programs have been moderately successful: the loss rate from development has declined since peaking in the 1960s at 39-42 square miles per year.

Controlling coastal erosion. In the 1980s, the Coalition to Restore Coastal Louisiana was established to inform the public on wetland loss and to solicit government action to address the crisis. In 1989, state legislation was enacted to provide for wetland restoration, and Louisiana voters overwhelmingly approved (by a 3-1 margin) a constitutional amendment establishing a trust fund making approximately $25 million per year available for restoration activities.

The Coastal Wetland Planning, Protection, and Restoration Act. In 1990, Congress passed the Coastal Wetland Planning, Protection, and Restoration Act (CWPPRA), 16 U.S.C. §§ 3951-3956. The Act established a six-member Louisiana Coastal Wetlands Conservation and Restoration Task Force with representatives from the state of Louisiana and five federal agencies: the Corps; EPA; the U.S. Department of the Interiors Fish and Wildlife Service; the U.S. Department of Commerces National Oceanic and Atmospheric Administration (NOAA) and National Marine Fisheries Service; and the USDA Natural Resources Conservation Service, formerly Soil Conservation Service. Charged with developing a "comprehensive approach to restore and prevent the loss of coastal wetlands in Louisiana," the Task Force is responsible for developing and implementing priority coastal wetland restoration projects. The CWPPRA is the primary federal legal authority for facilitating a broad-based approach to coastal wetland restoration

in Louisiana. In facilitating an interagency approach to the problem of coastal restoration, it may serve as a valuable model and/or nucleus for future activities to implement the ecosystem approach. Nevertheless, the current structure and process contain impediments to a broader ecosystem approach.

The CWPPRA authorizes funds for priority wetlands projects in Louisiana. In addition, the CWPPRA provides both mechanisms and incentives for comprehensive coastal wetland restoration and management. It requires the Secretary of the Army to convene the Task Force, which has provided a highly effective forum for dialogue among federal agencies and the state of Louisiana on developing a restoration plan. The CWPPRA process immediately led to integration of the traditionally independent planning and execution of budgets by federal agencies with natural resource responsibilities in southern Louisiana. The usually formidable obstacles to federal interagency and federal-state coordination seem to have been largely overcome.

Louisiana Coastal Wetlands Restoration Plan. The Task Force used several technical committees and groups to develop the Louisiana Coastal Wetlands Restoration Plan. Nine Interdisciplinary Basin Teams reviewed individual proposals and formulated plans for each of nine hydrologic units in Coastal Louisiana. A Monitoring Work Group developed plans and protocols for monitoring the effectiveness of projects, and lists of priority projects were prepared. Although it is too soon to judge the effectiveness of the CWPPRA, the Corps has indicated that about 211,000 acres of wetlands would be restored under the Restoration Plan, corresponding to about 70 percent of estimated wetland losses if the CWPPRA were not in effect.

Opportunities and constraints. The CWPPRA provided substantial funds to the Task Force to assist in restoring and conserving coastal wetlands. Positive aspects of the legislation include:

- Time commitments for a coastal restoration plan and for project development enforced by law.
- Accountability to Congress.
- Appropriations in large enough sums to accomplish larger scale restoration.
- Specific omission of traditional cost/benefit analysis.

These components of the ecosystem approach paradigm were recognized by all interviewees as major breakthroughs, but were also recognized as difficult to implement, given existing legal constraints-such as the Federal Advisory Committee Act-and the level of expertise and traditional orientation toward individual species of the federal environmental agencies involved. Moreover, CWPPRA legislation did not specifically include socioeconomic or sustainability provisions as part of its public involvement process, although CWPPRA implementation is subject to these considerations under the National Environmental Policy Act.

Several issues have impeded implementation of restoration efforts in Coastal Louisiana. Property rights issues before and after restoration form some of the most common and serious legal barriers. Eighty percent of the coast is privately owned, and the state estimates that real-estate-related activities may amount to one-third of the effort required before a project is implemented. Some projects have involved more than 100 different landowners, and legal questions have arisen regarding future access to restored areas and mineral rights in them.

State and federal agencies are actively working to resolve these issues. The Louisiana Department of Natural Resources has recently delineated more efficient ways of dealing with real estate issues. An important step was creation of a Real Estate Section with the ability to secure contractual support to speed up the process. The Department of Natural Resources is also negotiating a settlement with the Louisiana Land & Exploration Company concerning mineral rights when new land is created during restoration of the Isles Dernieres chain of barrier islands. These and other changes are part of a major very positive effort by the state of Louisiana to refine administrative and other components of its policies and activities for coastal restoration. These changes are outlined in a white paper titled, "The State of Louisianas Policy for Coastal Restoration Activities" (April 1995). Constitutional amendments are currently before the state legislature to resolve important land rights and oyster lease issues.

Restoration of Coastal Louisiana in general depends on finding the money for the large-scale projects needed. Several studies of the ecosystem suggest that major freshwater diversions from the Mississippi River are needed to restore the hydrological processes that create productive, sustainable coastal wetlands. Equally important appears to be restoration of the barrier island system.

Feasibility studies have been recommended under the CWPPRA program to address the issues of major river diversions and barrier island restoration. Such feasibility studies could broaden restoration planning under the current

CWPPRA process to include a much more comprehensive, longer term, ecosystem approach. Broader perspectives have been developed recently in several excellent reports emphasizing river diversions over time periods of more than 50 years (Governors Office 1994, Templet 1994, Van Heerden 1994). By contrast, the CWPPRA Restoration Plan envisions a 20-year management program of individual projects at the hydrologic basin level.

BUDGET ISSUES

The success of the CWPPRA Restoration Plan hinges on large projects (such as shoreline protection, major river diversions, barrier island restoration, and navigation gate establishment). One of the toughest challenges may be finding the resources to fund these projects.

Current Funding

The CWPPRA authorizes an amount equal to 18 percent of total deposits in the Sport Fish Restoration Fund, or of total receipts from small-engine fuels excise taxes (whichever is greater), to be allocated for wetlands planning and restoration. Seventy percent of this amount is made available by the Fish and Wildlife Service to the Corps (through the Sport Fish Restoration Account of the Aquatic Resources Trust Fund) for restoration of Louisiana wetlands (funds are available until expended). Each fiscal year since 1992, more than $33 million in funds have been made available for priority wetlands projects in Louisiana (table 1). Projections made by the Fish and Wildlife Service indicate that this level of funding will increase slightly each year through fiscal year 1999 (table 1, figure 2).

Funds for implementing the Restoration Plan have approached $40 million annually, with costs shared by state and federal governments at the ratio of 25 to 75 percent. Without additional action, however, the state of Louisiana may soon be unable to continue matching the federal contribution. Recognizing this, Louisiana has recently recommended a number of measures to generate additional funds (in its April 1995 white paper review of state wetland restoration policies). A constitutional amendment is presently before the state legislature to increase revenues to the Wetlands Trust Fund by lowering Fund thresholds. This and other measures would make significant progress toward ensuring continuation of restoration efforts. Changes by constitutional amendment are subject to approval by Louisiana voters.

Lists of priority projects have been prepared under the CWPPRA Restoration Plan (table 2). Implementing all projects in the plan across all basins would cost approximately $1.284 billion (table 3).

The CWPPRA requires each project to be substantially completed 5 years after placement on a priority project list. The Corps has interpreted this to mean that the CWPPRA excludes projects that cost more than about $5 million, which can take up to decades to complete. Forty of the 279 projects in the Restoration Plan cost more than $5 million, and 5 have estimated costs of more than $20 million (table 4). Political pressures forced initial project funding to be dispersed in all nine basins. Accordingly, CWPPRA dollars intended for wetland restoration were expended not only in areas where land was being lost (Barataria/ Terrebonne), but also in areas where land was accreting (Atchafalaya). The reality of project costs and the urgent need for large-scale offensive projects will probably force state and federal planners to ask Congress for specific project-by-project funding for large-scale projects with costs in excess of $5 million. As suggested in the states white paper analysis of the situation, this will require additional federal funding outside of the CWPPRA program.

table 1 paste-up

Figure 2 .-Annual and cumulative federal CWPPRA allocations for fiscal years 1992-1994 (actual) and 1995-2000 (estimated). Under provisions of the Coastal Wetlands Act, funds will be available through fiscal year 1999. (Source: U.S. Fish and Wildlife Service, Division of Federal Aid.)

Budget-Related Barriers to the Ecosystem Approach

Although the CWPPRA seems to provide an effective mechanism for building consensus on restoration issues and priority projects in southern Louisiana, the lack of a single entity in charge of budgeting for the ecosystem approach is proving to be a problem. Indeed, the Corps navigation and flood control projects are a major cause of the problems facing the CWPPRA process.

Budget Alternatives

Interviewees offered several comments on budgetary issues:

- The genius of the Restoration Plan lies in budgeting for 20 years of monitoring. Information gained should be enough to give the state of Louisiana the opportunity to adjust the system to make the plan work.
- The alternative-no action and the loss of 25 square miles of wetlands per year-is unacceptable.
- Massive public works (such as restoring barrier islands) may better be funded through separate congressional appropriations, a possibility that should be investigated.

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Table 2a.-First-priority CWPPRA projects

Project number
ParishFully funded cost
(dollars)BA-2Lafourche8,142,000IN-DCameron502,000XPO-52aOrleans
1,105,000IN-CCameron4,844,000TE-17,
18, ME-8Terrebonne, Vermilion,
Cameron848,000PMR-3Plaquemines8,517,000BA-19Jefferson1,
625,000TE-19Terrebonne1,254,000PPO-10St.
Charles4,327,000ME-9Cameron1,111,000TV-3Vermilion1,523,000TE-20Terrebonne
6,345,000BA-6Lafourche4,538,000TE-17T
errebonne6,109,000AR-bJefferson4,427,000
Total55,217,000Source: Boesch and others 1994; U.S. Army Corps
of Engineers, New Orleans District.

Table 2b.-Second-priority CWPPRA projects

Project number
ParishFully funded cost
(dollars)PAT-2St. Mary908,000ME-4, PME-21Vermilion2,770,000PPO-52aSt.
Bernard1,462,700PC/S-27Calcasieu1,741,000BS-3aPlaquemines2,522,000PC/S-24
Calcasieu2,904,000PBA-35Jefferson
4,302,800PTE-22/24Terrebonne1,070,000XAT-7St.
Mary4,136,000PC/S-25Calcasieu700,000PO-6St. Tammany3,048,000PT/V-18,
T/V-9Vermilion1,009,000C/S-9Calcasieu3,229,000PTE-27Terrebonne3,
146,700PTE-15Terrebonne6,908,000
Total39,957,200Source: Boesch and others 1994; U.S. Army Corps
of Engineers, New Orleans District.

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Table 2c.-Third-priority CWPPRA projects

Project number
ParishFully funded cost
(dollars)XPO-71St. Bernard512,000BA-4cPlaquemines
881,000XMR-10Plaquemines808,000TV-4St.
Mary5,173,000CS-4aCameron3,720,000XBA-65aJefferson
1,835,000PMR-8/9aPlaquemines2,858,000XTE-67
Lafourche2,047,000XCS-47/48i/48j/48pCameron4,
582,000BS-4aPlaquemines756,000PTE-23/26a/33Terrebonne
4,149,000PTE-15biTerrebonne4,844,000PTE-26bTerrebonne4,
718,000PO-9aSt.Bernard1,821,000BA-15St. Charles1,445,000PME-6
Vermilion/Cameron126,000XTE-43Kaiser
Aluminum, Gramercy533,000BS-5Plaquemines534,000PTV-19Vermilion1,516,000

Total42,858,000Source: Boesch and others 1994; U.S. Army Corps of Engineers, New Orleans District.

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Table 3.-Louisiana Coastal Wetlands Restoration Plan cost summary by basin

BasinArea created, protected, restored (acres)
Area benefited (acres)
Estimated cost (dollars)Pontchartrain16,90036,500132,738,000Breton Sound5,2009,60011,367,000Mississippi River

Delta85,90089,200452,630,000Barataria23,10051,200114,658,000 Terrebonne32,300106,400309,809,000Atchafalaya 8,50016,50019,388,000Teche/Vermilion4,8009,80034,039,000 Mermentau9,90020,90072,929,000
Calcasieu/Sabine24,80091,800136,460,000
Total211,400431,9001,284,018,000Source: U.S. Army Corps of Engineers, New Orleans District.

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Table 4.-Louisiana Coastal Wetlands Restoration Plan project distribution by estimated cost
Estimated cost
(dollars)Number of
projects0<100,0002100,000<
1,000,000891,000,000<5,000,0001485,000,000<
20,000,0003520,000,000<5Source:
U.S. Army Corps of Engineers, New Orleans District.
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INSTITUTIONAL ISSUES

The construction of major levee systems along the Mississippi River in the 1930s inaugurated a series of landscape changes, many of which are still evident. By the 1950s, losses in marsh area were apparent to hunters and fishermen, as well as to some scientists and resource managers. By the 1980s, awareness and concern had become widespread; today, the average Louisiana is much more aware of wetland issues than the average American citizen, attuned to the problem by a deeply rooted Acadian culture of hunting and fishing in Coastal Louisiana.

Louisianas Context for the Ecosystem Approach

Although Louisiana citizens appreciate the obvious benefits of navigation and flood controls on the Mississippi, as stakeholders in Coastal Louisiana they share an almost universal vision of restoring damaged wetlands and finding a long-term solution to the problem of the encroaching tide. Preserving the coastal marshes of Louisiana is truly a grassroots effort.

The public support enjoyed by restoration efforts represents a critical first step in the ecosystem approach to managing Louisianas coastal marshes. Remaining controversies revolve around just how the marshes can or should be restored. There is widespread recognition that conservation and restoration projects will necessarily be experimental in nature; managers are free to try various techniques, using an adaptive style of environmental management.

Adaptive management requires learning from the past and refining management and restoration efforts based on experience. Monitoring and evaluation of projects at appropriate intervals are critical steps in this process, linking management decisions to project results, in accordance with adaptive management. However, several interviewees expressed concern that the monitoring programs established for each project might not be designed or carried out to effectively provide the information necessary for evaluating project success.

The CWPPRA Process

The Task Force follows procedures that are largely determined by legislation. They provide for a great deal of stakeholder input, and for implementation of complex and costly restoration projects through dedicated funds of sizable long-term amounts. They also provide for long-term planning, and for evaluating the effectiveness of projects after implementation.

- Task Force procedures were criticized for several things, including:
- Overly lengthy deliberations. Too much time and money are spent on meetings and planning, according to some interviewees.
- Inadequate weighing of public input. Difficulties are created by Federal Advisory Committee Act requirements.
- The states nonvoting status early in the final project selection process.
- Inadequate consideration of landowner issues early in the process.
- Poor record of implementation until recently.

What works in the CWPPRA process also seems to make for problems. There is overall appreciation for the importance of long-term planning in CWPPRAs mandate, but also frustration with the complicated interagency deliberation process. The legislative requirement that projects be implemented under the CWPPRA within 6 months of the Task Forces establishment also caused problems. Designed to ensure swift action, this timeframe for rapid project startup led many interested parties (in the scientific community, for example, or among landowners and environmental groups) to be left out of early deliberations, and the actual Restoration Plan was not fully developed until 2 years later. These early missteps, however, seem to be correcting themselves.

Despite the slow bureaucratic pace of the CWPPRA process and the turf battles that are an expected part of it, the CWPPRA enjoys virtually universal acceptance as the right idea and a necessary part of any real solution. Many interviewees noted that individual agency interests were being set aside specifically because of the CWPPRA process, and that agency decision makers now felt more empowered to change course if needed. Interviewees felt that procedural aspects of the CWPPRA (such as decision making on a majority basis rather than through unanimous consent by Task Force members) were positive signs that progress is being made.

A common restoration vision that enjoys widespread grassroots support is a unique feature of the CWPPRA process that may well assure its long-term success. The rapid rate of marsh subsidence and land loss and the corresponding sense of crisis are key motivating factors in starting up a large-scale ecosystem approach in Coastal Louisiana.

Regulatory Agencies

Although federal funding of the massive projects necessary in this kind of restoration effort was recognized as essential, interviewees expressed resentment of federal agencies for regulating resource use without a credible local presence. Most complaints were about EPA for its failure to maintain staff at even the state level, despite its powerful influence on critical Clean Water Act section 404 wetland dredge and fill permitting. EPAs tendency to base its decisions on national policies rather than on local conditions, coupled with its lack of a field presence, created resentment and hostility among many stakeholders.

However, EPA was congratulated for its sponsorship of the Marsh Management Workshop and for funding scientific investigations into innovative management techniques. The overall mandate of EPA to protect the environment as a whole (and not just specific trustee components, such as fish and wildlife or marine species) was considered conducive to long-term ecosystem planning efforts. The workshop attendance of high-level EPA management was regarded as a positive sign that EPA was willing to listen to local concerns. But developing an EPA national policy on marsh management was considered inappropriate.

Although the Corps holds a special place among federal agencies in Louisiana, its interests are perceived as too parochial. As Chair of the Task Force, the Corps District Engineer in New Orleans is believed to hold a pivotal position in both selecting projects and implementing virtually all those selected by virtue of the Corps permitting authority. Actually, however, project implementation is the sole responsibility of the sponsoring federal agency. Interviewees expressed two major frustrations: first, the short 2-year rotations of the District Engineer necessitate continual reeducation; and second, the Corps has an inherent conflict of interest between exercising its national mandates and allowing for local needs. The Corps, interviewees complained, tends to give permitting preference to actions associated with Corps-approved or CWPPRA projects.

Some interviewees commented that the Natural Resources Conservation Service (NRCS), because of its long affiliation with local landowners, might be a good federal agency for coordinating discussion on CWPPRA mandates, goals, and ideas between agencies and local stakeholders. Through its local credibility and critical attention to local needs, the NRCS may also be in a unique position to take a leadership role in implementing jointly developed plans, although the question of whether the NRCS has the technical, administrative, or policy experience to play an effective leadership role was not discussed.

Trustee Agencies

The two major trustee federal agencies in Coastal Louisiana are the Fish and Wildlife Service and National Marine Fisheries Service. Both have a substantial local presence and field staff, and both therefore enjoy more credibility than the regulatory agencies. One major criticism is that both agencies purportedly favor measures to protect particular species under their jurisdictions.

Federal turf battles, although not as prevalent as some had expected, still cost these agencies credibility. Several interviewees felt that the National Marine Fisheries Service actually stood to benefit from increases in open water and therefore acted to thwart the CWPPRA process. The Fish and Wildlife Services handling of the black bear listing under the Endangered Species Act angered some interviewees: its announcement on critical habitat was made without adequate prior consultation with landowners, generating much unnecessary fear and turmoil.

However, one federal agency representative saw value in CWPPRA recognition of traditional agency missions. Barring a major federal government reorganization, maintaining traditional roles could help to define centers of expertise, fostering the esprit de corps necessary to retain valued employees, and developing the institutional knowledge needed for long-term management. But it was also pointed out that strong leadership in key positions on ecosystem management task forces or committees is essential to success, forcing compromise and consensus.

Federal Management Programs

The survey team solicited comments on three large-scale federal management programs in Coastal Louisiana: EPAs Gulf of Mexico Program; the Coastal Zone Management Act; and the Barataria/Terrebonne Estuary Program, part of the EPA-funded National Estuary Program. Both EPA programs received favorable review, and their structures were often preferred to those of the CWPPRA. The Gulf of Mexico Program was praised for the following positive aspects:

- Citizens appointed by the state government participate.
- All federal agencies are represented, located in a single office.
- States feel that they can drive the process.

But the Gulf of Mexico Program was also criticized for the following negative aspects:

- Mixing appropriations from various agencies creates problems.
- Although $5 million in funds were needed, only $3 million (including $2 million from EPA) were secured.
- Federal agencies are not set up to deal with ecosystems. There was a need to go to the Office of Management and Budget with regionwide appropriation plans.
- Variously scaled (nested) management areas are difficult to assimilate into a single plan.

Both the Barataria/Terrebonne National Estuary Program and the Coastal Zone Management Act were praised for their upfront involvement of the public, for working out problems with the public, and for their heavy involvement of state agencies in the decision-making process. Decisions under the National Estuary Program are made by consensus, and the primary funding agency (EPA) remains a nonvoting member of the Policy Committee, although EPAs Region 6 was described as "having a hard time letting go" of the program. No threat was seen of a veto of National Estuary Program activities by EPA under Clean Water Act section 404(c), although the opposite was true of activities under the CWPPRA.

Both the National Estuary Program and the Gulf of Mexico Program seem to coordinate successfully with the CWPPRA because they have members who are personally involved in the CWPPRA process. Without these personal connections and commitments, some said, institutions would not be able to effectively coordinate activities.

Institutional Alternatives

Several suggestions were made for improving the CWPPRA structure in accordance with goals of the ecosystem approach. The CWPPRAs restoration goals were perceived to be in potential conflict with the Corps goal of flood and navigational control. Therefore, leadership of the CWPPRA process by the Corps was seen as a potential conflict of interest, and a more neutral leadership was called for. Alternatively, the Corps should accept ownership of the CWPPRA plan and process.

But no specific examples of task forces with neutral leadership were offered. Special commissions (such as the W. Alton Jones Panel on scientific issues pertaining to wetland loss, or the Jack Ward Thomas Interagency Committee on strategies for protecting the northern spotted owl) were widely acknowledged for their invaluable service in resolving interagency conflicts on scientific issues. But these were not considered good examples of commissions designed for planning and managing ecosystems.

It was also suggested that architects of ecosystem planning should have the perspective and training of a planner, landscape ecologist, hydrologist, or geographer, professions that provide the ability to see the larger picture. Experts in these areas are viewed as unencumbered by special interests. Through its basinwide planning efforts, the CWPPRA Task Force has made good progress toward establishing a broader vision. Its chief disadvantage appears to be its perceived lack of independence (by virtue of its domination by federal agencies). A nonvested leadership of restoration efforts would be more effective.

One scientist whose involvement in marsh management issues spanned more than 40 years mentioned failure of institutional response as the reason for the delay of more than 30 years in acting on 1969 data showing dramatic wetland losses in Louisiana. Institutional inaction could be overcome, it was suggested, by uniting various agency regulatory functions under a single agency (which should not be the Corps).

One expert with international experience in marine and coastal environmental management suggested that keeping the CWPPRA Task Force involved in all aspects of CWPPRA implementation was a recipe for failure. He suggested a pyramidal structure for the ecosystem approach: planning should involve the largest number of participants, with fewer involved in project selection, fewer still in implementation, and the smallest number in implementation at the local level. This idea was echoed by many survey participants.

Interviewees emphasized the need for a good vision statement at the outset of the restoration process (as exemplified by the CWPPRA), followed by willingness to entrust responsibilities to a single lead. Several examples were offered of "ecosystem approach success stories" elsewhere in the world, including two efforts in Australia, one to develop a multiple-use zoning plan for the 2,000-mile Australian barrier reef, and the other to devise a long-term (50- to 100-year) timber plan for Australias forests.

LEGAL ISSUES

The CWPPRA is the primary federal legal vehicle for facilitating a broad-based approach to wetland restoration in Coastal Louisiana. But despite the interagency approach to restoration envisioned under the CWPPRA, impediments to a purely ecosystem approach remain. The primary obstacle to the ecosystem approach appears to be the Federal Advisory Committee Act, although other impediments were named as well in interviews conducted by the survey team, including the CWPPRA itself.

The CWPPRA

The CWPPRA process was criticized for several reasons, including its narrow approach, lack of continuous leadership, insufficient inclusion of state and other interests, and planning constraints.

Project-driven approach. One complaint often heard is that the CWPPRA is project-driven and therefore fails to take an ecosystem approach to coastal restoration. The CWPPRA requires the Task Force to submit yearly priority lists that usually contain discrete restoration projects developed by federal agencies, the state of Louisiana, or private landowners. Several commentators identified the need for a basinwide master plan to coordinate all federal and state restoration projects within the basin, including projects outside the CWPPRA process. Other interviewees noted that CWPPRA projects are often "bandaids" used to justify continued funding under the CWPPRA, even though they will not solve the overall problem of coastal deterioration in Louisiana.

Lack of continuous leadership. Under the CWPPRA, the Corps District Engineer in New Orleans serves as Task Force Chair. Several interviewees said that the primary problem with this is lack of continuity. Because District Engineers rotate every 2-3 years, the Task Force Chair must be constantly reeducated. As a result, the role of the Corps in the CWPPRA process is largely defined by midlevel civilian Corps employees-although interviewees did not characterize this as either positive or negative.

Insufficient state representation. A complaint often heard from state officials and the public was that the state has no vote on the Task Force in allocating funding-although by virtue of its cost-share requirement, it exerts considerable influence on the process. This provision was not written into the CWPPRA by Congress, but rather mandated by President Bush in his Statement on Signing the Bill on Wetland and Coastal Inland Waters Protection and Restoration (November 29, 1990), in which he instructed the Task Force to "promulgate its priorities list . . . by a majority of those Task Force members who are present and voting, and to consider the state official to be a nonvoting member of the Task Force for this purpose." The President justified this decision with the argument that the funding decisions made by the Task Force are "an exercise of significant authority that must be undertaken by an officer of the United States, appointed in accordance with the Appointments Clause" of the United States Constitution, Article II, § 2, cl. 2.

Some state representatives also called for more than one state representative on the Task Force. However, legislation specifically enacting the CWPPRA states that the Governor of Louisiana shall serve as state representative on the CWPPRA Task Force.

Insufficient representation of socioeconomic interests. A few commentators called for adding a member to the Task Force to represent the socioeconomic interests of people affected by coastline erosion and proposed restoration efforts. As one interviewee noted, "People are a resource that needs to be considered under the CWPPRA," just as other resources (such as land, vegetation, and wildlife) are considered.

Planning constraints. The authorizing legislation enacting the CWPPRA contains built-in planning constraints. Although these requirements have facilitated communications and coordination, they also affect the character of projects identified as priority, their ultimate benefit in the grand scheme of coastal restoration, the time in which projects must be identified and analyzed, and the level of funding available for plan formulation and development.

Some interviewees remarked that the most significant constraints are deadlines for submitting priority project lists and the Restoration Plan, and limitations on planning funds. The result is a dominance of small projects in the Restoration Plan. Under the CWPPRA, priority project lists must be submitted to Congress no later than November 28 of each year for 5 years. Three such priority lists have been submitted, containing 46 projects, and the Restoration Plan was submitted on November 28, 1993. Funding for the preparation of plans is not to exceed $5 million annually (although Task Force members did not identify this as a problem).

Section 404 Regulatory Program

There were a number of complaints about the Clean Water Acts section 404 program regulating the discharge of dredged or fill material into waters of the United States. Some complaints were merely general criticisms of the regulatory program, but others offered insight into potential barriers to the ecosystem approach. Although only 2-3 percent of wetland loss in Coastal Louisiana is due to fill, even this small percentage can be significant, given the high rate of wetland loss.

Lack of timeliness and consistency. Many commentators voiced the criticism that the section 404 regulatory permitting process takes too long, and they stressed the need for federal agencies to speak with one voice regarding permit applications. Under its section 404 authority, the Corps affords other federal agencies (such as EPA, the National Marine Fisheries Service, and Fish and Wildlife Service) the opportunity to comment on permit applications. Although the process of ensuring adequate coordination with other federal agencies takes time, it provides meaningful interagency input into the decision-making process, allowing the Corps to consider the effects of a permit applicants proposed activities on a wide variety of resources. Critics of the program urged federal agencies to submit comments on permit applications in a timely manner, and to work with the applicant to help achieve permit objectives, rather than "just saying no."

Mitigation sequencing. A local representative called on the Corps and EPA to eliminate the requirement for mitigation sequencing. Mitigation sequencing is a national policy broadly embodied in National Environmental Policy Act and in a Memorandum of Agreement between the Army and EPA on Clean Water Act section 404(b)(1) guidelines. The Memorandum provides that in reaching permit decisions, the Corps and EPA must follow a process of mitigation

sequencing to determine appropriate and practicable measures to offset unavoidable impacts. This process entails a sequence of three requirements: (1) avoidance of environmentally damaging actions if practicable in terms of cost, existing technology, and logistics; (2) minimization of adverse environmental impacts that are unavoidable; and (3) compensation for any remaining unavoidable adverse impacts after all appropriate and practicable minimization has been required. Stressing Louisianas unique nature, the parish representative noted that because wetlands are so widespread in Louisiana, compensation is sometimes better than avoidance because it does not unduly hinder development. However, this view is not shared by all.

Double standard on permitting. Parish representatives and landowners charged that federal permitting agencies are more amenable to restoration projects sponsored by the state or other federal agencies than to projects proposed by local governments and private landowners. This perceived double standard results in a smooth permitting process for state and federal projects, whereas local governments and landowners are unfairly confronted with obstacles.

Delegation of permitting authority to the state. The state of Louisiana (in particular the Louisiana Department of Natural Resources) has expressed a desire to assume authority for administering the section 404 regulatory program. According to several interviewees, the state is better able than federal agencies to address socioeconomic considerations. EPA has provided grant assistance to the state of Louisiana to explore the feasibility of a state-run section 404 program, and the Louisiana Department of Natural Resources has asked local universities to study this issue. However, under section 404(G) of the Clean Water Act, opportunities for the state to address socioeconomic considerations in permitting actions would be limited to nontidal wetlands (waters not influenced by tidal actions). The state would therefore have little influence on CWPPRA-related wetland permitting. However, the state no longer wishes to assume section 404 authority.

National Environmental Policy Act

The National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 et seq., requires federal agencies to consider the environmental effects of proposed major federal actions. If the proposed action will have a significant impact on the environment, the federal agency must prepare an environmental impact statement assessing that impact and addressing alternatives. Under NEPA, the public must be given sufficient time to comment on the environmental impact statement.

In Coastal Louisiana, the Corps completed a programmatic environmental impact statement on the Restoration Plan prior to its submission to Congress. Most interviewees said they had sufficient time to comment on the environmental impact statement, and that they thought their comments were given adequate consideration. As CWPPRA projects are developed, the agency in charge of each project may be required to prepare an environmental assessment or an environmental impact statement, depending on the projects environmental impact. This requirement could delay project completion, because both environmental assessments and environmental impact statements can be costly and time-consuming.

Federal Advisory Committee Act

The Federal Advisory Committee Act (FACA), 5 U.S.C. App. 2, was identified as the principal federal legal obstacle to an ecosystem approach to the restoration of Coastal Louisiana, primarily because it limits opportunities for meaningful public involvement and scientific input into the management and decision-making process. The FACA imposes a number of requirements on committees or similar groups established or utilized by the President or by federal agencies for the purpose of obtaining advice or recommendations (Public Citizen v. United States Department of Justice, 491 U.S. 440 (1989)). In enacting FACA, Congress hoped to "expose the advisory process to public scrutiny and curb abuses of the advisory committee process by public interest groups" (Center for Auto Safety v. Federal Highway Administration, 1990 U.S. Dist. LEXIS 13733 (1990)). A committee is more likely to be characterized as an advisory committee subject to FACA if it is established or funded by the federal government, if the federal government sets the agenda or appoints its members, if it has members that are not federal employees, or if it gives advice or recommendations about specific federal decisions.

Under FACA, an advisory committee must be organized under a charter, balance its membership, post notification of its meetings in the Federal Register, hold open meetings, take minutes of meetings, and (upon request) provide transcripts of meetings (see 5 U.S.C. App. 2, §§ 5 and 9-10).

A Citizen Participation Group established by the CWPPRA Task Force consists mainly of nonfederal interest groups. Designed to provide recommendations to the Task Force (which contains federal agencies), the Citizen Participation

Group is subject to FACA requirements. Therefore, it has languished, no longer used to solicit ideas and recommendations, as originally intended. Many interviewees deplored the ensuing lack of public involvement in the CWPPRA process and insisted that for the CWPPRA to work, it needs the support of the people.

Louisianas Sunshine Law could similarly hinder the states ability to solicit advice and recommendations from the public.

*Federal Programs That Encourage Urban Developme*nt

Some federal programs contribute to urban sprawl in Coastal Louisiana, to the detriment of wetland preservation. The U.S. Department of Housing and Urban Development provides assistance for low-income housing mortgage insurance for homes. The Veterans Administration also provides mortgage insurance. The National Flood Insurance Act, 42 U.S.C. §§ 4000 et seq., through the National Flood Insurance Program, offers flood insurance for private homeowners and other landowners who develop lands in coastal areas (provided local communities adopt land use and control measures to minimize losses due to flooding).

These programs and others have encouraged urban development in Coastal Louisiana. Following floods, the federal government has then been called upon to expend large sums of money on disaster relief and to meet flood insurance claims. Moreover, the public has appealed for expanded federal hurricane protection to enclose former wetlands converted to urban development.

One suggestion offered for alleviating problems caused by urban development is to enforce Floodplain Management and Wetland Protection Executive Orders. These executive orders direct federal agencies to avoid (to the extent possible) the adverse effects of occupying and modifying floodplains and wetlands. A second suggestion is to deny federal subsidies to developments in floodplains and other wetland areas.

Federal Programs That Affect Agricultural Development

Several federal tax incentives and USDA programs have encouraged conversion of wetlands to croplands in Coastal Louisiana. Under the Internal Revenue Code, costs associated with wetland alteration and development are tax deductible as business expenditures. Programs sponsored by USDA that contribute to wetland loss include disaster payments for crop losses, low-interest loans from the Farmers Home Administration, and price supports for rice, soybeans, and other crops.

Endangered Species Act

The Endangered Species Act (ESA), 16 U.S.C. §§ 1531 et seq., requires federal agencies to take steps to protect species listed under the Act as threatened or endangered, and to preserve their habitats as well. Recently, critical black bear habitat in Coastal Louisiana was proposed for listing. Local residents charged that the ESA process failed to provide sufficient communication with the public prior to listing, resulting in misperceptions about the implications of the listing among farmers and landowners in Louisiana. State officials suggested that prior to any listing, the Department of the Interior should meet with state and local representatives to explain its ramifications and to say who might be affected. If such meetings took place prior to listing in the Federal Register, they would serve to minimize possible misperceptions. However, bear habitat does not appear to impede the restoration effort in any way.

A second criticism of federal efforts to protect endangered species arose in connection with National Marine Fisheries Service measures to protect sea turtles. A regulation finalized in December 1992 requires shrimp trawlers to comply with sea turtle conservation measures in all areas throughout the year, including use of turtle excluder devices or, in certain circumstances, limited tow times. Turtle excluder devices are designed to prevent sea turtles from entering shrimpers trawl nets. One local representative said that because there are no sea turtles off the coast of Louisiana, these requirements should not apply to Louisiana shrimpers, especially because they are seriously damaging Louisianas shrimping industry. The representative offered this instance to show that not all regulations should be codified on a national level, and that agencies should be flexible, delegating decision making to the lowest levels.

Pipeline Safety

For safety reasons, federal law requires burial of pipelines that lie offshore or cross navigable waters. Under Title 49 U.S.C. App. § 1672(h)(4), the Secretary of Transportation is required to establish regulations requiring operators of offshore pipeline facilities, and of any other pipeline facility posing a hazard to navigation or to public safety because it crosses under, over, or through navigable waters, to bury the pipelines at issue. The deadline for compliance is 6

months after the condition of the pipeline facility is reported to the Secretary of Transportation, although the deadline can be extended to ensure compliance. This law was criticized for failing to take into account or to provide a mechanism for assessing potential environmental harm from burying pipelines.

State Law Issues

The major obstacle to CWPPRA projects is the state land rights issue. Several CWPPRA projects that are ready to be implemented are currently being held up due to issues involving land rights and public access. Private landowners say that lands upon which CWPPRA projects are constructed with federal or state money would be legally open to public access, and they object to public access because of potential liability issues, such as those stemming from injuries to the public that might occur on these lands.

Another state land rights issue involves ownership of lands built up by accretion. Many interviewees noted that when land erodes, ownership of the water bottom reverts to the state. But the reverse is not the case, according to the state: when land is subsequently built up as a result of a restoration project, ownership remains with the state rather than reverting back to the private landowner. Private landowners dispute this rationale. Land rights issues, including oyster leases, are currently being addressed by the state as part of a major revision of state policies and activities related to restoration.

Oyster leases also pose a problem for restoration projects on state and private land. When fresh marshes erode and brackish water infiltrates the marsh, the area becomes suitable oyster habitat. The state and many private landowners have leased such lands to oyster growers. But as the marshes are restored, oyster leaseholders will lose their livelihood and deserve to be compensated for their loss, according to many interviewees. Some pointed out, however, that oyster leases in the more interior areas are often speculative, with little expectation of profitable oyster harvesting. Anticipation of profits from compensation, however, might be great.

Legal Alternatives

Interviewees had two main suggestions for improving the legal framework for future ecosystem approach initiatives:

- Provide for a neutral entity to oversee the restoration effort to ensure that ecosystem concerns are taken into account when making decisions on restoration projects.
- Amend FACA to ensure that the public can play a meaningful role in the process of deciding how the ecosystem that they live in is managed.

PUBLIC PARTICIPATION

The importance of continuous public involvement beginning early in the restoration process was a predominant theme of discussions with federal, state, local, and nongovernment stakeholders in Coastal Louisiana. Stakeholders also pointed to the need for better coordination and communication among the federal agencies involved in the CWPPRA as a prerequisite to good two-way communication with the public.

Background

As lead Task Force agency, the Corps has overall responsibility for public involvement, in coordination with other federal agencies and the state of Louisiana. Many public involvement activities have been carried out since passage of the CWPPRA, including brainstorming sessions that resulted in priority project lists of several hundred possible projects, and a series of public scoping, basin planning, and Task Force meetings.

Although not required under the CWPPRA, a Citizen Participation Group was convened to advise the Task Force. The group comprised 16 members representing landowners, industry, agriculture, environmental groups, public advocacy groups, and commercial and recreational fishermen. The Citizen Participation Group received briefings on first-priority list projects (table 2a) and on screening methods for projects; the public also had the opportunity to review the draft project lists. After deliberating on the projects, the Citizen Participation Group responded to the Task Force.

Although very active at first, the Citizen Participation Group has since become largely inactive, due to conflicts with Federal Advisory Committee Act requirements and other factors. Currently, it functions as a stand-alone committee,

without strong links to the Task Force or federal agencies.

The Task Force has also established the Wetlands Assessment Group, the Monitoring Group, and the Research Committee. The first two groups consist of one member from each Task Force agency. The Research Committee was established under the auspices of the Louisiana Universities Marine Consortium, and contracts with the Corps to provide additional scientific input to the CWPPRA process. The Committee is composed primarily of academic scientists.

Active coalitions and organizations involved with the CWPPRA include Save Our Wetlands, the Coalition to Restore Coastal Louisiana, and the Coastal Parishes Coalition. The latter was founded in 1992 by local governments, which felt out of the loop and wanted to express their concerns to the agencies in a concerted voice.

Beginning on January 11, 1991, about 30 public meetings were held around the state to provide input into the 3-year process of devising the Restoration Plan. Other initiatives and programs, both governmental and nongovernmental, have contributed to grassroots efforts in Coastal Louisiana. As a result, there is a good deal of awareness of environmental issues on the part of the average citizen. Citizens are united behind the belief that the "no-action alternative means we all lose." Although such initiatives as the Gulf of Mexico Program and the National Estuary Program have had little funding, they have brought citizens together in grassroots planning and futuring exercises.

Interviewee Comments

Some interviewees remarked that because the CWPPRA "had come from the people," they had expected the public to have more of a voice in the process. The CWPPRA process is often perceived to be run from the top down rather than from the bottom up. According to many, no attempt was made to develop an overall vision for each of the nine basins before the Task Force went directly to planning projects for the long-term Restoration Plan. Partly due to the very short timeframes for developing priority project lists for each year, many projects seem disjointed. Some also noted that the CWPPRA is really designed for small projects, not large-scale ones.

In some cases, projects with much lower priority for the public were chosen for funding. According to one interviewee, at the Houma public meeting, people rejected the proposed project in favor of other, much more critical ones. Many CWPPRA projects do not seem to conform to state and local goals, in spite of the project selection criterion that a project "have public support." However, it was pointed out that the Task Force has a legally mandated responsibility to select cost-effective projects; in some cases, projects with strong local support may rank very low in terms of cost-effectiveness.

The CWPPRA organization. Many interviewees voiced frustration with the cumbersome CWPPRA structure, and with the extra layer of bureaucracy that has been added. Several complained that there were too many places to go for project approval, and that they knew of no single repository of information or authority. By contrast, they praised NOAAs Coastal Zone Management Program for allowing the state to retain authority on permitting and other matters.

Many interviewees complained of a lack of interagency coordination: the different agency mandates, they said, can result in agencies working at cross-purposes. This lack of coordination seems to be a particular problem in the implementation and monitoring phases. Little or no information gets out to stakeholders and the public after the planning phase.

Some interviewees noted the lack of a clear articulation of federal procedure-they wanted to be told upfront which agency they needed to work with. According to some, the CWPPRA works to maintain the status quo: it avoids upsetting the missions of each agency, even when things would then be done better. Others see a federal presence as positive, providing the restoration process with the power of federal law and the authority to arbitrate among competing interests, to advance national goals, and to curb any corrupt influences in the State. Some federal interviewees said that the public does not realize the enormity of the restoration task, and that producing a Restoration Plan for nine river basins was a considerable accomplishment.

One interviewee suggested an alternative to the current CWPPRA organization and process: all stakeholders should get together at the very beginning of the process, decide on a process, trim the organization as work progresses to keep it from growing cumbersome, and finally delegate the lead on implementation to a small committee or a single agency.

Human dimensions information. Issues and values of primary public concern in restoration efforts are usually those with human dimensions; yet human dimensions information has been virtually absent from the decision-making process. Social scientists and appropriate generalists (such as geographers and landscape architects) were not brought into CWPPRA science and technical work groups, or into the Task Force. Public involvement has focused on input into planning and process, not on collecting human dimensions information from the public. As a result, the environmental impact statement for the Restoration Plan has not considered navigation issues, economic displacement, and other critical factors in analyzing possible alternatives. Governments failure to compensate for land lost to the tax base has a substantial impact on local communities. Failure to take this impact into account greatly concerned some of the parish representatives interviewed.

Federal agencies were called insensitive by some for condemning marsh management as a real tool, without realizing the extent to which it is imbedded in Coastal Louisiana culture. Landowners use marsh management techniques to protect investments and limit risk, a human dimensions concern that should be considered. In addition, the public expects to have free access to lands where federal dollars are spent on projects, such as lands of the Louisiana Land and Exploration Corporation.

Agencies were suspected of aversion to the risk of incorporating human dimensions information and public opinion into what should be "application of the best science available." Agencies, some interviewees felt, suspected a hidden agenda on the part of private industry, and were therefore unresponsive to academics and private industry representatives, despite the cutting-edge ideas they might have to offer. Agencies were also charged with relying too much on cost-benefit analysis in the selection of projects, and with aversion to using other valuation methods.

Some federal and nongovernmental organization (NGO) interviewees said that scientists seemed preoccupied with science and seemingly unconcerned about human dimensions problems or agency limitations. They raised questions about what the appropriate science is for addressing management issues.

Technology exists to save Coastal Louisiana, in the opinion of some. But with 80 percent of Coastal Louisiana in private hands, problems with land title, private property rights, liability issues, and other potential impediments to public acceptance of restoration measures should be resolved before technology implementation can succeed.

Public education. The CWPPRA has had a strong orientation toward project implementation, with no funds authorized for public education. According to one interviewee, the La Branch project (the first completed under the CWPPRA) has no interpretive materials for the public. One interviewee said that public involvement has been largely limited to inviting the public to project dedication ceremonies.

According to many interviewees, community relations and public education efforts have not been good. One interviewee observed that the perception on the street is that nothing has come of all the CWPPRA dollars spent, and that federal agencies are taking over what is largely a state responsibility, usurping power from the citizens. Some in the public reportedly believe that agencies like the National Marine Fisheries Service would like to see more wetlands lost to open water in order to extend their jurisdiction.

Several interviewees mentioned that there was little or no public education prior to public meetings, and that this made it difficult for the public to participate in them. It seems that the concept of tradeoffs has not been adequately explained to the public: the policy of preventing net wetland loss may have created the public expectation that agencies can hold onto every existing acre of wetland. It should be explained that under the policy, some wetlands will be lost, but that accretion in other areas will make up for the loss. It is also necessary to communicate such important concepts as constant change and uncertainty. There is no way to freeze current conditions, to predict with great certainty even using very sophisticated computer models, or to recreate exactly what people remember as Coastal Louisiana.

The Marsh Management Workshop, held in mid-August 1994, was cited by many interviewees as an extremely productive meeting of private citizens with state and federal representatives. People were impressed that top EPA officials showed up at the meeting, and that EPA seemed genuinely interested in improving the situation in Coastal Louisiana. The workshop seemed to change somewhat the public perception that federal agencies firmly oppose marsh management, a technique long used by landowners in Coastal Louisiana. The National Estuary Program was also praised by several interviewees for its outstanding public education components.

Fairness. Public involvement efforts were criticized by some local government and NGO interviewees as inadequate and unfair. Others, special interest groups that seemed to be key stakeholders with the right contacts and experience in

getting information, expressed more satisfaction with the public involvement process.

According to some, the public sees a double standard: federal agencies can get away with practices forbidden to state and private interests. For example, according to one interviewee, the Corps can get categorical exclusions for some of its projects, but landowners may have to wait years to get their projects permitted.

Communication. Communication problems seem to have plagued CWPPRA efforts from the beginning, and there seems to be no overall plan for communicating with the public. Some who had wanted to attend Task Force meetings did not know until the evening before where and when the meetings would be. One major stakeholder said that all her agency got was "a notice in the Federal Register."

A few interviewees observed that the public meetings they attended were almost entirely informational (consisting of slide shows, presentations by planners, and similar activities), with little time for exchange of views. As for interagency communication, some interviewees said that the CWPPRA has gotten some agencies together for the first time, and that although there are problems, the agencies have made real headway in working together. Purely state law issues were brought up for the first time, as well.

Accountability. The problem of government failure to respond adequately to public concerns was mentioned by a few interviewees. One asked whether all the data gathered from the public during the formation of the no-net-loss policy had been forwarded to the new Clinton administration. Others said that agencies seemed to disappear for periods of time, failing to report back to the public on how input was used in making a decision, or even what the decision was. One interviewee called for more followup efforts in communicating with the public, and for better display of a participatory attitude encouraging the public to "keep working with us."

Access. Several interviewees mentioned the inconvenience of meeting locations, saying that they had to drive great distances to be meaningfully involved in Task Force or Citizen Participation Group meetings. One interviewee observed that attendance is a problem at regional meetings, and that the only way to get to the public is to go to locations where the public is present.

The CWPPRA agencies appear to have done a good job of identifying and contacting stakeholders. In some areas, however, the 30 public meetings held during the restoration planning process were insufficient, given the complexity of the issues and the high level of interest on the part of landowners. Public involvement efforts should be resumed, and at a high level. Tribal rights might become a bigger issue, particularly if the Department of the Interior decides to officially recognize the Houmas as an Indian tribe.

Some interviewees, complaining of having to wade through huge documents that they did not understand, called for good summary documents. Scientists, they said, "dont talk in plain English," and sometimes appear arrogant at public meetings. There is the added frustration of not having expected outcomes explained early enough in the process, at least not in a way that average citizens can understand.

Some scientists complained about being put off by the agencies, which told them to "go away, we havent started monitoring yet." One scientist complained about the narrow scope of feasibility studies and the monitoring program, saying that they should go beyond the project level to encompass the entire basin or ecoregion. According to some, scientists did not support the CWPPRA because, in their opinion, many priority list projects that the public helped identify did not make ecological sense.

The Federal Advisory Committee Act (FACA) was mentioned repeatedly as a real obstacle to good public involvement. After getting off to a good start, the Citizen Participation Group had to be abandoned because of FACA constraints; citizens have come to the conclusion that it is no use coming to meetings or trying to advise federal agencies, because their input will not be used. Some federal interviewees were equally frustrated, knowing that many public involvement activities (such as charettes, Delphi techniques, regular meetings with stakeholders, and others) run a real risk of violating FACA.

Timeliness. Private property issues are particularly hot in Louisiana. Several interviewees complained that federal agencies failed to approach landowners early in the process to get their opinions or to obtain specific information, such as where access to their holdings is needed for crude oil extraction. According to many interviewees, agencies tended to draw up their plans for projects, then go to landowners for rubberstamping. One interviewee said that if landowners had been included earlier in the process, some of the infeasible projects would not have made the list.

Some complained that the process is too slow, and that agencies are not responding quickly enough to the loss of 25 square miles of coastline each year. One interviewee said that "as we drive from the Task Force meeting in New Orleans back to Houma, we see the water lapping at the highway."

The "can-do" attitude and antiresearch bias of some federal and state agencies were brought up as real problems. Already treated with suspicion by some government stakeholders, scientists were brought in too late in the process, when frustration was already high.

Leveling the playing field. Some interviewees remarked that they did not have the background to participate fully in the restoration process, and that some kind of leveling was needed. They simply felt overwhelmed by the "mega-agencies" and their operations, and by the whole concept of the ecosystem approach. The right people, they said, were needed around the table to discuss one or two issues-but not a hundred different issues. A few interviewees said that "basin" or "watershed management" would be a much easier term for the public to deal with than "ecosystem management."

Some interviewees said that the level of public involvement was fine, but that corrective mechanisms were needed to prevent recurring mistakes. Some parishes and interests are very powerful and well organized, they said, while others barely function. One key stakeholder noted that the public can get involved if it wants to, although it takes the patience to attend meetings and get information, and also strong advocacy skills.

The NRCS was praised by many interviewees as a federal agency that provides the correct balance of exercising federal authority and promoting grassroots leadership. The Coastal Zone Management Program was also praised for keeping power at the state level through the establishment of a state commission with permitting authority.

Public Participation Alternatives

Based on their comments and concerns, interviewees offered the following suggestions for improving public participation in the CWPPRA process:

· Use facilitated negotiation and consensus-building techniques to build upon current efforts to develop visions for each basin and to resolve conflicts among various interests.
· Provide a better mix of specialists on technical and science teams advising on the CWPPRA. Include social scientists and people who can see the big picture.
· Continue and improve implementation of a public involvement plan for the next phases of the CWPPRA. Each project or basinwide public involvement plan should conform to a philosophical tier in a larger public involvement plan (although implementation specifics would vary widely), and should complement other public involvement efforts in Coastal Louisiana.
· Recruit people capable of facilitating public involvement and popularizing science. Provide agency personnel with training in how to involve the public.
· Implement the monitoring plan for the overall process and for public involvement efforts. Establish realistic indicators of success, and use them to measure outcomes. Use measurement results to correct any problems with the process.
· Investigate the possibility of using public involvement techniques that go beyond public hearings and comment periods for environmental impact statements. For example, use the townhall approach and high-tech tools where appropriate (such as radio, television, satellite downlink, spatial imagery, 1-800 numbers, and Internet). Emphasize getting out and talking to people (door-to-door, or through surveys, booths at fairs, or similar means).
· Resume public meetings and presentations at local functions. Assemble divergent views whenever possible so people can hear alternatives. It is important to bring together oil and gas industry workers, landowners, oystermen, conservationists, representatives from cultural and historical organization representatives, and others in informal, nonthreatening settings with low-key agency presence.
· Provide more technical assistance and information to the public and to landowners, utilizing existing programs where possible, such as the Wetlands Reserve Program, state coastal zone management programs, the wetlands education program developed by the state, and another marsh management workshop.
· Add an education and outreach budget for the next fiscal year. The Farm Bureau could help in disseminating educational materials to the public, and Louisiana State University has a road show based on a report it produced (Van Heerden 1994). Environmental education efforts should be conducted by people who know Louisiana well. Provide interpretive materials on completed CWPPRA projects and projects-in-progress so that

people have more information about what is going on.

· Coastal Louisiana is of nationwide and even international concern. There is a need to educate the national public and to facilitate dialogue among stakeholders at the national level-including those on Capitol Hill, the National Association of Conservation Districts, oil and gas associations, private property rights groups, the National Audubon Society, and others.

· Citizens have a good level of awareness and are an important asset. Get a coastal restoration campaign going in the schools and among adults, and form partnerships with corporations, tourism industry, schools, landowners, and others.

· Locate federal offices in a single site to improve communications among agency personnel. Loosen up restrictions on borrowing staff from other agencies.

SCIENCE AND INFORMATION

The role of science in defining problems, assessing options, and designing solutions has been exceptionally prominent in Louisiana. Scientific data on land loss, effectively presented, provided the common focus that led to the CWPPRA. Ecological restoration science and techniques will be among the final determinants of CWPPRA success. Scientific assessments have made several key contributions to the CWPPRA process, and an admirable commitment to short- and long-term monitoring has been made. The public, too, appears well informed on the main scientific issues.

The prominence of science in the CWPPRA process has led to close scrutiny of its role and to substantial debate surrounding it, among both scientists and nonscientists. Debate is not about whether the CWPPRA process uses (or should use) science, but rather about how much, how well, and specifically where it utilizes (or should utilize) science and scientists. Among academicians, agency scientists, and many others, our interviews revealed intense interest and strong opinions about the science that is (or should be) involved in CWPPRA decisions. Opinions vary on the sufficiency and certainty of the scientific basis for some actions. Many respondents voiced the need for more effective communication between scientists and managers, more effective involvement of independent scientists, and a need for research and monitoring support to help evaluate restoration project effectiveness.

The survey team attempted to determine prevailing opinions on the role of science, scientific quality and gaps in the science base, and the effectiveness of information management and flow. We used interviews as our main source of information, and although we briefly reviewed several of the better-known scientific reports and assessments, we did not conduct a comprehensive literature review. Findings are summarized below under six headings: the state of scientific understanding; assessments; the role of science in decision making; monitoring; the state of information systems; and how to improve science and information management.

State of the Science

Opinions on the status of scientific understanding varied widely, often aligning to some degree with the profession of the respondent. For example, many nonscientists appeared to be disinterested in research, considering it unnecessary because there was sufficient scientific basis for action. For their part, some academic scientists deplored a perceived reluctance to fund research that would answer basic, still-unresolved questions. The bulk of our interviews seemed to indicate that there is enough understanding of the ecosystems processes and problems, as well as their causes and potential solutions, to proceed with an adaptive management approach that accepts the need for midcourse corrections. Despite many pleas for research addressing key gaps in understanding, no one suggested delaying action until we have "enough" science. The "no-action" alternative is clearly inappropriate.

Under closer scrutiny, some uncertainty does appear in many areas, including ecosystem components and processes, ecosystem problems, possible causes of the problems, and restoration options.

Ecosystem components and processes. Some components and processes of the ecosystem are better understood than others. The basic ecosystem characteristics and functions, including delta dynamics and salt, brackish, and fresh tidal marsh extent, patterns, and functions, are well understood overall. Individual basins, however, were cited as unique by some scientists, who argued that ecological processes and predicted impacts in one basin may not translate effectively to another. For example, the degree to which different wetland types require mineral sediment accretion and organic soil formation, and in what proportion, is not entirely resolved.

Ecosystem problems. Land loss is well documented, although studies of land loss rates by the Corps and Fish and Wildlife Service arrived at different conclusions (25 and 35 square miles per year, respectively). However, all agree on

the land loss trend. Wetland alteration, mainly consisting of saltwater intrusion and attendant shifts in vegetational composition in formerly fresh marshes, is not well documented qualitatively or quantitatively, partly because this impact is not as amenable to rapid assessment through remote sensing techniques (as is land loss). The dynamics of fresh and brackish vegetation communities under shifting salinity regimes and competition are not entirely understood.

Causes of ecosystem problems. The most prominent problems (land loss and wetland hydrology/salinity alteration) are largely due to multiple causes. Causes are well known, but relative contributions to the total effect are somewhat uncertain. There is strong evidence that the loss problem is linked much more to subsidence without sediment replenishment than to erosion, filling, or draining. Oil and gas withdrawal may increase subsidence rates near shallow oil and gas fields, but there is some debate as to whether the effects are far reaching. Sea level rise relative to subsidence could be a significant factor if episodic, but this is untested. Delta and channel characteristics have a major influence on sediment availability and fate. Levees physically prevent overbank flooding that might replenish sediments in many areas. The Mississippi delta is a birdfoot type, with deep channels prone to shunting sediment loads directly into the gulf instead of depositing them across a broad fan. Curtailment of riverine sediment supply to the wetlands presents the dominant long-range threat to their survival. There appears to be a growing consensus that reestablishing flow and sediment distribution by the Mississippi River delta channels must be a major part of the solution.

Restoration options. Predicting the results of specific restoration techniques appears less well understood and deserves more study. This is particularly critical to a successful ecosystem approach in Louisiana: among the seven survey sites discussed in this volume, the Louisiana coast is uniquely dependent upon successful ecological restoration rather than protection and management. In this and other areas of some uncertainty, gaps in understanding are for the most part already identified and can be addressed through specific, well-focused research projects.

Valuation of the different components and functions of an ecosystem is often difficult, and there is little consensus on methods. Values related to ecological sustainability are poorly represented in traditional economic analysis methods. Quantifying wetland values was seen as particularly challenging. The Task Force uses the Wetland Values Assessment to evaluate CWPPRA proposals and projects in terms of average annual habitat units created. However, Boesch and others (1994) found the Wetland Values Assessment to be a very restricted assessment method that discounts many wetland attributes and functions beyond fish and wildlife habitat. In general, more comprehensive valuation methods (including consideration of economic and social concerns) are needed to fully represent the Louisiana coastal ecosystem in order to improve the CWPPRA process and, in particular, to ensure that its project priority-setting supports a long-term, sustainable vision for the Louisiana coastal ecosystem.

Finally, the restoration planning process could be improved by gaining consensus on a set of indicators of ecosystem health. The immediacy of wetland loss has so dominated the CWPPRA process that reducing marshland loss rates appears to be the only indicator of success-perhaps justifiably so, for now. However, other potentially appropriate indicators could include demographic trends, sustainable resource harvests, economic measures reflecting recreational use, various physical, biological, and chemical measures of health in the river and gulf, and other diverse but highly relevant aspects of Louisiana coastal ecology and culture. Whether under the CWPPRA or a broader effort to implement the ecosystem approach, a more comprehensive suite of indicators could help define and guide the overall vision of the future Louisiana coastal ecosystem.

Assessments

The term "assessment" is subject to different interpretations; we considered an assessment any study of broad scope that translates scientific information into policy-relevant findings and actions. At least three different types of assessments have played very important roles in Louisiana. The earliest and most important assessments documented coastal land loss rates, inspiring decisive action in the form of the CWPPRA. A second type of assessment includes the several restoration planning and feasibility studies that assess and help assign priority to different management options. A third type of assessment used in Louisiana examines the environmental management process, evaluating its scientific soundness and results.

Several assessments and planning studies have been completed. The 1993 Restoration Plan developed by the Task Force under the CWPPRA provides a basis for all restoration projects funded by the CWPPRA. The "Scientific Assessment of Coastal Wetland Loss, Restoration, and Management in Louisiana" (Boesch and others 1994) was sponsored by private foundation funding and compiled by a panel of environmental scientists experienced in studying the Louisiana coast, but without active involvement in the research or management activities underway in Louisiana.

A primary purpose of this assessment, published as a special issue of the "Journal of Coastal Research," was to review and evaluate the Restoration Plan and its related monitoring strategy. Many more specific assessments have been completed, such as the Atchafalaya Feasibility Study and the Mississippi River Gulf Outlet Bank Evaluation Study. The CWPPRA Task Force also assesses individual restoration proposals for priority ranking. The Governors Office (1994) has very recently issued an economic and environmental blueprint for Coastal Louisiana. This document may provide the broader vision many interviewees described as insufficient in the CWPPRA process, but it appeared to be too new for many interviewees to express their opinions on it.

The Boesch assessment, as an independent, scientific review, contains several important insights on where improvements can be made to the Restoration Plan. One of this assessments most valuable contributions was to issue an unbiased, expert judgment on scientific areas where consensus prevailed and on those where uncertainty was significant. Based on its evaluation, the independent assessment panel offered many suggestions. The assessment indicates that the Restoration Plan, and the CWPPRA in general, are oriented toward local and basinwide scales, and need a stronger, clearer vision of overall ecosystem health to drive individual project decisions and priorities. Many scientists, both agency and private, echoed this opinion in our interviews.

Role of Science in Decision Making

Scientific data have been very influential in many management actions concerning the Louisiana coast. But the importance of science in decision making over the lifetime of the CWPPRA has received mixed reviews. Competition between government and nongovernment scientists seems evident, with nonfederal scientists pointing to the continued need for a CWPPRA mechanism to engage the independent scientific community in a comprehensive way.

Many scientists expressed dissatisfaction with the current level of influence that scientific information has on the CWPPRA process. They cited, for example, limited peer review opportunities, deficiencies in the role of scientists in project priority ranking, inadequate monitoring protocols, and the absence of a unifying, scientifically based vision for a sustainable coastal ecosystem and its management. Some renowned wetland scientists were reportedly alienated by the CWPPRA due to the absence of opportunities for meaningful involvement. Others, however, pointed with pride of accomplishment to the influence of academic scientists on early CWPPRA decisions and activities. This suggests, at least in part, that the role of scientists with different affiliations in the CWPPRA process, as well as the role of scientific information itself, are both somewhat controversial. It appears that better collaboration among agency scientists, academic scientists, and consultants could address both problems, fully exploiting the range of possible contributions from the scientific community at large.

Monitoring

Monitoring is widely recognized as an integral part of identifying the Louisiana coastal ecosystems problems and planning, and of tracking the ecosystems restoration. Retrospective monitoring of time series of historical aerial photographs and land loss rate calculations using geographic information systems were instrumental in the passage and funding of the CWPPRA. The CWPPRA now requires monitoring on a site-specific scale as part of each restoration project, with about 5-7 percent of the project budget devoted to this requirement. Many managers and scientists, and the law itself, support the idea that monitoring the Louisiana coastal ecosystem should be a commitment with a timeframe of decades to be effective.

Despite consensus on the necessity of monitoring, there are differences of opinion on how monitoring should be carried out. Although most scientists agreed that project-specific monitoring is appropriate, some indicated the need for a coastwide monitoring design to track and guide system recovery on a broader scale. However, costs of such a monitoring approach, it was pointed out, would likely be considerable. Opportunities for cost-effective collaboration on large-scale monitoring may be possible if existing federal monitoring programs, such as the USDAs National Resources Inventory, NOAAs Coastal Change Analysis Program, or EPAs Environmental Monitoring and Assessment Program, will cooperate with the CWPPRA Task Force and the state.

It was clear that federal and state agencies predominate in carrying out monitoring under the CWPPRA. Although centralized design and oversight is appropriate, the CWPPRA may not be using university programs and volunteer citizens monitoring potential to full advantage. The major concerns have been quality control and maintaining consistency and institutional memory over the 20-year time frame of CWPPRAs monitoring plans. Although these are valid concerns, they are not insurmountable. Simple monitoring protocols, training, and quality assurance audits may be sufficient to enable the development of a useful volunteer monitoring component. Through negotiations with academic institutions, long-term agreements can be designed that will not only foster supervised involvement of

graduates and undergraduates in the monitoring process, but also train a generation of monitoring professionals capable of staffing agencies and organizations involved in implementing the CWPPRA.

Whether on site-specific, basinwide, or coastwide scales, monitoring is crucial to adaptive managements ability to make midcourse corrections. The most valuable monitoring is clearly and explicitly linked to the primary objectives of the overall management effort, as well as to that of the project at hand. For example, one of the most important needs for CWPPRA monitoring is to closely track the rates of marshland accretion attributable to each restoration technique. Several interviewees called for improving the CWPPRA process through clearer expression of its overall objectives, and through strengthening the monitoring component and its linkage to these objectives. For example, marsh management practices differ, depending on management or use objectives for the habitat: managing wetlands for waterfowl may be very different than managing wetlands for other purposes, such as maximum biodiversity.

Information Systems

Information management and data base issues appear to be secondary to science issues. However, to the extent that information transfer, data sharing, and communications are also information management issues, they are critical to the CWPPRAs success and show room for improvement.

Although there are many types of data bases and data management systems, the nature of the Louisiana coasts problem is uniquely suited to spatial data bases, and specifically geographic information systems. Remote sensing and geographic-information-system-based techniques for measuring land loss and change have been critically important in documenting the magnitude and rate of coastal land loss. Projections of possible coastal scenarios are effectively developed and communicated to a broad audience through geographic information systems. Spatial data bases are appropriate for tracking the multiple project sites of the CWPPRA, individually and collectively. Measuring and documenting land restoration will continue to involve remote sensing and use of geographic information systems during the recovery process. Geographic information systems, however, remain data-limited and do not serve all purposes equally well; for example, the salinity gradients that are important to fresh and brackish marsh restoration have not yet been represented well using geographic information systems.

The most outstanding geographic information system data holdings, hardware capacity, and expertise are in four locations: the National Biological Services Southern Science Center in Lafayette, Louisiana; the Louisiana Department of Natural Resources in Baton Rouge; Louisiana State University; and the Corps New Orleans District Office. Many other participants have smaller systems, but the proliferation of geographic information system technology can be expected to involve more and more stakeholders in the development and exchange of geographic information system data on the coastal zone.

There is typically room for improvement in technical information transfer in any large science-based program. The public and interested managers who are not scientists are often isolated from key scientific information, either through the complexity of information systems design or the absence of translations into common English. There is considerable interest in scientific information concerning the Louisiana coastal ecosystem, and a premium should be placed on developing user-friendly modules for the CWPPRAs major data centers. Effective public information access can be achieved through hotlines, computer bulletin boards, newsletters, videos, and PC-based interactive programs. The benefits may be measured in terms of grassroots support and easier communications between managers and scientists concerning key CWPPRA decisions.

Science and Information Alternatives

Interviewees had the following suggestions for improving science and information to facilitate the CWPPRA process:

- Establish appropriate priorities. Ecological restoration technology, together with monitoring to closely track and evaluate each projects success, constitute the CWPPRAs greatest scientific needs. New research should focus on developing and/or testing new and proposed restoration techniques, and on verifying with certainty the effectiveness of existing techniques. The highest priority for monitoring should be verifying as quickly as possible whether CWPPRA projects are achieving the expected degree of success.
- Improve communications. Science and communications issues are closely linked in Coastal Louisiana. Even if science and technology are adequate, problems with communications may seriously limit CWPPRA success. The Task Force should convene a multidisciplinary working group to review all

issues concerning the involvement and role of the scientific community in the CWPPRA process and to develop an appropriate coordination strategy.

- Keep the big picture in view. The process that links identification of an ecosystems environmental problems and management objectives with the actions eventually taken is weakened when action taken at each step does not clearly relate back to a common vision. In Louisiana, many interviewees pointed out the need for a better unifying sense of purpose, or "the big picture," to which all activities would ideally relate.
- Coastal Louisianas cooperators should first determine what the perceived absence of a common vision means: should the planning and implementation process itself be improved, or is it communications about the process that needs improvement? If the process itself is flawed, cooperators should concentrate on developing feedback loops to assure that all activities and projects remain relevant to the common vision for the Louisiana coast. If communications need improvement, then interactions of scientists with landowners, managers, and the public should be fostered to build understanding and acceptance of a common vision.
- Improve interagency coordination. Many interviewees recommended improving the consistency of federal activities and policies. Cohesive coordination among agency scientists and managers should be sought as a primary component of the federal role in the ecosystem approach.
- Fund critical research. Focused research that will answer critically important questions should be funded. Policy-relevant research with a clear relationship to achieving CWPPRA objectives must earn broader acceptance as a necessary component of the process.
- Develop new options. New options for marshland restoration and creation should be studied and carefully evaluated. For example, an ecological risk assessment should be conducted to evaluate the potential for using the "red mud" byproduct of aluminum extraction as a marsh substrate. Also, use of dredged material as marsh substrate and its transport through pipeline networks merit further investigation, as do new structural designs to help minimize impacts of marsh management on estuarine fish and shellfish.
- Evaluate marsh management techniques. Marsh management, as a general type of restoration-related activity, is controversial. To the extent possible, individual marsh management procedures (and not marsh management as a whole) should be scientifically evaluated to resolve debates about what works, and where. Open dialogue should continue among agencies and all parties potentially affected.
- Use universities in monitoring. Long-term monitoring over more than 20 years presents special difficulties in working with universities, because of high student turnover. However, the economic and academic benefits of university involvement in monitoring can be significant. A plan for a university role in consistent, long-term monitoring, in conformity with CWPPRA and graduate program requirements, should be developed jointly by agencies and a consortium of local universities.
- Explore the possibility of coastwide monitoring. Despite agreement on the need for monitoring, wide differences of opinion persist on its purpose and design, and especially on whether it should be coastwide rather than specific to the project site. Site-specific monitoring appears needed in any case; the potential costs and design components of coastwide monitoring should be investigated. Existing federal monitoring programs, such as the EPA Environmental Monitoring and Assessment Programs gulf coast component, should be asked to assist in this investigation.
- Develop volunteer monitoring. Because access to remote sites for monitoring can be difficult and costly, a premium should be placed on volunteer monitoring. Appropriate monitoring activities for volunteers should be identified in the Louisiana coastal ecosystem, supplemented by training and an active quality assurance audit program. Local public information programs should then be developed to disseminate results.
- Translate scientific information into lay terms. There is little incentive for scientists to translate scientific information into lay terms, yet public understanding is crucial to the implementation of scientific findings. The CWPPRA should fund an information transfer network to perform this function. A centralized group should work through and with local educators and community leaders to accomplish this objective.

OBSERVATIONS AND RECOMMENDATIONS

After careful deliberation on the results of its study on the ecosystem approach activities in Coastal Louisiana, the survey team has chosen the following as its most important observations and recommendations. Some pertain

specifically to the CWPPRA, but many draw from what was learned in Louisiana to address the ecosystem approach in general.

Program Support

1. Continue the CWPPRA process and implementation of the Restoration Plan. Despite imperfections, the CWPPRA is working, providing a positive model of restoration-based efforts to implement an ecosystem approach to management. The strength of the CWPPRA plan lies in its budgeting for 20 years of monitoring, an integral part of each restoration project. This information should be enough to give the state of Louisiana and the CWPPRA Task Force the opportunity, through adaptive management, to make necessary adjustments to methodology and planning to ensure success of continuing restoration work.
2. Sound monitoring science is critically important for adaptive management and for making the right ecosystem approach decisions. Louisianas monitoring program needs to be very carefully tailored to reveal the best restoration procedures, evaluate progress, answer key management questions, and be responsive to coastal restoration timeframe requirements. To best address these needs, decision makers and environmental managers should work as closely as possible with experts from all parts of the scientific community (including federal and state scientists, academics, consultants, industry scientists, NGO researchers, and others) in monitoring design, execution, and revision.
3. Ecological restoration technology, paired with monitoring to closely track and evaluate each projects success, together constitute CWPPRAs greatest scientific needs. The highest priority for new research appears to be developing and/or testing of new and proposed restoration techniques and verification of the effectiveness of all existing techniques. The highest priority for monitoring should be to verify as quickly as possible whether every CWPPRA project is achieving the expected degree of success, and to facilitate modification of methodologies and plans based on monitoring information.

Establishing a Common Vision

4. In order to effectively plan and develop future ecosystem approach initiatives, the CWPPRA experience suggests that future ecosystem management efforts might benefit from establishment of an independent Task Force or Committee to act as "ecosystem approach architects." Members should be able to visualize large-scale solutions and see the big picture. Social scientists should be included, along with planners, landscape ecologists, hydrologists, or geographers. The leadership of this group should be selected to ensure neutrality, and membership should be from a nonvested community. It would be helpful for the group to be appointed under separate authority, and with special legal protections. One way of handling decision making across multiple jurisdictions is to establish an independent authority, like the one used to build the subway system for the Washington, DC, metropolitan area (costing more than $5 billion).
5. Although it does not contain all of the desired elements, the CWPPRA Task Force has succeeded in developing a common vision through its basinwide planning efforts.
6. The process that links identification of an ecosystems environmental problems and management objectives with the actions eventually taken is weakened when action taken at each step does not clearly relate back to a common vision. In Louisiana, many interviewees pointed to the need for a better unifying sense of purpose (or "big picture") to which all activities would ideally relate. Coastal Louisianas cooperators should periodically revisit their commonly held vision to determine if their actions conform to this vision, to make sure that the vision remains acceptable to the public, and to determine if improvements are needed to public communications. If the process needs improvement, cooperators should concentrate on instating feedback loops to assure all activities and projects relevance to the common vision for the Louisiana coast. The consensus process established in the Delta Initiative was recommended as an appropriate mechanism for addressing "big picture" concerns.
7. With respect to communications, the interaction of scientists with landowners, managers, and the public should be fostered as the key to establishing understanding and acceptance of a common vision.
8. Use facilitated negotiation and consensus-building techniques to establish a common vision for the ecosystem in full, rather than basin by basin, and to resolve conflicts among various interests.

Public Information and Involvement

9. Amend FACA to ensure that the public can play a meaningful role in the process of deciding how the ecosystem in which they live is managed. Public representatives should have equal standing with other

partners in the early stages of developing the vision and plan under the ecosystem approach. This role should be more than merely advisory.

10. Bring in a team to work with agency officials to prepare and implement a public involvement plan for the next phases of the CWPPRA. Each project or basinwide public involvement plan should conform to a tier in a larger public involvement plan (although implementation specifics would vary widely), and should complement other public involvement efforts in Coastal Louisiana. Monitoring of the overall process and of public involvement efforts should be required. Realistic indicators of success should be established and progress measured against them, with results used to correct any problems in the process.
11. Recruit people who are skilled at involving the public and can popularize science. Provide training in public involvement techniques for agency personnel.
12. Investigate the possibility of using other public involvement techniques besides public hearings and comment periods on environmental impact statements. The town hall approach can be used, with high-tech tools where appropriate (such as radio, television, satellite downlink, spatial imagery, 1-800 numbers, and Internet). Getting out and talking with people should be emphasized, through door-to-door campaigns, surveys, booths at fairs, and other techniques. Public meetings should be resumed, along with presentations at local functions. Whenever possible, divergent views should be presented so people can hear what others have to say. It is important to bring together landowners, oystermen, conservationists, oil and gas industry workers, representatives of cultural and historical organizations, and others in informal, nonthreatening settings with a low-key agency presence.
13. Add an education and outreach budget to the CWPPRA process for the next fiscal year. The Farm Bureau could help in disseminating educational materials to the public, and Louisiana State University has a road show based on a report it produced (Van Heerden 1994). Environmental education efforts should be conducted by people who know Louisiana well. Interpretive materials on completed CWPPRA projects and on projects underway should be provided so that people have more information about what is going on. In addition, there is a need to educate and to facilitate dialogue among stakeholders at the national level-including those on Capitol Hill, the National Association of Conservation Districts, oil and gas associations, private property rights groups, the National Audubon Society, and others.

Interagency Coordination

14. Experience in the CWPPRA process, as well as examples of large-scale planning elsewhere, indicate that a pyramidal structure may be a successful organizational model for the ecosystem approach. Under this structure, the greatest number are involved in establishing the vision and in planning (including many federal agencies), fewer are involved in project selection (perhaps state, local, and federal permitting agencies), and the fewest are involved at the lowest levels or implementation stages. This structure requires sharing a common vision among all stakeholders and entrusting to others implementation of the vision.
15. Collocate federal offices to improve communications among agency personnel active in the region. It is recommended that all key federal agencies involved in major ecosystem approach initiatives maintain at least one staff member at the local level, preferably located in an interagency office of all federal agency staff.
16. Experience in Coastal Louisiana has shown that early involvement of all stakeholders in the ecosystem planning process-especially before options are identified-defuses much suspicion, frustration, and anger, particularly on the part of landowners and the public. Future efforts should not only involve all stakeholders early in the management process, but also ensure that they have opportunities to participate on an equal footing in the planning stage, and are formally included in approval of the plan and development of the vision.
17. Science and communications issues are closely linked in Coastal Louisiana. Even if science and technology are adequate, poor communication may seriously limit CWPPRA success. The Task Force should continue its established Academic Assistance Subcommittee and its agreement through the Louisiana Universities Marine Consortium to assure involvement and assistance of the scientific community.

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Chapter 4: GREAT LAKES BASIN

The Great Lakes basin is one of seven ecosystems identified by the Interagency Ecosystem Management Task Force for study of activities to implement the ecosystem approach. The Great Lakes ecosystem is an excellent choice, partly because it comprises an enormous geographic area, encompassing subsystems on multiple scales-basinwide, lakewide, and local. The multiple scales and the numerous problems on the Great Lakes have generated interest on multiple levels-from governments, institutions, and citizens. Perhaps most importantly, the Great Lakes community has been promoting an ecosystem approach to managing environmental problems at multiple scales since the 1970s, when the United States and Canada signed the Great Lakes Water Quality Agreement governing Great Lakes protection and restoration activities. This agreement serves as a model for other efforts to implement the ecosystem approach.

An interagency survey team appointed by the Interagency Ecosystem Management Task Force performed this study, based on several information sources: interviews conducted in Chicago, Illinois, and Ann Arbor, Michigan; telephone interviews; and written materials provided by federal and state officials, and by representatives of tribal organizations, nongovernmental organizations (NGOs), academia, industry, and the International Joint Commission. This study reflects what survey participants said, or what was stated in materials provided by them. It does not reflect the views or legal position of the team, except where explicitly stated.

Most participants in this case study emphasized that their idea of the ecosystem approach is based on a place-based approach. It focuses on problems locally-where people have pride of ownership of their ecosystem-and is built on public participation. Interviewees stressed the need for a bottom-up approach to ecosystem management: they want guidance and support from the federal government, not direction. Specifically, what they want from the federal government is sustained commitment, technical assistance, smooth interagency coordination, and policies that are consistent with local goals.

BACKGROUND

Although a good ecosystem approach is based on a bottom-up approach, early efforts were facilitated at high levels. One forum for basinwide discussion was already established under the International Joint Commission, established by the Boundary Waters Treaty of 1909, which is responsible for overseeing U.S. and Canadian efforts under the Great Lakes Water Quality Agreement of 1978, as amended by protocol in 1987. This agreement calls for efforts at multiple scales-for example, Lakewide Management Plans for whole-lake problems and Remedial Action Plans for specific concerns. Other discussion forums, such as the Great Lakes Fishery Commissions Lake Committee structure, have come to play increasingly important roles in the basin. Another major element in fostering an ecosystem approach was the science base established by research programs already underway. A third factor was the publics focus on the endangered resource. The Great Lakes were threatened by many highly visible crises, including fish kills, eutrophication of Lake Erie, the burning Cuyahoga River, and introduced species. In contrast to other ecosystems, restoration efforts were not initiated primarily in response to litigation.

Even though the ecosystem approach in the Great Lakes is a success story and model for similar efforts elsewhere, many barriers remain to frustrate its implementation, including: knowledge gaps with respect to species, population, community, and guild interactions within the Great Lakes basin; failure to integrate basinwide planning efforts from a multidisciplinary and multi-interest perspective: a complex binational web of lack of coordinated budgeting and planning on an ecosystems basis among agencies; fiscal allocations based on governmental appropriation cycles that are years to decades shorter than the time scale of problems being addressed; agency obligations to commit personnel and other resources to existing programs; lack of agency personnel resources and commitment to provide expertise and support; and national policies that are inconsistent with ecosystem goals and objectives.

Great Lakes Ecosystem

With an area of 95,000 square miles, the Great Lakes system is the worlds largest body of surface freshwater. Reaching far into the continent, this natural resource has long supported essential habitats for many of North Americas plant and animal species. Multitudes of birds pass through the Great Lakes on their seasonal migrations. The Great Lakes yield a rich bounty to fishermen. Thirty-five million people live in the Great Lakes basin, and millions of Americans and Canadians rely on the Great Lakes for drinking water, economic vitality, and recreation. Many U.S. and Canadian industries rely on them as an important commercial waterway.

In many ways, the five Great Lakes can be considered freshwater seas. They contain about 18 percent of the worlds surface freshwater and 95 percent of the surface freshwater of the United States. The Great Lakes basin includes parts

of eight states and the Province of Ontario (figure 1) and a variety of ecoregions (figure 2).

The northern part of the region is heavily forested, particularly by conifers. The soil is generally thin and acidic, covering an ancient bedrock called the Laurentian Shield. Principal industries are timber, mining, and hydroelectric power. In the south, soils are deeper and fertile, the temperatures are warmer, and the population is much denser. Vast wetlands and deciduous forests have generally been replaced by agricultural, industrial, and residential landscapes.

Lake Superior has the largest surface area of any freshwater lake in the world. It is the third largest in volume, trailing only the immensely deep Lake Baikal in Siberia and Lake Tanganyika in Africa.

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Figure 1.-The Great Lakes basin covers parts of eight states and the Province of Ontario and is home to 35 million people. It contains 187 percent of the worlds surface freshwater and 95 percent of the surface freshwater of the United States.
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Lake Superior holds just over one-half of the water of the entire Great Lakes system. Lake Michigan is the only Great Lake completely within the United States. Lake Huron, the second largest in surface area, is slightly larger than Lake Michigan. Lake Erie is the southernmost of the Great Lakes. Its waters are the warmest in summer and most productive biologically, supporting abundant fisheries. Eries watershed is the most agricultural, most urban, and least forested of all the lakes. Lake Ontario has the smallest surface area, but contains more than three times Lake Eries water volume. The Canadian population within Lake Ontarios watershed is about twice that of the comparable U.S. population, and has increased significantly during the 1970s and 1980s. Canadas largest industrial region lies along the western and northwestern shores of Lake Ontario.

An important characteristic of the Great Lakes is their clarity. Before Europeans began to settle the region around 1800, the Great Lakes contained little phosphorus, were rich in oxygen, and were very clear except in shallow waters. These conditions existed because the shorelines were rimmed by forests and wetlands, allowing little nutrient runoff to stimulate production of floating algae. Excessive nutrient loading results in excessive algal growth and can cause rapid eutrophication of a lake. Despite todays level of development, most of Lakes Superior and Huron remain very clear, as do parts of the northern basin of Lake Michigan. Lakes Erie and Ontario, as well as Saginaw Bay in Lake Huron and Green Bay in Lake Michigan, were subjected to rapid eutrophication.

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Figure 2.-The multiple ecoregions in the Great Lakes basin support essential habitats for many of North Americas plant, fish, and animal species.
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At the onset of the 20th century, the watershed had a population of slightly more than 10 million. As of the 1986 census, the region had 35 million residents-27.5 million U.S. citizens and 7.5 million Canadians. The Lake Superior and Lake Huron watersheds are sparsely inhabited. The southern and southwestern shore of Lake Michigan, the Canadian shore of Lake Ontario, and the U.S. side of Lake Erie are heavily populated. The third and sixth most populated U.S. metropolitan areas (Chicago and Detroit) and the largest Canadian metropolitan area (Toronto) are near the lakes. Native American tribes also reside in the region, with 5 reservations bordering the Great Lakes on the U.S. side and 14 on the Canadian side.

Nonindigenous nuisance species, such as the sea lamprey, zebra mussel, ruffe, spiny water flea, purple loosestrife, and Phragmites, continue to threaten the indigenous living resources in the Great Lakes. In addition to the threats that nonindigenous nuisance species pose, water level regulations, channelization, hydropower dams, shoreline structures, and filled wetlands challenge indigenous species at various stages in their life cycles.

Perspectives on a Great Lakes Ecosystem Approach

The living resources in the Great Lakes must be carefully managed to ensure maximum public benefit while guaranteeing their perpetuation. The goals and objectives of the international cooperative efforts between the United States and Canada will be realized as the health of fish and wildlife resources improves. Restoration goals for the Great Lakes basin will be met when viable and productive stocks of indigenous and other desired fish species are available, bald eagles successfully reproduce and inhabit shorelines, mink and otter reinhabit suitable shorelines

throughout the basin, chemical and other stress-induced deformities in fish and wildlife are reduced to normal background levels, and fish and wildlife can be consumed with little or no risk to human health.

The complexity of the Great Lakes ecosystem is matched by the complexity of the institutional framework in place for Great Lakes management. The Great Lakes system is managed at many levels, from municipalities to national governments: two federal governments, eight states, Native American tribes, and two provinces share responsibility in the system, along with municipalities, county boards, and regional and international bodies such as the Great Lakes Fishery Commission, Great Lakes Commission, and International Joint Commission. Adding to this management complexity is the diversity of interests represented by research institutes, universities, citizen groups, businesses, and private individuals within the Great Lakes basin.

Adoption of an ecosystem perspective in the stewardship and rehabilitation of Great Lakes resources is widely recognized as crucial for the future of the system. Current resource assessments and research and management tools alone are inadequate to evaluate changes in large, complex ecosystems. New tools must be developed as an outgrowth of partnership efforts to identify ecosystem impairments, focus rehabilitation efforts, adaptively manage resources, and monitor results.

Restoration of the Great Lakes is a complex process requiring the cooperation of local, city, county, state, provincial, Native American tribal, and federal agencies in addition to many conservation and public interest groups. Within a governmental agency, there can often be dramatic differences in how the resource management and environmental sections within the agency approach Great Lakes issues. In the future, environmental, fish, and wildlife managers must overcome substantial challenges. Differences in mandate, perception of priorities, and style of management create major institutional impediments to systematic and comprehensive coordination of ecosystem management. Many of the current problems are, in fact, the unintended consequences of uncoordinated management of water quality, fisheries, shipping, and human developments in the Great Lakes basin. Concepts of responsible resource use and management and biological conservation should not be at odds, but should be integrated via partnerships to meet future needs. Information exchange and cross-program forums should be established to encourage management and environmental policies to be endorsed as one.

Although coordination of water quality and fish and wildlife management is necessary for progress in implementing ecosystem management, it is not sufficient. Water quality and fish and wildlife management issues are themselves imbedded in a hierarchy of other management decision-making and social and economic developments. It is important to recognize that a systematic and comprehensive approach to the restoration of the ecosystems of the Great Lakes requires joining ecological restoration and human development at spatial and temporal scales that are beyond human experience. The integrity of the Great Lakes ecosystems is affected by activities far outside the basin.

Economy

During the past 300 years, various industries have boomed in the Great Lakes region. Fur trapping thrived from the last half of the 17th century until the early 19th century. The Great Lakes and St. Lawrence River were a pathway to the Atlantic coast for canoes laden with animal pelts destined for customers in Europe. Many early settlements were fur-trading posts, including Chicago, Detroit, Duluth, and Green Bay.

As the beaver fur industry declined with the animals population, early settlers began harvesting trees on a large scale. Commercial logging began in the 1830s with the advent of steamships and the opening of the Erie Canal, which provided access to eastern markets. The heyday of lumbering was from 1850 to 1900.

The Great Lakes lumber industry ran out of trees early in the 20th century. Because climate and soils of the North Woods and the Laurentian Shield generally are not conducive to farming, little of the cleared forest was converted to agriculture. Gradually the forests returned to much of their former domain in the northern half of the region, although the trees are much younger and smaller than their predecessors. Today, these woods are harvested for paper. The paper industry, which started in the 1860s, is still important in both the United States and Canada.

The mining industry grew concurrently with the lumber industry and remains important today. In 1845, rich iron ore was found in the Marquette Range of Michigans upper peninsula. Additional iron ranges were later discovered in Minnesota and Wisconsin. In 1855, completion of the Sault Canal opened Lake Superior to shipping of iron ore and permitted these ranges to be mined. Iron ore from the mineral-rich Lake Superior watershed helped to make the Great Lakes region a center of iron making, steel making, and heavy manufacturing.

Oil became another significant industry. The worlds first oil was tapped in the northwestern Pennsylvania town of Titusville in 1859. Oil was later found in three locations: Midland, Michigan; Toledo, Ohio; and northeast of Lake St. Clair.

The automotive industry, born in the Michigan triangle bounded by Lansing, Flint, and Detroit, supplanted the carriage industry that once thrived there. Detroits population soared almost 400 percent between 1890 and 1920. Industries associated with the automotive business, such as tool and die making, machining, aluminum, and rubber were drawn to the area. Proximity to the steel industry attracted appliance and agricultural equipment manufacturers. Proximity to industrial customers and brine wells in southeastern Michigan attracted chemical manufacturers.

During the 1970s and early 1980s, foreign competition and rising energy costs caused profit and job losses in Great Lakes heavy industries, especially in the United States. Demand increased for fuel-efficient cars made of lighter materials, such as plastics and aluminum, as alternatives to steel. During the 1970s, Detroit lost 20 percent of its residents. In the early 1980s, about 1 million manufacturing jobs disappeared in five Great Lakes states. However, heavy industries such as mining, steel, machine, tools, and cars remain important. Today, manufacturing is still the economic mainstay in most Great Lakes states and Ontario.

Agriculture is another productive element in the regional economy. During the 19th century, cheap land, ample top soil, flat terrain, and railroads that brought crops to distant markets contributed to extraordinary agricultural productivity in the American Midwest. Agricultural output within the U.S. Great Lakes watershed has increased during the last 40 years, although farm acreage has actually decreased by one-third. Cropland accounts for 18 percent of the land in the U.S. counties of the watershed, predominantly in the south. Corn is the largest crop (42 percent of farm acreage), followed by soybeans (24 percent) and small grains, especially wheat (17 percent). Dairy products, fruits, vegetables, and tobacco are also farmed.

The Great Lakes are a source of drinking water to millions. Industries use water to make products and for cooling in manufacturing processes. Some rivers are harnessed to generate electricity; up to one-half of the Niagara Rivers natural flow is diverted for this purpose.

Another large element of the Great Lakes economy is recreation, including sightseeing, fishing, boating, camping, and hiking. The Great Lakes sustain both sport and commercial fisheries, although recreational fishing is more important today. As the value of recreational fishing has increased, some jurisdictions have established policies that favor it. The U.S. Fish and Wildlife Service recently reported that participants in the fishing industry in the U.S. portion of the Great Lakes generate about $2.22 billion in sales to local businesses and that the industry represents $4.4 billion in annual economic activity. About 75,000 jobs are supported by sport fisheries, and commercial fisheries provide an additional 9,000 jobs and $270 million annually. A small portion of the commercial harvest is taken by tribal fisheries that operate pursuant to treaties dating from 1836 and 1842 (see the "Great Lakes Fishery Resources Restoration Study: Report to Congress," U.S. Fish and Wildlife Service 1995).

Historically, the Great Lakes have provided many economic benefits to citizens. The regional economy depends on a healthy natural environment. When the Great Lakes ecosystem has not been considered, economic disruptions have occurred; and when environmental values have been fostered and maintained, the economy has sustained the region over many years.

Environment

The Great Lakes support a rich diversity of birds and other wildlife. Among the most biologically productive areas are Green Bay, Saginaw Bay, western Lake Erie, St. Marys rapids, and the St. Clair delta.

Fish species of special interest include lake trout, lake sturgeon, lake whitefish, walleye, Pacific salmon, and landlocked Atlantic salmon and their forage. Native mussels are being seriously impacted by zebra mussels and are in danger of extirpation from the Great Lakes basin. The basin provides critical breeding, feeding, and resting areas as well as migration corridors for waterfowl, colonial nesting birds, nongame birds, and many other species of migratory birds. Thirty-one species of migratory nongame birds of management concern to the U.S. Fish and Wildlife Service are found in the Great Lakes ecosystem.

A recent survey of biological diversity in the basin identified 130 globally rare or endangered plant and animal species or ecological communities. The bald eagle, peregrine falcon, piping plover, Mitchells satyr blue butterfly, Indiana bat,

gray wolf, lake sturgeon, deepwater sculpin, and pugnose shiner are a few of the many threatened, endangered, and candidate species that inhabit the Great Lakes ecosystem.

An estimated three million waterfowl, following the Atlantic and Mississippi flyways, migrate through the Great Lakes each year, relying on the lakes for food and shelter. Native animals include deer, fox, moose, wolves, and fur-bearing mammals such as beaver, mink, and muskrat. These animals fueled the early development of the region by European settlers.

By the start of the 20th century, the combined effects of pollution, harvest, and habitat change had devastated many of the prolific animal populations. Over the past 30 years, there have been encouraging ecological successes in the region: excessive algae in Lake Erie have been abated, the detrimental effects of sea lamprey predation on fish populations have been diminished, and oxygen has been restored to the waters. Although certain toxic contaminant levels have declined substantially in some fish and wildlife species, many species remain affected by persistent historical and newly discovered toxic contaminants.

Its long retention time makes the Great Lakes ecosystem especially sensitive to environmental stresses. The Great Lakes food web remains contaminated by various bioaccumulative toxic substances that have reached unacceptable levels in some fish and wildlife. Today, these levels are much lower than in the early 1970s, but public health advisories on fish consumption are still issued. Problems persist throughout the food web, as evidenced in toxic contaminants found in fish and wildlife predators, such as lake trout, mink, and bald eagles. Locations such as harbors and rivers with highly contaminated bottom sediments still have problems. Generally, contaminant levels are highest in Lakes Michigan and Ontario, although these lakes have also showed the greatest declines in contaminant levels during the past two decades.

More than 130 nonindigenous species have been introduced into the Great Lakes since 1800, nearly one-third carried by ships. Some introduced species have profoundly affected native species. A recent troublesome invader, the zebra mussel, probably entered the Great Lakes in ballast water discharged from an ocean-going vessel. The full impacts of the mussel are not yet known, but economic and environmental costs are expected to be significant. A prolific breeder, it devours microscopic plants at the foundation of the food web and may create a food shortage for grazing fish. Ultimately, this would threaten predator fishes, such as walleye, salmon, and lake trout. River ruff, spiny water flea, quagga mussel, tubenose goby, and roundnose goby are other recent invaders. The river ruffe has recently been documented in the waters of Lake Huron and is expected to rapidly expand its range, possibly even if immediate and decisive actions are taken to contain it.

The increased introduction of foreign species over the last 30 years is largely due to greater transoceanic shipping traffic on the Great Lakes since completion of the St. Lawrence Seaway in 1959. These species have made their way up canals into the Great Lakes. Species formerly barred by Niagara Falls were able to enter after the Welland Canal was completed or enlarged. Fish are among the most common of the introduced species, but plants represent about 45 percent of introduced species and algae 18 percent.

Some species have been introduced intentionally, such as carp, brown trout, and a variety of Pacific salmon. Since the 1960s, salmon have been regularly stocked by the Great Lakes states and the Province of Ontario to provide recreational fishing and another predator to control smelt and alewife, which are also introduced species. Salmon provide an alternative to diminished lake trout for sport fishing.

Population levels of many native fish species are lower than they were two centuries ago. Damage to once richly abundant native fish populations has been profound. Lake herring was once the predominant commercial species. Sturgeon exceeded 6 feet in length and weighed more than 100 pounds. Today, sturgeon and lake herring populations are greatly depleted. Hatchery-reared lake trout are stocked to maintain ecological balance and to sustain sport and commercial fisheries. Stocked, nonindigenous Pacific salmon are the most abundant top predators, except in western Lake Erie, where the top predator is walleye.

The demand for harvestable fishery resources offers an increasingly difficult challenge. Historically, large numbers of lake trout, lake whitefish, lake herring, walleye, blue pike, lake sturgeon, yellow perch, and other fish populated the Great Lakes and supported a major commercial fishing industry. In Lake Ontario, Atlantic salmon were gone by 1900 and sturgeon were severely depleted. Populations of commercially valuable fish further declined precipitously during the 1950s and 1960s due to a combination of factors, including overfishing, sea lamprey predation, competition with nonindigenous nuisance species, and pollution. Resource management agencies throughout the Great Lakes region responded by implementing aggressive long-term programs designed to restore the fisheries, including the

introduction of nonindigenous hatchery-reared salmon, the stocking of lake trout, and the control of sea lamprey. Adequate and consistent funding is critical to the successful implementation of these programs.

Bottom sediments that hold chemicals such as PCBs and DDT are probably the principal cause of the continuing contamination of fish and wildlife. The transfer of sediment-bound contaminants to the base of the food web happens when bottom-dwelling organisms accumulate contaminants, and when phytoplankton absorbs contaminants that are resuspended. These sediments are toxic to bottom-dwelling organisms, killing them or impairing their normal functions. Sublethal effects associated with contaminated sediments include tumors in bottom fish and bioaccumulation of persistent toxic chemicals up the food chain.

The transport of contaminants by air is a major problem for the Great Lakes. The aerial transport of contaminants has introduced pollutants to the Great Lakes that did not originate there. For example, 76 to 89 percent of PCB loadings to Lake Superior are estimated to come from air pollution. Even small amounts of pollutants that bioaccumulate can result in significant pollutant burdens in fish. The aerial introduction of contaminants has also complicated the selection of "pristine" sites as reference sites for scientific research.

Many of the wetlands of the Great Lakes watershed have been lost during the last two centuries. The most extensive losses happened in the 19th and early 20th centuries when many wetlands were drained for agricultural use. Remaining wetlands continue to be threatened by construction, harbor and marina development, waste disposal, and mining of sand. Ground water consumption has diminished recharge of certain wetlands. There are also indications that wetlands have been disrupted by nonnative plants, such as purple loosestrife, and by fish, such as carp.

By the late 1960s, various areas of the Great Lakes experienced thick algal blooms that imparted unpleasant odors and taste to the water and depleted dissolved oxygen. These eutrophic conditions were most pronounced in Lake Erie, which is the shallowest, warmest, and biologically most productive lake, and the one most susceptible to nuisance levels of algae. Lake Erie has also been vulnerable because it receives more effluents from sewage treatment plants and sediment from farmland in its watershed. Both effluents and sediments carry phosphorus to the lake, altering its chemistry and creating algal blooms.

During the last two decades, the United States and Canada have reduced phosphorus levels across the Great Lakes by more than 50 percent. Lake Eries improvement has been visible and dramatic. The Great Lakes states and Canada have passed laws banning or limiting phosphorus content in household detergents, constructed more effective municipal sewage treatment plants, and reduced phosphorus from agricultural runoff. Phosphorus levels have also declined in Saginaw Bay and Green Bay, where eutrophication was a problem.

Over the last 25 years, there have been various efforts to address the pollution problems of the Great Lakes. Responsibility for correcting pollution of the Great Lakes rests with an alliance of federal, state, tribal, and local agencies, as well as NGOs and industry. This effort emphasizes prevention, restoration, and remediation. It fosters public involvement and stewardship and pursues innovative solutions, including public-private partnerships.

Much of the success in resolving pollution problems is the result of bilateral agreements between the United States and Canada, in particular the Great Lakes Water Quality Agreements of 1972 and 1978, and the 1987 protocol that amended the 1978 agreement. Other influential documents go back to the 1909 Boundary Waters Treaty. Since the 1987 protocol, the United States and Canada have undertaken actions to reach the goals of the 1978 agreement. The Binational Executive Committee was created to identify binational products and priorities required to implement the agreement, to assign responsibilities, and to track the progress of binational remediation activities. In the United States, the Great Lakes Critical Programs Act of 1990, the Great Lakes Fish and Wildlife Restoration Act of 1990, and the Clean Air Act Amendments of 1990 have imposed specific requirements on U.S. parties, including several statutory deadlines. In addition, the National Pollution Discharge Elimination System and the construction grants program under the Clean Water Act have significantly contributed to improving the quality of Great Lakes waters.

Two processes for targeting ecological problems on a geographic basis are Remedial Action Plans for Areas of Concern and Lakewide Management Plans. Including 5 shared with Canada, the United States has 31 Areas of Concern in some of the most ecologically degraded areas around the lakes-usually harbors or river stretches. The Lake Committee structure, supported by the Great Lakes Fishery Commission, is the predominant process for identifying fisheries-related ecosystem problems within the Great Lakes basin.

The Lakewide Management Plan process has the advantage of focusing at the level of the lakes rather than at jurisdictional levels, and this level of coordination is probably the best approach. Both the Lakewide Management

Plans and the Lake Committees are striving to put the ecosystem approach into practice. A better understanding of the interrelationships between fisheries communities and water quality management is necessary in order to achieve a more integrated approach. Neither process can afford to work in isolation from the other, and both are generally beginning to work together at an informal level that has been slowly evolving and is best represented in Lake Superior.

The Remedial Action Plan process defines ecological problems, identifies appropriate solutions, and measures progress toward ecological goals. States, enlisting grassroots collaboration from local communities, develop and implement the Remedial Action Plans. These Plans are models of an ecosystem-based, multimedia approach to addressing impaired uses. They exemplify grassroots environmental democracy, stressing empowerment of the affected public within Areas of Concern. States approach Remedial Action Plans in differing ways. Some practice hands-on involvement, while others delegate much of the decision making to local groups or agencies within the Area of Concern. The complementary application of federal statutes and authorities, in addition to technical and financial support at this ecosystem level, is often necessary to attain goals in these areas.

The most successful Remedial Action Plans are those that are community-driven, with active federal, state, and local involvement. The affected community, which is closest to and most directly affected by the resource, is empowered to create and implement a future vision for the Area of Concern.

Integrating the activities of all the subbasin projects on a given lake, where necessary, is the responsibility of the Lakewide Management Committee. These committees, consisting of binational managers of federal, state, provincial, tribal, and nongovernmental agencies, currently address lakewide problems through the Lakewide Management Plan process. The situation is slightly different on Lake Michigan, where committee representatives are all U.S. citizens. The focus of each lakes Lakewide Management Plan is slightly different. Lakewide Management Plans are not yet developed for all five lakes.

The goal of Lakewide Management Plans is to restore and protect beneficial uses of the Great Lakes from both existing and potential impairments. Each Plan must address and manage a whole lake, considering critical pollutant loadings and other stressors in addressing beneficial-use impairments. It is clear that the Lakewide Management Plan must be closely related to the various Remedial Action Plans, the "Joint Strategic Plan for Management of Great Lakes Fisheries" (Great Lakes Fishery Commission, 1980), the Fish Community Goals and Objectives for each lake, and other subbasin activities on a particular lake. Coordinating activities (such as monitoring, sampling, biological inventories, and sharing of data) mutually benefits each of these programs.

The Lakewide Management Plans markedly increase the scale and complexity of carrying out the ecosystem approach. Vehicles for public input exist for all current lakewide planning efforts. For some Lakewide Management Plans, there are standing public forums of representatives selected from identified nongovernmental stakeholder groups (such as industry groups and environmental organizations), which act as a two-way conduit of information for the Lake Management Committee. The forums poll their constituencies, gauge their reactions, and inform the Lake Management Committee. Most importantly, the forums seek to articulate the publics shared vision for the lake, which-as with the Remedial Action Plans-is generated by the group that will be directly affected by the decisions made. For Lakewide Management Plans without standing public forums, lakewide networks of existing committees fill the role. The desired result is active and timely public input on a lake-by-lake basis.

Present Situation

Two federal governments, eight U.S. states, two Canadian provinces, numerous regional agencies, thousands of substate/provincial governments, many Native American authorities/First Nations, and a multitude of other governmental entities have some legal authority for matters pertaining to the Great Lakes/St. Lawrence ecosystem. The complexity and sophistication of the "institutional ecosystem" for the regions governance have garnered global recognition. Cooperative and collaborative relations among these jurisdictions, in partnership with business and industry, citizen organizations, and all other basin interests, are needed if ecosystem integrity is to be achieved and maintained.

The ecosystem approach extends back at least to 1978, when the Great Lakes Science Advisory Board, in its report "The Ecosystem Approach," recommended to the International Joint Commission that such an approach be used for problem identification, research, and management in the Great Lakes basin.

An ecosystem approach to management is embraced by many public sector, nongovernmental, and citizen-based institutions in the Great Lakes basin because it is based on recognition that environmental and economic attributes of the area are fundamentally linked and interdependent, as are goals for environmental protection and economic development. It is also based on recognition that sustainable development for the Great Lakes depends on managing resources as dynamic, interdependent communities and ecosystems, rather than as separate, distinct elements. Practicing the ecosystem approach means that all partners-government and private sector alike-understand the implications of their actions and strive to avoid unintended adverse consequences.

An ecosystem approach to management, involving rehabilitation and protection for ecological processes and resources of the Great Lakes, has been perceived as needed by the diverse governmental, organizational, and private interests within the basin. Over the past few decades, these interests have independently evolved processes for identifying and addressing problems. These processes are now beginning to be integrated into an ecosystem approach, which is based on the understanding that human activities, natural resources, and ecological processes are related parts of a unified whole. The chemical, physical, and biological integrity of the Great Lakes basin ecosystem can be achieved by understanding, respecting, rehabilitating, and protecting the total environment and by identifying and maintaining diverse plant and animal populations and their habitats.

BUDGET ISSUES

Survey participants focused on three main budget issues affecting the ecosystem approach in the Great Lakes basin-coordination, flexibility, and funding levels.

Coordination

Participants were consistent and clear in their message that federal agencies exhibit a lack of coordination in program strategies and budgeting. They expressed an urgent need for interagency approaches to budgeting. Because each agency has its own mission and agenda, there has been lack of cohesion in program implementation from an ecosystem perspective. If program activities are coordinated across agencies, the concomitant budgetary actions supporting them must be well coordinated to ensure that "the left hand knows what the right hand is doing." Participants maintained that a coordinated approach would enable ecosystem managers to "leave their agency hats at the door" when deciding how to spend dollars.

Another recommendation from many survey respondents was to develop legal authorities that would permit agencies to share funds. Fund sharing is not widely practiced due to complicated budget procedures within each agency. Because activities to implement the ecosystem approach are functionally crosscutting, many different federal agencies must be involved in field activities, making coordination of budget activities essential. Respondents felt that agencies should be more willing to coordinate activities and the necessary budgeting.

As an ecosystem, the Great Lakes region is unique in how it relates to Congress in terms of its budgetary needs. Congress is informed by the Northeast-Midwest Institute (an NGO) on a wide variety of issues related to the Great Lakes-including natural resource management and budgetary needs. Accordingly, Congress gets a coherent and crosscutting analysis of ecosystem approach imperatives. However, this broad-based approach breaks down when federal agency budgets are developed in isolation from each other, and when these budgets are reviewed piecemeal by different examiners at the Office of Management and Budget and by congressional committees. Several respondents felt that this process gives the Office of Management and Budget an incomplete understanding of the Great Lakes region (and other ecosystems).

Flexibility

Inflexible federal budgetary rules and regulations were a major concern to those surveyed. Several interviewees felt that protocols and processes have overwhelmed on-the-ground actions and have severely hampered program execution. Nearly all those questioned felt the rules should be simplified to better serve the involved stakeholders.

Recommendations to increase flexibility included: switching to a 2-year budget cycle; providing real incentives to save dollars without jeopardizing the amount of future allocations; and ensuring that carryover funds stay with the unit that created the carryover.

Another idea presented to the survey team was to increase the ability of federal agencies to give direct grants to NGOs. Some agencies, such as the U.S. Department of Agriculture Forest Service, have direct grant authority through

such vehicles as the Forest Services Challenge Cost-Share Program. Eliminating the middleman (that is, state governments) would permit greater flexibility and shorten the timeline for grant delivery.

Allowing creativity in the budgeting process was also suggested. In some cases, settlements in legal disputes were hampered by restrictions on how dollars could be awarded or spent. Some respondents felt that more flexibility would allow more creative solutions to litigation, reducing litigation fees and presenting win-win solutions to both sides. The survey team concurs.

Funding Levels

Specific numbers for the Presidents fiscal year (FY) 1995 budget include about $280 million across agencies for key national programs that benefit the Great Lakes ecosystems, such as the Clean Water Act section 319 program, and the national Coastal Zone Management Act (not including agricultural and drinking water programs or the State Revolving Loan Fund for sewage treatment construction)-an increase of 3.4 percent over FY 1994. Programs benefiting Great Lakes environmental concerns, including the Environmental Protection Agencys (EPAs) Great Lakes National Program Office, the Great Lakes Fishery Commission, and the International Joint Commission, totaled about $44 million (a decrease of $6.6 million over 1994).

The Northeast-Midwest Institute issued funding priorities for the Great Lakes that stressed: increased funding for state nonpoint source pollution control grants under section 319 of the Clean Water Act; more funding for exotic species management, including work on zebra mussel and sea lamprey; added funding for the ecosystems programs of EPAs Great Lakes National Program Office to support work in remediation of contaminated sediments, monitoring toxic loadings by air, water mass-balance modeling, and technical assistance to Remedial Action Plan planning committees; more research, especially on the effects of consuming contaminated fish on human health; a new effort focused on sustainable development in cities around the Great Lakes (including "brownfield" locations); new funds to develop integrated pest management techniques for sea lamprey control; new funds to adopt a basinwide ecosystem approach, particularly regarding soil erosion and sediment control; and more funds to promote integrated research coordination.

Inadequate funding was a common thread in the survey, although the survey team conveyed the message that this was not the focus of its work. However, we feel it is our responsibility as a team to report that chronically low funding remains an important issue to many interviewees. This is especially critical, in their minds, because of the long-term problems in the Great Lakes ecosystem. Some of the waters in Lake Superior, for example, take 199 years or more to cycle through to the Atlantic Ocean. Quick improvements that coincide with political agendas are not possible. Interviewees maintained that interested parties, including Congress, must devote long-term attention to ensuring environmental improvement in the Great Lakes. The survey team wholeheartedly agrees.

Sudden cutoff of funds was also cited as a problem. Ecosystem restoration projects need ample lead time, and they are implemented over several or many years. Continued commitment by federal agencies to these projects for periods longer than the annual budget cycle is essential to a successful ecosystem approach.

Respondents also pointed out that large amounts of money were not always needed to fully implement programs-only the seed money to get them started. This coincides with the view that the federal government should play a catalytic role at the local level, steering the boat rather than rowing it.

INSTITUTIONAL ISSUES

The ecosystem approach was formally recognized as a goal in the Great Lakes region in the 1987 amendments to the Great Lakes Water Quality Agreement. The Great Lakes region has a rich and multilevel institutional structure (or "institutional ecology") that has developed around the Great Lakes Water Quality Agreement and other basinwide agreements, such as the Boundary Waters Treaty of 1909 and the Great Lakes Fishery Compact of 1956. In general, those surveyed felt that there is no need to develop new institutions; instead, commitments to existing institutions (in terms of both participation and financial support) should be renewed to make them work better.

*Existing Institution*s

The two primary binational institutions are the United States-Canada International Joint Commission and the Great Lakes Fishery Commission. The International Joint Commission was established by the Boundary Waters Treaty of 1909; among other responsibilities, it facilitates cooperation on issues related to air and water pollution and to regulation of water levels and flows. The Great Lakes Fishery Commission was established in 1955 pursuant to the

United States-Canada Convention on Great Lakes Fisheries, partly as a response to declining fishery stocks in the region.

On the governmental level, several U.S. agencies, the Canadian Provinces of Ontario and Quebec, and many counties and municipalities have jurisdictions in the Great Lakes basin. There are several regional mechanisms for management and coordination, including: the Great Lakes Commission, which was created by compact among the eight Great Lakes basin states in 1955; the Council of Great Lakes Governors, a nonprofit entity formalized in 1982; the Council of Great Lakes Research Managers; and the International Association for Great Lakes Research.

Environmental issues in the region are nested at multiple scales, from basinwide and lakewide problems to contamination problems in harbors. The institutions and management structures that address these problems also address the several geographic levels of ecosystems, nested within one another. A basinwide perspective is provided by the Great Lakes Water Quality Agreement, supported by the International Joint Commission; the Commission makes recommendations every 2 years, and tracks implementation of recommendations approved by the governments. The Lakewide Management Plans established under the Great Lakes Water Quality Agreement serve as vehicles to integrate subbasin activities and to coordinate priority setting. The goal of Lakewide Management Plans is to restore beneficial use impairments as listed in the Great Lakes Water Quality Agreement. On a local level, Remedial Action Plans for 43 Areas of Concern identified by the Canadian and U.S. governments are being developed in coordination with citizens and other stakeholder groups. Remedial Action Plans specify remediation of toxics, but many Plans are considering toxics within an ecosystem approach. For example, while the Area of Concern may be limited geographically (such as the one encompassing southern Green Bay), many Remedial Action Plans assess activities within the watersheds around the Area of Concern for remediation. Interviewees said that the Remedial Action Plan process has been a model cooperative management and decision-making process in which governments, user groups, and organizations came together to set common goals.

Other institutions active in the region include the Council of Great Lakes Industry and Great Lakes United (a coalition of citizens and environmental groups).

Although most participants felt that there is no need for new institutional infrastructure, there are several proposed new coordinating mechanisms. In some cases, these new mechanisms have been developed out of frustration with existing institutions; they may or may not address the problems of those institutions.

Participants Observations and Recommendations

The Great Lakes Water Quality Agreement has been an important organizing principle and tool for driving policy. The Agreements implementation was strengthened through the Great Lakes Critical Programs Act (section 118 of the Clean Water Act Amendments), which made certain obligations under the agreement legally binding as a matter of U.S. domestic law.

Federal agencies should consider local and regional goals and priorities in their planning mechanisms and activities. The goals of the Lakewide Management Plans and Remedial Action Plans could be implemented more easily, according to interviewees, if federal activities were consistent with and supported locally developed plans as much as possible. Participants felt that Lakewide Management Plans and Remedial Action Plans are good for identifying priorities and common goals for local and regional areas; however, they were concerned that mechanisms for transmitting these goals and priorities into state and federal actions were weak. Acknowledging that federal regulations are sometimes designed to implement nationwide policy goals, interviewees felt that if regional or local and federal planners recognized each others goals, areas of conflict could be more easily resolved.

Some common goals to be recognized are the 14 beneficial use impairments (a degradation in physical, chemical, or biological quality resulting in such actions as beach closings, fish and wildlife consumption restrictions, and so forth) identified in the Great Lakes Water Quality Agreement with the goal of restoring impaired uses. Individual Lakewide Management Plans and Remedial Action Plans set environmental quality goals for these uses that should be recognized by federal programs.

Institutions should foster connections with place, including setting up public/stakeholder participation mechanisms to take advantage of local interests. Participants emphasized that the ecosystem approach can amount to little more than abstract issues and concepts unless tied to the concrete needs of a particular place. Regional programs, interagency budget coordination within regions, legislation designed for regions, federal interagency coordination offices, and mechanisms for incorporating public participation and using grassroots energy were cited as ways of encouraging a

place-based focus. Several interviewees indicated that those living in the Great Lakes region, including its managers, scientists, citizens, industries, and other stakeholders, are closest to the resource and have a vested interest in maintaining it. They contended that local participants should be empowered to make decisions and implement solutions; this can be achieved if federal agencies cede some goal-setting authority, recognize regional goals, and share responsibility to achieve them with the region.

An impediment to place-oriented mentality is that national programs are scattered all over the country, disconnecting local and regional problems from the Washington, DC, offices that manage those programs. Several participants felt that the program-oriented mentality of federal agencies must change to a place-oriented mentality: programs must be aligned with the ecosystem goals of particular places.

Interagency decision making and priority setting is needed, and may require building coalitions among agencies to address common problems. Agencies should establish common goals and priorities for a region that recognize local and regional priorities. One federal representative saw federal acknowledgment of common agency goals (such as those determined in Lakewide Management Plans or Remedial Action Plans) as a way to improve agency budget development, program execution, and accountability. The representative pointed out that after agencies have signed onto a goal, it can be used to set performance measures and establish accountability. Moreover, to the extent that the public is involved in establishing goals based on local or regional priorities (such as those incorporated into Lakewide Management Plans and Remedial Action Plans), these goals are what citizens want their tax dollars to be spent on.

Interviewees recommended finding ways of using resources to address common goals and programs. The Lake Michigan Enhanced Monitoring Program (part of the Lake Michigan Lakewide Management Plan) was cited as a successful example in which several state and federal agencies share responsibilities for monitoring different variables or regions of the Lake. In this case, funds are not actually pooled; instead, agencies have agreed to fund and implement monitoring activities related to their missions and programs. EPA also funds other agencies monitoring activities specifically related to this program.

However, a number of participants both within and outside the federal government felt frustrated that agency representatives at the working level cannot commit to involvement on behalf of their agencies. Goals should be acknowledged at all agency levels so that they get appropriate budget and policy support. Better coordination could also be achieved in the many federal programs designed to fund activities within states. For example, it was suggested that states might obtain federal matching funds and directing them toward common goals, regardless of whether the federal fund programs are themselves coordinated.

The Upper Mississippi River Plan and its implementation by the Upper Mississippi Basin Commission were cited as a model of successful agency goal coordination. This effort involved the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Park Service, and several states. For other examples of organization on an ecosystem basis, refer to the Recommendations section of the "Great Lakes Fishery Resources Restoration Study: Report to Congress" (U.S. Fish and Wildlife Service 1995).

Implementation of programs should be flexible. Many participants felt that agencies are motivated more by rules than by missions, and should become more flexible in addressing goals of environmental quality, rather than insisting on strict observance of rules. Areas where flexibility is needed to achieve goals in the most cost-effective manner include:

- Meeting Clean Water Act requirements. The Clean Water Act allows little flexibility to achieve desired water quality standards in the most cost-effective way (such as by trading discharge allowances, or by using or trading Best Management Practices for sewage discharges).
- Handling contaminants. Some participants felt that new solutions were needed for handling organic contaminants, such as PCBs, which are very expensive to manage properly as a hazardous waste; but thermal disposal (burning) can involve Clean Air Act problems.
- Spending Superfund monies. The statutory requirement that Superfund monies be used only for cleanup, and not for restoration, was cited as an impediment to regaining beneficial uses.
- Dealing with liability issues. Liabilities under the Superfund may discourage new owners from reusing or rebuilding on inner city or old industrial sites, resulting in development of previously undeveloped or clean sites. Natural Resources Damage Assessments are potentially good tools for achieving restoration, but are underutilized.

More realistic performance and progress indicators that focus on environmental outcomes are needed. Participants suggested that performance measures should be based on ecosystem goals, not on numbers of permits issued,

publications, or meetings held. They also recommended including ecological factors in economic indicators.

The Lake Superior Lakewide Management Plan work team and some Remedial Action Plans are developing environmental indicators appropriate for their ecosystems, based on stakeholder goals of environmental quality. Although most participants were not yet familiar with the 1993 Government Performance and Results Act, they offered milestones and benchmarks developed for Lakewide Management Plans and Remedial Action Plans as examples of performance indicators for environmental quality programs. Milestones and benchmarks included: government management actions; remedial and preventive actions by sources; changes in discharge quality; reduced contaminant loadings; changes in ambient air/water/sediment loadings; biological recovery and use restoration; number of people participating in each Remedial Action Plan process; and requests for input to other programs. Although interviewees recognized that some indicators are necessarily qualitative, they felt that quantitative measures should be determined as much as possible.

Survey participants called for incentives for employees and managers to work with other agencies and stakeholders, to manage adaptively, and to be innovative. Interviewees suggested that agencies might require interactions with other agencies and stakeholders, and might explicitly include nontraditional activities in performance plans (such as involvement in a public participation or interagency activity, or participation in management conferences by scientists). Many participants saw a need for a better reward system for federal and state agency employees engaged in ecosystem efforts. If time spent on ecosystem-based approaches were treated as equal to that spent on other programs, employees could be rewarded. This would require that managers-from the first line supervisor to the top of the chain of command-acknowledge and value ecosystem-oriented efforts. Rewards should go beyond standard cash bonuses to include increased funding for successful programs, and public recognition for the employee or manager.

New processes of conflict resolution are needed. The active participation of many stakeholders in planning processes in the Great Lakes region means that many conflicts can be resolved during discussions. Some interviewees said that federal recognition of regional and local goals should help to limit conflicts, allowing parties to work toward each others goals instead of against them.

Participants in the Green Bay Remedial Action Plan said that the goal-setting process they undertook avoided conflicts and litigation in determining how to limit sewage discharges. Discharge limits to achieve desired water quality goals (in this case, biological oxygen demand) were set by consensus among industries on the Lower Fox River, not by litigation.

A framework for the ecosystem approach has evolved. Several participants emphasized that although the ecosystem approach is an evolving process, a general framework has emerged. An academic researcher who is involved in regional and Remedial Action Plan processes outlined 10 steps for planning rehabilitation of large aquatic ecosystems. Steps 1-6 are diagnostic tasks; steps 7-10 involve the framing of solutions (including taking no action) by considering desired alternative states for the ecosystem. Echoed and supplemented by many others, the 10 steps are as follows:

1. Bounding the ecosystem: theory versus practicality. Boundaries of Areas of Concern were originally small, then expanded to include the larger watershed.
2. Delineating problems. Define stresses and stressors. The Great Lakes Water Quality Agreement defined a need for mass balance studies to determine the relative loads and fates of contaminants and nutrients.
3. Coupling science with management. Get both science and management involved, and use them as guides, like the binational agreement that specifies "restoring integrity" as a guide to management principles. For all of the Remedial Action Plans, the 14 beneficial use impairments are used as a guide.
4. Setting goals and objectives. Public participation is vital. In the case of Green Bay, several public interest groups formed before the Remedial Action Plan were important in formulating goals for the Plan.
5. Developing models and targeting standards. These should address the goals and objectives of ecosystem quality. Determine what quantitative values address those goals (whether they are, for example, PCBs, suspended solids levels, nutrients, or light).
6. Assessing ecosystem risk. Assessment should attach as much importance to ecological risks as to human health risks. One methodology developed assigns a risk value (a relative ecosystem disturbance factor) to each ecosystem stressor-impaired use pair, such as exotic invasions and economic costs, nutrient loading and aesthetic qualities, and persistent organic chemicals and human health. Risk values can also be ranked from perspectives such as prevention management or remediation management.
7. Framing solutions. Frame solutions around alternative desired future states for the region. Envisioning these states must involve significant public participation and be consistent with ecological and

environmental sustainability principles. For example, the Saginaw Bay Alliance has recognized that its vision for a sound economy in the region (based considerably on tourism) is inconsistent with unchecked coastal development. It has recommended coastal zone planning based on sustainable development principles. Many Remedial Action Plans have developed and published a list of key actions to restore beneficial uses, used in this step.

8. Implementing change. For example, a local Public Advisory Committee was established for the Green Bay Remedial Action Plan to initiate Plan implementation and to evaluate options for long-term implementation. This committee has representatives from state and local governments, the state legislature, business, industry, environmental groups, and citizens from the Area of Concern. The committee attempts to influence lead state and federal agencies to take actions based on the Remedial Action Plans key actions and recommendations as assigned to particular organizations (such as regional planning commissions, municipal wastewater treatment plants, and county governments). Annual progress reports are prepared, implementation priorities are updated annually, and feedback is provided to the lead agency contacts.
9. Monitoring change. Monitor change and look for changes measured by quantitative measures determined in step 5 (for example, reduced sediment load and increased light, addressing the goal of increased submerged aquatic vegetation and fish). The Lake Michigan Enhanced Monitoring Program coordinated by the Lakewide Management Plan program is a good model of interagency cooperation for monitoring.
10. Assessing progress and implementing adaptive management. There are several annual or periodic assessments of the state of the basin, individual lakes, and Remedial Action Plans. These progress reports provide feedback to participating agencies and the public.

A process for evaluating progress is being developed by some Remedial Action Plans and Lakewide Management Plans, based on International Joint Commission guidance on listing and delisting areas for the 14 beneficial use impairments identified in the Great Lakes Water Quality Agreement. Quantitative objectives and targets are established by some Remedial Action Plans to evaluate their progress in addressing these guidelines for use restorations. Following are examples for two use impairments:

Example 1:

Use impairment: Restrictions on fish and wildlife consumption.

Listing/delisting guideline: Whether or not contaminant levels in fish or wildlife populations exceed current standards, or when public health advisories for human consumption are in effect.

Quantitative objectives or targets: A short-term target is based on the U.S. Food and Drug Administration Action Level of 2 mg/kg PCBs in the edible portion of fish; a long-term target of 0.05 mg/kg in fish tissue was established to protect human health through Rule 57 of the Michigan Water Quality Standards.

Example 2:

Use impairment: Eutrophication or undesirable algae.

Listing/delisting guideline: Whether or not there are persistent water quality problems attributed to anthropogenic eutrophication.

Quantitative objectives or targets: In Saginaw Bay, modeling of phosphorus loading has led to establishment of a 15 mg/L total phosphorus target for the inner bay. This corresponds to a loading target of 440 tons/year. Land use or sewage treatment decisions can be made based on this target.

LEGAL ISSUES

Survey participants did not raise legal issues when discussing ecosystem-oriented efforts in the Great Lakes basin. Instead, they focused on the various institutions and interpersonal relationships that emerged over the years, rather than on specific litigation-forcing events. These institutions and relationships have provided what many interviewees described as a much-needed forum for bringing federal and nonfederal agencies, NGOs, and people together. These

forums, in turn, appear to have focused efforts on ecosystems rather than on any single-media concerns driven by a particular federal regulatory program.

Clearly, no single federal statute drives the ecosystem process now underway in the Great Lakes region. Instead, as one participant observed, there is a rich mix of institutional arrangements structured around statutes specifically addressing the region, and there are the general federal regulatory programs that apply to activities in the region as well. Regional activities are governed by a mixture of international agreements, interstate compacts, federal and state legislation, and treaties with Native Americans. This umbrella of arrangements and programs appears to have garnered a consensus among participants that sufficient regulatory regimes are in place, if all the statutes are looked to as tools in problem solving. Indeed, an August 1994 report by the Northeast-Midwest Institute, "Progress in Great Lakes Environmental Protection: Priorities for the Fiscal 1995-1996 Federal Budgets," noted that "congressionally authorized programs such as the Pollution Prevention Act, the Nonpoint Source Pollution Control Program (section 319) of the Clean Water Act, the Great Lakes Critical Programs Act, the Great Lakes Fish and Wildlife Restoration Act, and the Nonindigenous Aquatic Nuisance Prevention and Control Act provide a comprehensive blueprint for the federal government to build effective partnerships with state and local efforts to address these pressing environmental priorities."

Interviewees generally refrained from critical comments on the effect of existing federal regulatory programs in implementing an ecosystem approach. The notable exception is the amalgamation of legal constraints now governing the budget process. However, participants did voice concerns about the Freedom of Information Act and Federal Advisory Committee Act. Additionally, several participants felt that the lack of any express congressional mandate for federal agencies to participate in coordinated efforts limits the time federal employees can commit to those efforts.

Specific Great Lakes Authorities

A variety of legal authorities that specifically address the Great Lakes region have assisted an ecosystem-based approach through interagency and governmental-nongovernmental coordination. In particular, the Boundary Waters Treaty of 1909 led to the establishment of the International Joint Commission between Canada and the United States. The U.S. and Canadian governments, in turn, entered into Great Lakes Water Quality Agreements in 1972 and 1978, and amended the 1978 Agreement in 1983 and 1987. The purpose of the Agreement "is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem," a formulation that parallels Clean Water Act language. In 1990, Congress passed the Great Lakes Critical Programs Act, which for the first time created enforceable statutory deadlines for key requirements of the Great Lakes Water Quality Agreement. According to various representatives, these agreements were instrumental in establishing a foundation for implementing an ecosystem approach in the Great Lakes region. A representative from the International Joint Commission noted that the Commission had been following an ecosystem approach since approximately 1978. The 1987 Great Lakes Water Quality Agreement expressly endorsed a coordinated and cooperative effort to protect and restore the Great Lakes ecosystem. Congress sanctioned these agreements in section 118 of the Clean Water Act.

In addition to the International Joint Commission, institutions concerned with Great Lakes water quality include the Great Lakes Fishery Commission, established by the Convention on Great Lakes Fisheries between the United States and Canada in 1954, and the congressionally ratified interstate compact among the eight Great Lakes basin states establishing the Great Lakes Commission.* For the most part, the Great Lakes Fishery Commission focuses on controlling sea lamprey and assisting in coordinated research efforts for the restoration of fishery resources.** The Great Lakes Commission embraces five general areas of responsibility:

1. Promoting the orderly, integrated, and comprehensive development, use, and conservation of the basins water resources.
2. Planning the welfare and development of water resources in the basin as a whole, as well as in those areas that may have special problems.
3. Making it possible for the basins states and their citizens to derive the maximum benefit from the use of public works, in the form of navigational aids or otherwise, that may exist or be constructed from time to time.
4. Advising in securing and maintaining a proper balance among industrial, commercial, agricultural, water supply, residential, recreational, and other legitimate uses of basin water resources.
5. Establishing and maintaining an intergovernmental agency to accomplish the purposes of the compact more effectively.

In addition to the various Clean Water Act provisions that address the Great Lakes ecosystem, several federal statutes have furthered an ecosystem approach. The Great Lakes Fish and Wildlife Restoration Act of 1990 authorized a comprehensive Great Lakes Fishery Resources Restoration Study and sought proposals for implementing recommendations from the study. It also sought to assist various entities by encouraging cooperative conservation, restoration, and management of the fish and wildlife resources and their habitats in the Great Lakes region. The Act also established a centrally located Fish and Wildlife Service Great Lakes Coordination Office and two other Great Lakes Coordination Offices. Other relevant statutes include the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 and the Great Lakes Critical Programs Act of 1990.

Mandates

Congressional mandates, or the lack thereof, was a common theme in survey interviews. The perceived lack of any congressionally mandated commitment toward an ecosystem approach was viewed by some as a potential impediment to ecosystem efforts. Many federal agency employees engage in coordinated ecosystem-based efforts with little or no reward, out of personal and professional interest. For instance, they squeeze in the time for intra- and interagency meetings, when distance and/or their travel budget allows. However, when the pressure of other programs becomes too great, they must-albeit reluctantly-choose to devote their limited time to specific, congressionally mandated programs. The unstated belief was that an express congressional mandate might allow these employees to continue their ecosystem-based efforts without fear of recrimination.*

Conversely, one survey participant noted that certain deadlines in existing congressional mandates can adversely affect an ecosystem-based approach. The Great Lakes Critical Programs Act, according to this participant, is a good example of the problem. In that case, Congress imposed severe deadlines for completion of the Lake Michigan Lakewide Management Plan** and certain Remedial Action Plans. Considerable effort went into meeting the artificial deadline, yet the goal, in the long run, was simply to complete the Plan, regardless of how well it was prepared. This fostered the attitude that "if we dont have time to do it right, then get it done and just do it over," which this participant considered bad policy and potentially disruptive. Such deadlines ignore the nature of the project: these projects are iterative, involve public participation, and are dependent upon scientific judgments. The process must be adaptive, and artificial deadlines hinder rather than help.

One federal participant noted that officials previously have been motivated too often by laws and regulations. Now we need to ask different and new questions about priorities and how we measure progress, although such questions and priority establishment may not fit neatly into the legal boxes constructed by various regulatory programs. We must view our laws and regulations as important tools for achieving broader ecosystem goals. Similarly, a nonfederal representative commented that the federal government is preoccupied by laws, tending to forget the local people and the needs of the ecosystem.

Primary Legal Issues

Survey participants mentioned specific laws or programs affecting the ecosystem approach in the Great Lakes basin, including the Comprehensive Environmental Response, Compensation, and Liability Act, the Clean Water Act, the Endangered Species Act, and the Toxic Substances Control Act.

Natural Resources Damage Assessments. The Natural Resources Damage Assessment process embraces an ecosystem approach to management. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, the Oil Pollution Act of 1990, and the Clean Water Act, the Natural Resources Damage Assessment process can be undertaken when there is a release of hazardous substances or a discharge of oil. The assessment can be conducted by tribal, state, or federal agencies with trustee responsibilities for affected natural resources, sometimes with a lead trustee coordinating the efforts of cotrustees. Natural resources can include fish, wildlife, biota, habitat, sediments, soils, surface water, ground water, and air. Trustees have responsibilities for resources in their jurisdiction or management control, and can recover damages for costs of restoration, as well as for injury, loss, or destruction of natural resources resulting from the discharge. The restoration process does not focus on a single medium, but entails a cooperative effort to address all natural resources.

Federal interviewees, among others, observed that the Natural Resources Damage Assessment process is an opportunity for input from all parties and is on the cutting edge of multidisciplinary efforts. It also addresses tough questions about responsibility for damages.

Some state and industry representatives disagreed, maintaining that the Natural Resources Damage Assessment process hampers cooperative efforts. They cited Wisconsin as an example, where the Fish and Wildlife Service is conducting an assessment in the Fox River Area of Concern. Both the state and industry were concerned that the assessment process retarded their efforts to develop a cooperative solution to the contaminant problem in the Fox River Area of Concern. But federal commentators pointed out that the state/industry voluntary project, if implemented, may not address the extent of contamination in the entire river or in Green Bay, and may not deal with remediation, restoration, and compensation as set forth in the Natural Resources Damage Assessment process under the Comprehensive Environmental Response, Compensation, and Liability Act.

Comprehensive Environmental Response, Compensation, and Liability Act. Interviewees raised three issues concerning the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). One state representative observed that because proposed Superfund cleanups do not adequately consider the needs of the place or ecosystem, they may leave too many contaminants in place, making it "tougher to come in later and clean up the rest." An ancillary concern expressed by both an NGO and a state representative involved the need for more flexibility in developing settlements under CERCLA, although no specifics could be provided.*

One representative commented that CERCLAs liability structure may adversely affect remediation efforts in urban areas. Prospective buyers fearful of CERCLA liability often look for "greenfield" sites, rather than contaminated "brownfield" sites. Reinvestment in "brownfield" sites, which often are located in poor and minority communities, is consequently constrained. This participant felt that environmental health is connected with economic health, and that because CERCLAs liability structure can discourage peoples willingness to buy in affected areas, it indirectly affects ecosystem efforts in those areas. In light of these concerns, and as part of a national Brownfields Economic Development Initiative developed by EPA, Region 5 of EPA is developing a proposed "Brownfields Strategy" to encourage redevelopment of abandoned and unused urban sites. This strategy relies on four basic principles that include encouraging participation in state voluntary cleanup efforts and developing partnerships with Region 5 states, local governments, and key external stakeholders.

Clean Water Act. The point source and nonpoint source programs under the Clean Water Act have played a major role in ecosystem-based efforts in the Great Lakes basin, and are responsible for much of the improved environmental health of the area. These programs, moreover, are supplemented by additional pollution control efforts in the basin, such as the International Joint Commissions zero-discharge recommendation for Lake Superior. Aside from observing that these programs are important and must continue to be funded, participants had very little to say about the Clean Water Act. One participant contended that contamination today is not generally caused by noncompliance with the Clean Water Act, except in northwestern Indiana.*

One participant stated that the Clean Water Act section 208 program had failed because it was disconnected with local needs and did not conform to a watershed approach, which is necessarily place-based. While others supported a watershed approach, some representatives commented that a focus on "surface watershed" may be too narrow, because it could exclude sediment transport and acid deposition.

Endangered Species Act. One survey participant was frustrated with the decline of species not yet protected by the Endangered Species Act, whether as listed or candidate species. But according to this interviewee, due to limited resources and budget constraints, there is little that can be done; available money and resources must be spent on activities that take higher priority.** This participant maintained that when species are on the way to endangered or threatened status, by the time they are finally listed, efforts to protect them and to help them recover are more costly and less effective.

Toxic Substances Control Act. Some participants were frustrated that the Toxic Substances Control Act (TSCA) is not used more effectively as a tool for an ecosystem-based approach. Persistent toxic substances continue to enter the Great Lakes ecosystem, affecting the environment and ultimately human health. Although the TSCA provides the legal authority to assist in controlling toxic substance discharges into the Great Lakes, interviewees said that it has not been utilized fully to implement the Great Lakes Water Quality Agreement goal of virtual elimination of discharges of any or all persistent toxic substances. According to one report, "though TSCA has been used to prevent the entry into U.S. commerce of many new substances, the Act has not been used to control any existing substance other than PCB, which was mandated under Section 6(e)."

It was suggested that the Acts effectiveness may be limited because of its language. Pursuant to section 6 of TSCA, "if the Administrator finds that there is a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture, or that any combination of such activities, presents or

will present an unreasonable risk of injury to health or the environment," then the Administrator shall prohibit or regulate those activities. To prohibit or regulate these activities, however, the Administrator must use the "least burdensome requirements." One interviewee felt that this requirement limits the ability to regulate existing persistent toxic substances under TSCA.

Unlikely partners in hydroelectric relicensing. A governmental representative emphasized that an ecosystem-based approach requires working with "unlikely partners" (a point reiterated by an NGO representative), possibly in nontraditional settings. One example involved relicensing of 11 Consumers Power hydroelectric projects in Michigan. There, federal and state agencies and conservation groups worked with Consumers Power to put together a settlement addressing "virtually all resources" in the affected three river systems (AuSable, Manistee, and Muskegon). A settlement was worked out in Michigan by the parties and then provided to the Federal Energy Regulatory Commission for inclusion in conditions of Consumers Powers hydroelectric licenses.

Miscellaneous Legal Tools

Other federal statutory programs governing activities in the Great Lakes region were mentioned as tools for implementing the ecosystem approach. Unfortunately, aside from generalities, survey participants could not provide any instances when these programs either facilitated or hindered an ecosystem approach. These programs include the Army Corps of Engineers section 404 program under the Clean Water Act,* the Coastal Barrier Resources Act, the Coastal Zone Management Act, the Anadromous Fish Conservation Act of 1985, the Estuary Protection Act, the Migratory Bird Treaty Act, and the Lacey Act. Additionally, various representatives mentioned their scientific efforts to relate acid deposition, an important aspect of a holistic view of the basin, to water, fish, and wildlife resource issues, but no opinions were expressed on the nature of the Clean Air Act program.

Public Participation and Open Information

Several survey participants discussed federal statutes-including the Federal Advisory Committee Act, National Environmental Policy Act, and Freedom of Information Act-that may hinder or aid public involvement in efforts to implement the ecosystem approach, or that constrain the open sharing of natural resource information that is key to an ecosystem approach.

Federal Advisory Committee Act. Various participants commented that the Federal Advisory Committee Act presents a potential barrier to an effective ecosystem approach, because it may hinder involvement by nonfederal officials. This is particularly true in the Great Lakes region, where a variety of institutional forums exist and where new forums for public participation are being considered. However, no interviewees provided specific instances when the Federal Advisory Committee Act has obstructed their efforts.

National Environmental Policy Act. One federal agency official emphasized that the National Environmental Policy Act allows for public input. But others expressed concern that the Act calls for public input only when a federal agency has proposed some action; it does not provide a forum for public input into the process of assessing what proposals to consider.

Freedom of Information Act. Several representatives stated that an ecosystem approach requires a well-distributed data base without specific agency ownership. However, both a nongovernmental and a federal representative noted that the Freedom of Information Act can hamper attempts to facilitate such sharing of scientific tests. The Act allows private parties to obtain scientific data that could be used adversely in making development decisions or altering aspects of a sensitive ecosystem in advance of any application to a governmental body.

This problem currently affects, for example, the Natural Heritage program established by The Nature Conservancy in partnership with state and provincial governments. This program assembles various inventories of biological resources, supplements them with additional surveys, and then analyzes the data. But if this data is then given to EPA, it can become subject to the Freedom of Information Act and provided to developers and others in advance of development activities. Someone with this information might alter environmentally sensitive areas in advance of any activity requiring state and/or federal approval. Accordingly, EPA has not purchased the data yet and apparently is now performing an advance confidentiality data assessment to determine the confidentiality of the data.

Bottom-Up Ecosystem Approach

The array of ecosystem efforts in the Great Lakes basin was driven not by any regulatory structure, but rather by place-based needs and by the institutions that developed to address those needs. These institutions, in turn, provided an arena for Canada, federal and state agencies, NGOs, and private parties to discuss and respond to constantly evolving problems in the Great Lakes ecosystem. Although Congress responded to the concerns that emerged from this region by ratifying interstate compacts, statutorily engrafting elements of the Great Lakes Water Quality Agreement, and enacting specific measures to foster research and control problems identified in the region, actual ecosystem approaches were crafted by the participants themselves. No single statute or lawsuit can be credited with initiating the ecosystem approaches described for the Great Lakes basin.

This may explain why survey participants did not view the ecosystem approach as a regulatory concept driven by concern for a single medium (such as air, water, or pesticides), but rather as a process that necessarily leads to resource management from a holistic perspective. According to almost all participants, the ecosystem approach should be based on an approach that considers the needs of a particular ecosystem-a definite place-rather than focusing on single media issues.

PUBLIC PARTICIPATION

For more than 15 years, the Great Lakes have been considered an ecosystem and have enjoyed the support of a wide array of agencies, organizations, and individuals. Over the years, this coalition has formed work groups and task forces to determine the health of the Great Lakes ecosystem and the status of its biological and physical features. The public has helped to identify problem areas and possible solutions for improving the health of the Great Lakes ecosystem.

Federal and state agencies identified a variety of ways to encourage public participation: involving the public in the decision-making process; sharing information with the public; and educating the public. Questionnaires, public meetings, roundtable discussions, speaking engagements, news releases, computerized networks and tours of project areas are used to get public input. Multimedia approaches have often been found to be very effective in informing the public and getting feedback on issues related to Great Lakes resources.

Federal Involvement

There is considerable federal involvement in efforts to solicit public participation in ecosystem approaches to the Great Lakes basin. Agencies active in the region include EPA, the Fish and Wildlife Service (part of the U.S. Department of the Interior), the Forest Service, the National Oceanic and Atmospheric Administration (NOAA, part of the U.S. Department of Commerce), and the National Park Service (also part of the Interior Department).

Environmental Protection Agency. EPA has obtained input from the public through surveys, listening sessions, news releases, and other means of involving the public in resolving problems and determining outcomes. Both Lakewide Management Plan and Remedial Action Plan processes stress public participation. Moreover, public forums have been created and are supported by EPA and the states for each of the active Lakewide Management Plans and for each Area of Concern. Finally, EPA supports education programs through grants as well as specific activities related to its research vessel.

Fish and Wildlife Service. The Fish and Wildlife Service uses multimedia approaches to inform the public of proposed actions. The various agency offices located around the Great Lakes hold periodic public meetings, usually in conjunction with other federal and state agencies. Brochures and other written materials are often provided to attendees. Public notices requesting formal responses are published in the Federal Register. In addition, the agency develops special videos and short films for public education and outreach.

Forest Service. The Forest Service has joined the National Park Service and other federal agencies in a series of meetings with nonfederal groups and the public to discuss common concerns in the region. The Forest Service has also used traditional methods of informing the public through news releases, Federal Register notices, and speaking engagements.

National Oceanic and Atmospheric Administration. NOAAs National Sea Grant Program funds Sea Grant Advisory Service Agents at universities in all the Great Lakes states, except Pennsylvania. These agents provide a wealth of information to citizens, industry, state agencies, tribal groups, and other organizations. Citizens serve on advisory committees. The Great Lakes Environmental Research Laboratory participates in these outreach activities and works closely with public schools in mentoring and advising on science curricula, and related activities.

National Park Service. In 1985, the Midwest Region of the National Park Service, in cooperation with other federal agencies, began sponsoring a series of meetings with nonfederal groups and the public. The purpose of these meetings has been to gather together people and agencies with mutual interests to discuss their common concerns. The National Park Service also holds public meetings to find out how the public feels about operations on the national parks. Scoping sessions are held with NGO representatives to solicit similar input. Representatives from NGOs, Great Lakes states, and local governments serve on advisory boards for the agency.

State Involvement

Representatives from several state agencies made observations and offered suggestions during meetings with the team, including the following:

- Federal agencies should not interfere with states authorities, including species management, as implied by the designation of ecosystem boundaries. States were concerned about federal efforts to assert regulatory authority where, in the states view, it does not exist. Programs specifically cited that cause problems in some states are listed (endangered and threatened) species, exotic species, contaminants, and fisheries management.
- Communication breakdown between federal agencies, states, and the public is a major problem. According to state officials, the general public feels that people in Washington, DC, are not in tune with local problems. State officials see the need for communication as a "two-way street."
- Federal agencies working within an ecosystem should pool their funds and make them available to state agencies to carry out tasks at the local level.

Nongovernmental Involvement

Nongovernmental organizations that play a role in developing ecosystem approaches to the Great Lakes basin include environmental organizations, universities, industry, and tribal natural resource organizations. Many national, regional, state, and local NGOs participate in ecosystem activities, and some fund research and other activities on the Great Lakes. For example, the National Wildlife Federation cited several studies funded on its own initiative.

Observations from this diverse group were as varied as one might expect. Comments and suggestions included the following:

- Federal and state governments must cooperate. But when they do, it is often in secrecy, without involving the public.
- Public participation is often solicited on an ad hoc basis. Scientists should participate with policymakers before decisions are made.
- The Federal Advisory Committee Act is thought by some to be a barrier to public input.
- Historically, federal agencies have not sought tribal participation when planning the ecosystem approach. As landowners and managers, tribes want to participate fully in ecosystem planning.
- Industry representatives stated that too much attention is paid at meetings to representatives from environmental organizations. They felt that some interagency groups, like the International Joint Commission and Great Lakes Commission, allowed their decisions to be swayed by the sheer numbers of environmentalists at meetings.

Participants Suggestions

Comments and suggestions from interviewees on public participation in the ecosystem approach in the Great Lakes basin included the following:

- Federal and state agencies must cooperate and improve collaboration with tribal leaders and the public in developing approaches to and management plans for the Great Lakes ecosystem.
- Federal agencies should develop common ecosystem boundaries as a basis for working together, but also for better cooperation with states and the private sector. State and nongovernmental representatives

expressed concern about the different ecosystem boundaries that different agencies have. One agency even has different boundaries within itself.
- An information network is needed that is understood by and available to all who cooperate on management of the Great Lakes basin. This recommendation focuses on improving communications among agencies and having data systems that are compatible and accessible to all stakeholders.
- Agencies must agree as to which ones will carry out which tasks within the Great Lakes ecosystem. They must also make resources available and share them among agencies. It is important to avoid duplication and to use resources more efficiently in these times of scarcity.
- The Federal Advisory Committee Act should be examined to determine whether it hinders public participation.
- Federal agencies should encourage public participation in the ecosystem approach. Some nongovernmental representatives in particular indicated that they have had limited opportunity to contribute to operation and management plans.

In summary, members of the public feel a close relationship to the resources of the Great Lakes basin. They recognize a declining resource that needs attention, and feel that too many issues are not addressed by federal and state agencies. Due to their interest in the resource and to low government funding, some organizations have chosen to fund projects that will answer their questions.

Some survey participants thought that public participation needs to be improved. Some felt that federal laws hinder meaningful public input, particularly the Federal Advisory Committee Act and the National Environmental Policy Act. Others have had to use the Freedom of Information Act to get information on specific governmental decisions and actions.

SCIENCE AND INFORMATION

According to interviewees, a scientific understanding of how the system works is essential to the ecosystem approach. Sustained, continuous scientific analysis is important for long-term solutions. Furthermore, a commitment to monitoring and assessment is fundamental to the success of this approach. For example, the Green Bay ecosystem approach has facilitated long-term research and monitoring oriented toward management objectives, as well as to collaboration of multiple agencies in the Green Bay Mass Balance Study.

It was also emphasized that the ecosystem approach must be a multiple-scale effort that addresses all media (including air, soils, and water). Several interviewees asserted that each location had a different ecosystem, with its own set of problems and factors, and that different stressors must be recognized at different locations. Another participant put it this way: efforts must focus on a particular set of stressors and on interactions among them.

The Great Lakes scientific community, especially through the International Joint Commission, has advocated an ecosystem approach for more than 15 years; several reports on the subject date back as far as 1978. The research community is large and diverse: there are more than 300 organizations doing research on the Great Lakes, with more than 900 projects recently catalogued.

Gaps and Limitations

In general, survey participants said they got their science and information from multiple sources. One state agency said it got scientific input by convening a panel of experts. Tribes in particular need research and expertise from the federal government. Like others, they get science from various sources. Although interviewees said that science and information are essential, no one indicated that current lack of data or science was a major stumbling block to the ecosystem approach.

Nevertheless, interviewees described several science and information gaps and limitations. Two types of scientific information were said to be important: ecological patterns and ecological processes. Linked to the first was recognition of the need for landscape-level, geographically organized information that is linked through models to ecological, social, and economic factors. Another theme was the need for information to be shared and accessible. One participant warned that the ecosystem approach is information-intensive-more intensive than community- or population-level information. Several interviewees emphasized the need to be able to measure progress (and success).

A number of assertions were made about data, data quality, and data sharing. Most interviewees organizations collect data, but are starting to realize the need for data from other sources. Participants felt that data collected by volunteers can be useful, although it must be carefully evaluated for quality and accuracy. Still, they also felt a need to understand the limitations of data they did not collect themselves or that was collected for purposes other than their own.

Some said that there is duplicated data collection among various federal agencies. Many agreed that, no matter what the source, data bases (that is, data sets) must be standardized and shareable. Other interviewees felt that there are too many sets of information owned by single entities-all of the stakeholders involved in an ecosystem, they maintained, should have a common set of information with compatible data sets.

The Great Lakes community is a model for other ecosystems in terms of data sharing and accessibility. The Great Lakes Information Network links data, information, and individuals in the region using the Internet. Linked information providers include the Great Lakes Commission, Great Lakes Environmental Research Laboratory/NOAA, Federal Reserve Bank of Chicago, Army Corps of Engineers, U.S. Geological Survey, Great Lakes Protection Fund, EPA Great Lakes National Program Office, Great Lakes Sea Grant Network, Michigan State University, Great Lakes Research Consortium at State University of New York at Syracuse, Canadian Center for Inland Waters, and Universities Council on Water Resources. Subjects include: the environment and natural resources; commerce, industry, and the economy; policy and legislation; human health; and education. Available are fact sheets, calendars and current events, newsletters, directories and bibliographies, and draft documents for review.

Interaction of Scientists With Managers and the Public

Several survey participants stated that science is not linked strongly enough to management. Many felt that research projects intended to be useful to managers must be designed with management objectives in mind.

Some participants felt that scientists write only for other scientists, and that they must learn to write for the public as well.

OBSERVATIONS AND RECOMMENDATIONS

Based on interviews and materials collected in the Great Lakes basin, and after careful consideration, the survey team developed a series of observations about the ecosystem approach, and recommendations for its continued development in the Great Lakes ecosystem and its broader application across the nation.

Observations

After studying and discussing ecosystem approaches in the Great Lakes basin, the survey team drew the following conclusions:

1. The ecosystem approach is a process. It begins by involving all stakeholders in diagnosing problems. The middle phase consists of selecting objectives and potential solutions. It concludes with another process: adaptive management. Of course, managing ecosystems is nearly impossible, except for some water level and diversion management, but we can manage human interactions with ecosystems.
2. The ecosystem approach is place-based. Pride of citizens in their ecosystem requires involvement of all stakeholders from the beginning. A place-based approach requires flexible application of national laws, policies, and regulations to allow selection of remedies at the ecosystem level. Furthermore, it requires flexibility in and coordination among federal (and state and local) agencies to support locally derived goals and objectives consistent with the national and international significance of the ecosystem.
3. Ecosystems must be viewed in perspective. Not all ecosystems are of equal value from a natural resource perspective. An ecosystem must be viewed both globally and locally to determine its regional, national, or even international significance.
4. The ecosystem approach must occur at multiple scales. The ecosystem approach must address ecosystem processes, governments, other institutions, industries, economies, and societies that operate at nested and overlapping scales. Similarly, decisions are made at multiple scales. For example, decisions and policies are made at the national (and global) scale regarding climate change, water quality, coastal zone management, air pollution, and protection of areas of national or international significance. At a regional, state, or watershed scale, decisions are made about watershed planning, resource allocation, and funding for water supply, municipal sewage, and ground water protection. At a local or individual level, everyday

decisions are made by residents, communities, municipalities, and individual industries or farms. Each level above the local or individual level must recognize the needs and constraints of the level below it while still striving for a level of protection appropriate for the ecosystem in question.

5. The ecosystem approach is long term. Environmental problems on the Great Lakes, such as pollution, overfishing, and introduction of nonnative species, are decades old or more. Short-term solutions should not be expected. Monitoring change and the results of management decisions is fundamental to adaptive management and to assuring long-term solutions. Political systems, which change relatively frequently, must recognize that persistence is needed to solve some of these problems in the long term.
6. The ecosystem approach is based on scientific understanding. A scientific understanding of how the system works is essential. Without a scientific basis, decisions on diagnosing problems, identifying objectives, selecting solutions, and monitoring change are likely to miss their targets, cause frustration, and waste resources. Our present knowledge and understanding of ecosystem processes is good but not adequate.
7. The ecosystem approach can be both aided and hindered by federal law. Some features of the Clean Water Act, the Great Lakes Critical Programs Act, and others clearly promote the ecosystem approach. But features of other federal laws were cited by survey participants as real or potential barriers to the process. Some participants stated that a clear congressional mandate for the ecosystem approach would assist federal workers and agencies in pursuing the objectives and goals of the ecosystem approach.

Recommendations

After careful deliberation based on observing ecosystem approaches in the Great Lakes basin, the survey team makes the following recommendations for federal agencies:

1. Develop interagency budgeting. The federal government should develop interagency approaches to budgeting. A similar recommendation is also appropriate for state, local, and private interests. The fact that each agency has its own mission and agenda has led to a lack of cohesion in program implementation from an ecosystem perspective. A coordinated approach would enable agencies to "leave their agency hats at the door" when deciding how to spend dollars. Furthermore, interagency teams could coordinate budgetary actions affecting large, bioregional ecosystems. At a minimum, this would increase communication across agency boundaries and reduce redundant programs. An interagency budget team could also look for synergistic activities among agencies, which could be very beneficial when financial resources are scarce.
2. Take local and regional goals into account. Federal agencies should consider local and regional goals and priorities in their planning, as well as national goals.
3. Foster a place-oriented mentality. The federal government should instill a place-oriented mentality into federal programs by encouraging a regional focus and taking local and regional goals into account during goal setting, planning, budgeting, and implementation.
4. Set common goals. The federal government should establish common goals for agencies with programs in a given region, ensuring that these goals are consistent with regional goals (the Great Lakes 5-Year Strategy is a good example).
5. Be flexible in implementing programs. Federal agencies should be flexible and creative in applying environmental policies and programs that address ecosystem goals and objectives. In many cases, standard interpretations of laws and regulations are restrictive, whereas the laws and regulations themselves may be interpreted to allow flexible management.
6. Coordinate remediation and restoration activities. Remediation (cleanup) activities should be addressed in a manner that will be supportive of and complementary to natural resource damage restoration. State, Native American tribal, and federal trustees should strive to coordinate Natural Resource Damage Assessment activities with remedial planning activities in order to identify joint areas of concern that may be addressed in an efficient manner by all involved parties.
7. Establish incentives for employees and managers. There should be incentives for federal employees and managers to work with other agencies and stakeholders, to manage adaptively, and to be innovative. The federal government should support interagency cooperation and coordination by requiring interactions with other agencies and stakeholders and other nontraditional activities in performance plans (such as explicitly including involvement in a public participation or interagency activity, and participation in management conferences by scientists). A team approach that includes representatives from multiple

agencies could be an efficient and cost-effective way of achieving true coordination. Rewards should go beyond standard agency cash bonuses, and could include increasing funds to continue or expand successful programs, and publicly recognizing the employee or manager.

8. Use realistic ecosystem indicators. More realistic performance and progress indicators should focus on environmental outcomes. Performance measures should be based on ecosystem goals and objectives, not on numbers of permits issued, publications, or meetings held.
9. Encourage interagency research and monitoring. Federal employees must be motivated to encourage interagency coordination and collaboration in research and monitoring at both the project and program level.
10. Fund ecosystemwide research, monitoring, and data bases. Portions of multiple agency budgets for research, monitoring, assessment, and information management should be organized on an ecosystemwide basis.
11. Improve public access to science and information. Scientists who write for public consumption should be rewarded.
12. Support sharing of information. Efforts such as the Great Lakes Information Network should be funded and encouraged in other ecosystems. Geographically based data collection, standardization, and distribution should be encouraged and expanded.

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Chapter 5: PACIFIC NORTHWEST FORESTS

The Pacific Northwest forests are one of seven ecosystems chosen for further study by the Interagency Ecosystem Management Task Force. In August 1994, a survey team traveled to Oregon and Washington to interview federal, state, and tribal parties. The team focused on the management of federal forest lands within the ecosystem, because those lands were the subject of an interagency effort based on a forest management plan jointly adopted by the Secretaries of Agriculture and the Interior. The team did not review the relationship of the Administrations Forest Plan to private land management issues: the ecosystem-based management strategy for the Pacific Northwest is limited to federal lands and does not prescribe management practices for private lands. The survey team consisted of Bob Szaro, Diane Gelburd, and Susan Huke from the U.S. Department of Agriculture (USDA); Jim Pipkin, Don Knowles, and Harvey Doerksen from the U.S. Department of the Interior; and Louise Milkman from the U.S. Department of Justice.

From August 16 through 19, the team met with representatives from the USDA Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, National Park Service, National Marine Fisheries Service, and Environmental Protection Agency; staff in the Office of Forestry and Economic Development and Regional Ecosystem Office; state officials from California and Oregon; and three tribal representatives.

The team also met or talked with George Frampton, Assistant Secretary of the Interior for Fish and Wildlife and Parks; Jack Ward Thomas, Director of the Forest Service; and Mike Dombeck, Acting Director of the Bureau of Land Management.

It should be noted at the outset that this survey was limited by pending litigation. In view of the numerous lawsuits that were challenging the Clinton administrations Forest Plan at the time of the interviews, it was deemed inappropriate to meet with any of the private parties or counties involved in the litigation. Even with federal officials, it was not considered appropriate to discuss issues under litigation. For example, the team did not pursue questions related to the scientific analysis underlying the Administrations decision on the Forest Plan or the decisions compliance with all relevant statutes and regulations.

BACKGROUND

The Pacific Northwest forest ecosystem refers generally to the extensive forests that are now considered to be the range of the northern spotted owl (figure 1). The ecosystem extends from the coast to the crest of the Cascade Mountains (including a portion of the east side of the Cascades), from southern British Columbia into northern California almost to the San Francisco Bay. With the exception of the Puget Sound and the Willamette Valley in Oregon, the region is mostly mountainous. Figure 2 shows physiographic provinces within the range of the northern spotted owl.

The Historic Ecosystem

Throughout much of the region, wildfire and Native American use of fire played a major role in shaping the forests. Intensive timber harvesting since World War II and intensive fire suppression efforts over the past 60 years have caused several changes in forest characteristics, such as increases in fragmentation and fuel materials, and changes in species mix.

Vegetation is generally of a mixed conifer forest type, but varies among physiographic provinces. In the Olympic Peninsula area, there are coniferous rain forests on the western slopes of the Olympic Mountains and relatively dry Douglas-fir forests in the rain shadow on the eastern slopes.

There are lowlands, including coniferous forests, deciduous forests, and native prairie grasslands, throughout the Puget Sound and southwestern Washington. The northern portions of the Cascades region are characterized by Douglas-fir and western hemlock at lower elevations, and mountain hemlock and silver fir at higher elevations. To the south in Oregon, Douglas-fir and western hemlock give way to mixed conifer forests of Douglas-fir, grand fir, and incense cedar. In California, the forests are dominated by mixed conifers or ponderosa pine. The Coast Range Mountains are dominated by Douglas-fir, western hemlock, and western redcedar in the north; redwood forests and mixed forests of Douglas-fir and hardwoods dominate the southern portion.

This ecosystem is characterized by relatively higher precipitation than the area immediately east of the Cascade divide. Precipitation is generally in the form of winter storms. The higher elevations receive mostly snow, whereas lower elevations get rain. Condensation drip is an important source of moisture at middle elevations and in the coastal provinces. Precipitation increases over coastal mountains and the Cascade Range, and decreases sharply in the lee of the higher terrain. The southern part of the region has a typical Mediterranean climate of mild, wet winters with warm, dry summers, whereas the northernmost area has a much wetter climate and cooler summers.

There are thousands of miles of rivers and streams within the ecosystem. They include large systems such as the Columbia, Skagit, Rogue, and Klamath Rivers; small headwater streams originating from glaciers in the Cascade Range; coastal streams influenced by rain; many lakes and ponds; and wetlands associated with rivers, streams, lakes, ponds, seeps, and springs. Aquatic conditions in the Pacific Northwest provide suitable habitat for salmonids, particularly anadromous salmonids, which are present throughout the ecosystem.

Historic Forest Practices

Timber harvesting in the extensive forests of the Pacific Northwest began in the 1800s, when the first non-Indian immigrants began to settle and farm the interior valleys of western Oregon and the Puget Sound region. Initially, the forests that covered much of the landscape were viewed as an impediment to progress. They were systematically cleared to make way for agriculture.

In the late 1800s and early 1900s, timber extraction for commercial purposes began to increase. Lumber camps sprang up in the region, especially in areas accessible by river or railroad. Lowland areas close to population centers were logged first, then less accessible areas in more mountainous terrain. Logging in these early years frequently consisted of a clearcut and burn approach in which noncommercial species and many small-diameter trees were wasted. There was little or no attention to replanting after harvest.

Shortly after World War II, with increased demand for housing, the invention of the gas-powered chain saw, and improvements in transportation, logging began in earnest on federal lands in the Pacific Northwest. Gradually, methods of forest management were adopted on most federal and private lands that included clearcutting, removal of logs and snags, slash burning, thinning, and planting of single-species stands on cutover areas. It was assumed that forests managed in this manner could be cut and regrown in relatively short intervals of perhaps 40-80 years without negatively affecting other resources, such as water quality, fish, soils, or terrestrial animals.

The emphasis on timber production is exemplified by the Oregon and California (O&C) Lands Act of 1937 (43 U.S.C. §§ 1181a et seq.). This Act covers Bureau of Land Management timber management on revested O&C Railroad grant lands and reconveyed Coos Bay Wagon Road grant lands in western Oregon. The Act specifies that lands "classified as timberlands, and power-site lands valuable for timber, shall be managed . . . for permanent forest production, and the timber thereon shall be sold, cut and removed in conformity with the principle of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities."

Furthermore, the O&C Lands Act and the National Forest Management Act of 1976, 16 U.S.C. §§ 1604 et seq., create both a strong interdependency between local governments and the two primary federal land management agencies, the Bureau of Land Management and the Forest Service, and an incentive to harvest timber. Counties in which any part of the O&C lands are located receive 50 percent of the revenues generated by those lands. Counties receive 25 percent of revenues generated from Forest Service lands.

After more than a century of logging and fire control, the Pacific Northwest forests are now a highly fragmented mosaic of recent clearcuts, thinned stands, and young plantations interspersed with uncut natural stands. The remaining natural stands

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Figure 1.-Range of the northern spotted owl in the United States. Boundaries of national forests within the owls range are shown.

Figure 2.-Physiographic provinces within the range of the northern spotted owl.
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range from forests that are at least 1,000 years old to relatively young, even-aged stands that have regenerated naturally after wildfires. Because wildfires and windstorms often kill only part of natural stands, they are frequently characterized by uneven-aged mixtures of trees that survived catastrophes and younger trees that filled in the understory afterwards.

Stands that still have many old trees in the overstory are usually referred to as "old growth" or "ancient forests." Where there are only scattered individuals or patches of large old trees and a majority of young or mature trees, the stands are referred to as "mixed age" or even "young." Mixed-age stands are particularly common in areas such as the Oregon Coast Range, where there were extensive fires in the 1800s. Mixed-age stands defy categorization according to the significant attributes of either "old growth" or "young" forests. These mixed-age stands have been the center of the debate over how much "old growth" or "ancient forest" is left in the Pacific Northwest.

Modification of Management

Changes in public perceptions of and expectations for federal land management in the Pacific Northwest and elsewhere have led to gradually increased protection of unique ecosystems and species, increased concern for riparian areas, and experimentation with methods of "new forestry" that are designed to produce timber while retaining some of the structural features found in old forests, thereby more closely imitating natural disturbance regimes. Prior efforts to ensure permanent forest production levels assumed that sustainable forest harvest levels would sustain all forest processes and functions. These changes have decreased the volume of timber sold on federal lands, and have generated considerable public controversy.

As studies on the ecology of late-successional, or old-growth, forests began to proliferate in the 1970s and 1980s, it became apparent that forest management based primarily on high-yield, short-rotation forestry would not adequately protect the considerable biodiversity that was present in those forests and their associated aquatic ecosystems. Furthermore, new legislation, particularly the National Environmental Policy Act of 1969, 42 U.S.C. §§ 4231 et seq., the Endangered Species Act of 1973, 16 U.S.C. §§ 1531 et seq., and the species viability requirements under the National Forest Management Act of 1976 focused attention on the ecological implications of timber harvest practices.

Ultimately, the issue focused on the need to retain the old-growth forest ecosystem in the Pacific Northwest, and on methods for preserving it. Much of the public debate centered on threatened and endangered species, most notably the northern spotted owl as an indicator species for this ecosystem. Subsequent listings of the marbled murrelet and certain runs of salmon have highlighted the fate of specific species in the region.

Modification of timber management on federal lands in response to apparent declines of the northern spotted owl had already begun in the early 1980s, even before the owl was listed as threatened. For example, on September 26, 1983, the Bureau of Land Management and the Oregon Department of Fish and Wildlife signed an agreement for "Spotted Owl Habitat Management on Bureau of Land Management Lands in Western Oregon" that stipulated the Bureaus obligation to manage certain sites designated as spotted owl habitat for a 5-year period and to maintain a population of 90 pairs. The Bureau of Land Management and Oregon Department of Fish and Wildlife were to cooperate on the development of habitat management plans for these sites, which came to be known as spotted owl management areas.

By 1987, approximately 110 spotted owl management areas were being monitored. On December 22, 1987, the parties extended their agreement for 3 years.

In October 1989, the Interagency Scientific Committee to Address the Conservation of the Northern Spotted Owl was established by an interagency agreement between the Forest Service, Bureau of Land Management, Fish and Wildlife Service, and National Park Service. Its charter was subsequently incorporated into section 318 of the Department of the Interior and Related Agencies Appropriations Act for Fiscal Year 1990

(P.L. 101-121), which required the Interagency Scientific Committee to develop a scientifically credible conservation strategy for the owl. The six-member committee was chaired by Jack Ward Thomas, who was then Chief Research Wildlife Biologist at the Forest Services Pacific Northwest Research Station in La Grande, Oregon. He was assisted by advisors from states, interest groups, and federal agencies.

The Interagency Scientific Committees report (commonly called the "Thomas Report" or the "ISC Report"), which was published on April 2, 1990, recommended a strategy that included establishing reserves known as habitat conservation areas. These areas, which were interspersed among other lands referred to as the forest matrix, were designed to support multiple owl pairs, and to provide a basis for future dispersal and nesting. The Interagency Scientific Committee established standards and guides for the distribution, location, size, spacing, and quality of habitat conservation area lands and connectivity between them.

On June 26, 1990, the Fish and Wildlife Service listed the northern spotted owl as threatened throughout its range, effective July 23, 1990. On January 15, 1992, 6.9 million acres of federally owned land were designated by the agency as critical habitat for the owl. Deleted from earlier proposed critical habitats were state and federal acreage where the economic impacts of designation outweighed the potential benefits to the owl.

The Forest Service committed itself to managing its lands in a manner "not inconsistent with" the Interagency Scientific Committee strategy. In lieu of following the Committee plan, the Bureau of Land Management used the so-called Jamison strategy in proposing timber sales, under which the Bureau would offer reduced levels of timber sales (reduced from the annual allowable harvest based on the agencys 10-year harvest plan) in both fiscal years (FY) 1991 and 1992, offer no timber sales in habitat conservation areas or in spotted owl management areas delineated under the agreement with Oregon, and consider the Interagency Scientific Committees standard for dispersal habitat where possible. In addition, the Bureau proposed to increase efforts, in cooperation with other agencies, to study the owl and its needs as well as associated topics in silviculture management. It also proposed to include a management option emphasizing owl and habitat protection that incorporated the Interagency Scientific Committees recommendations as an alternative for analysis in the planning process, leading to new resource management plans.

The Fish and Wildlife Service, in its final biological opinion on the FY 1990 Bureau of Land Management timber sales program, concluded that 52 of the proposed 174 sales were likely to jeopardize the existence of the northern spotted owl, partly because the Bureau did not agree to strictly follow Interagency Scientific Committee guidance in many areas. The Bureau modified eight of the sales to remove jeopardy, but sought exemption from section 7 of the Endangered Species Act to permit it to hold timber sales on the remaining 44 tracts in its FY 1991 timber sales program. In its meeting of May 14, 1992, the Endangered Species Committee exempted 13 of the 44 sales and denied exemptions for the other 31. Nevertheless, the sales were the subject of litigation and the 13 exempted tracts were not offered for sale. Early in the Clinton administration, Interior Secretary Babbitt withdrew the Bureaus request for exemption, rendering moot the Endangered Species Committees decision.

In February 1991, then-Secretary of the Interior Lujan appointed an interdisciplinary Northern Spotted Owl Recovery Team with expertise in biology, forestry, silviculture, and economics. The team included federal employees from several agencies, academic scientists, and representatives from the Governors offices in California, Oregon, and Washington. The recovery team held monthly open public meetings from March to September 1991, then met in closed session to develop final options and recommendations in the form of a draft recovery plan. Significantly, the draft plan included an appendix devoted to analyzing the effects of recovery efforts on all known plants and animals associated with late successional old growth ecosystems. This represented an initial step away from species-by-species correction efforts. The draft plan was released for public review in January 1992, and public hearings were held throughout the three states during the spring of 1992. The proposed final recovery plan was presented to Secretary Lujan in the final days of the Bush administration, but action was deferred to the Clinton administration. To date, no action has been taken to accept the plan as final.

Shortly after the recovery team was convened, the House Agriculture, Interior, and Merchant Marine and Fisheries Committee and relevant subcommittees formed the Scientific Panel on Late Successional Forest Ecosystems and assigned it the following tasks: to identify, map, and classify ecologically significant old growth forests on federal lands; to develop management options for lands outside of reserves; to develop alternatives for protecting old growth; and to quantify the effect on sustainable harvest levels of each reserve system. This effort specifically targeted the sustainability of late successional old growth ecosystems, in contrast to species-driven efforts. Referred to as the "Gang of Four," the panel of experts consisted of K. Norman Johnson of Oregon State University, Jerry F. Franklin of the University of Washington, Jack Ward Thomas of the Forest Service, and John Gordon, Dean of the Forestry School of Yale University. The panel submitted its report to Congress on October 8, 1991, but there has been no congressional action on it.

Federal agency actions pertaining to Pacific Northwest forests have been the subject of constant litigation since the 1980s. An injunction against the Forest Service following the Endangered Species Committee decision to allow the 13 sales to proceed led to creation of yet another scientific group, the Scientific Analysis Team. This team evaluated the effect of the Interagency Scientific Committee strategy on all forest species known to occur in the range of the northern spotted owl to ensure that liability requirements under the National Forest Management Act were not knowingly violated. This represented another step away from single-species protection of the northern spotted owl and toward more multiple-resource management of the ecosystem. The Forest Services attempt to implement Interagency Scientific Committees recommendations was stopped by Judge William L. Dwyer based on the following determinations: the 1992 Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests violated the National Environmental Policy Act; the Forest Service did not address whether its adoption of the Interagency Scientific Committees conservation strategy would cause extirpation of any of 32 species identified in the final environmental impact statement as closely associated with late-successional or old-growth forests, in addition to its consideration of the owl; and the Forest Service had not analyzed the effects of the Interagency Scientific Committees strategy on the 13 Bureau of Land Management sales exempted by the Endangered Species Committee.

The Scientific Analysis Team, led by Jack Ward Thomas, was composed primarily of Forest Service personnel, with only 1 of its 10 members from another agency (the Fish and Wildlife Service). The 13 experts recruited by the team to assist in its work were all from the Forest Service. The teams report, completed in March 1993, was later used as a significant resource document by the Forest Ecosystem Management Assessment Team and as an appendix to the draft supplemental environmental impact statement that accompanied the Administrations Forest Plan.

Protecting Regional Economies

At the same time that agencies were taking actions to adjust to the new demands of public opinion, to satisfy their legal obligations, and to meet the needs of listed endangered species (particularly those of the northern spotted owl), there were other actions to mitigate economic losses incurred from reduced timber harvests.

The Federal Timber Contract Payment Modification Act of 1984 (P.L. 98-478) was intended to address financial problems in the timber industry. Timber purchasers had submitted high bids for contracts in the late 1970s, based on their belief that housing starts would remain high, demand for forest products would increase, and inflation would continue. But timber prices dropped drastically, forcing holders of those contracts to absorb major losses. The "Buy-Out Act" allowed purchasers to pay fees in lieu of carrying out their contracts. In 1988, purchasers who still held contracts but had been unable to take advantage of the Buy-Out Act were allowed to defer certain portions of payments for harvested timber under certain circumstances.

In response to judicial prohibitions on timber harvesting and a policy stalemate, section 318 of the U.S. Department of the Interior Appropriations Act (P.L. 101-121) required the Bureau of Land Management and Forest Service to offer an aggregate total of 1.9 billion board feet for sale in FY 1989 and 1990, a reduction from approximately 3 billion board feet. It also required the Bureau and Forest Service to consider the recommendations made by the Interagency Scientific Committee.

For FY 1991, 1992, and 1993, Congress passed "safety net" legislation (P.L. 101-512, 102-154, and 102-381) to protect O&C counties from declining revenues due to reduced timber harvest. The legislation provided that revenues to those counties in FY 1991 would not be less than 90 percent of the average annual payment made to them from O&C receipts during a 3-year baseline period (FY 1988-1990); for 1992 and 1993, the average of the 5-year baseline period of FY 1986-1990 was used. In both cases, the years used for averages were ones in which there had been particularly high payments to the counties. The Omnibus Budget Reconciliation Act of 1993 (P.L. 103-66) gives a new

payment calculation for FY 1994-2003 for O&C timber receipt sharing. The payments for FY 1994-1998 will be equal to the applicable percentage multiplied by the average of the revenues to each county during FY 1986-1990. In FY 1999-2003, payments will be the greater of the amount calculated by the new formula or the amount calculated under the old 50-percent formula.

Concurrently, both the Forest Service and Bureau of Land Management were mired in litigation. By the early 1990s, most federal agencies were prohibited from offering additional timber sales west of the Cascades. A White House press release on September 14, 1994, during the Bush administration, echoed the increasing frustrations of the Pacific Northwest region:

Environmental organizations have filed eleven lawsuits seeking to lock up our public forest lands and opposing Administration efforts to implement spotted owl management plans. These lawsuits exploit the conflicting mandates of laws passed by Congress governing the management of our federal forest lands. Laws such as National Environmental Policy Act, National Forest Management Act, and Endangered Species Act were passed by Congress without any review of how these statutes, each with their own particular congressional mandate, work together.

This avalanche of litigation regarding forest management, heard by judges who have gone far beyond simply interpreting the statutes, and a Congress that has failed to pass legislation necessary to appropriately change the law, has resulted in stopping the federal timber harvest program in the Northwest. As a result, hundreds of mills have been shut down, and thousands of timber workers have been thrown out of work, reducing critical federal timber harvest revenues to local communities for schools and other services.

Current Situation

On April 2, 1993, consistent with his campaign pledge, President Clinton convened the Forest Conference in Portland, Oregon, to address the human and environmental needs served by federal forests of the Pacific Northwest and northern California. The President, Vice-President, and many Cabinet members spent an entire day listening to all points of view and collecting information.

President Clinton directed his Cabinet to craft a balanced, comprehensive, long-term policy for the management of over 24 million acres of public land. The President directed that the plan meet the following five principles:

1. Where sound management policies can preserve the health of forest lands, sales should go forward. Where this requirement cannot be met, we must do our best to offer new economic opportunities for year-round, high-wage, high-skill jobs.

2. The long-term health of our forests, wildlife, and waterways should be protected.

3. To the extent possible, efforts must be scientifically sound, ecologically credible, and legally responsible.

4. The plan should produce a predictable and sustainable level of timber sales and nontimber resources that will not degrade or destroy the environment.

5. The federal government should be made to work together and for the people to achieve these goals.

An interagency, interdisciplinary team of expert scientists, economists, sociologists, and others was assembled and led by Jack Ward Thomas. After 3 months of intensive work, which included review and evaluation of all fully developed proposals for management of federal forests within the range of the northern spotted owl, this Forest Ecosystem Management Assessment Team produced a detailed assessment of 10 options. A second team developed options for dealing with economic dislocation that could result from reduced timber harvests, while a third team reported on the required interagency coordination for implementation of an ecosystem-based approach to forest management.

On July 1, 1993, President Clinton announced his proposed "Forest Plan for a Sustainable Economy and a Sustainable Environment," containing comprehensive strategies for forest management, economic development, and agency coordination. The Administrations Forest Plan provides:

- A new forest management plan to enable sustainable harvest, allowing: timber sales and logging that are scientifically sound and legally responsible; an innovative approach to environmental protection that is focused on key water supplies and valuable old-growth forests and that bases forest management on science and a respect for existing law; and a comprehensive system of old growth reserves to protect old growth ecosystems.
- New economic assistance to local workers, businesses, and communities in order to strengthen the regions economy, create family-wage jobs, offer new economic opportunities, and ensure the regions long-term economic health.
- New opportunities for people in the region to participate in decision making, including improved coordination among federal agencies responsible for managing federal lands.

The forest management strategy was analyzed in a draft supplemental environmental impact statement issued in July 1993. More than 100,000 comments were received during the 3-month public comment period. The final environmental impact statement was made available to the public in February 1994.

There have been several actions aimed at implementing the preferred alternative (Alternative 9) of the final environmental impact statement. In a Record of Decision, the Secretaries of Agriculture and the Interior jointly amended the planning documents of 19 national forests and 7 Bureau of Land Management districts. This comprehensive strategy for an ecosystem approach to common administration of lands in the Pacific Northwest has extensive standards and guidelines, including land allocations. About 30 percent of the lands of these two agencies have been set aside by Act of Congress. Under the plan, the remaining 70 percent are allocated as follows: late-successional reserves (30 percent); adaptive management areas (6 percent); managed late-successional areas (1 percent); administratively withdrawn areas (6 percent); riparian reserves (11 percent); and matrix (16 percent). Although certain thinning and salvage activities would be allowed in the reserves, programmed timber harvest could be conducted only in the 22 percent designated as matrix or adaptive management areas (rather than in the full 70 percent formerly available for harvesting), and only in compliance with standards and guidelines designed to achieve conservation objectives.

The implementation of this decision calls for a high level of coordination and cooperation among agencies in the long term. A Memorandum of Understanding for Forest Ecosystem Management, agreed to by the White House Office on Environmental Policy, the Departments of the Interior, Agriculture, and Commerce, and the Environmental Protection Agency (EPA), established a formal procedure for interagency coordination for an initial 5-year period. The memorandum also created several coordinating groups, including the Interagency Steering Committee, Regional Interagency Executive Committee, and Regional Ecosystem Office.

The Interagency Steering Committee establishes overall policies governing the prompt, coordinated, and effective implementation of the Forest Plan by all relevant federal agencies, and addresses and resolves issues referred by the Regional Interagency Executive Committee. The Interagency Steering Committee has representatives from the offices of the Secretary of the Interior, Secretary of Agriculture, Administrator of EPA, and Under Secretary of Commerce for Oceans and Atmosphere, and is led by the chair of the Council on Environmental Quality. A White House-appointed representative from the Committee serves as interagency coordinator to provide general oversight and guidance of regional activities.

The Regional Interagency Executive Committee (RIEC) consists of the Pacific Northwest regional heads of the Forest Service, Bureau of Land Management, Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, Bureau of Indian Affairs, and EPA. In addition, the RIEC receives public advice from the Intergovernmental Advisory Committee, with representatives from the agencies on the RIEC itself, three tribal representatives, and representatives from research arms of the Forest Service, National Biological Service, and Natural Resources Conservation Service, and from the states of Washington, Oregon, and California, and affected counties. The RIEC is the senior regional entity charged with assuring the prompt, coordinated, and successful implementation of the standards and guidelines outlined in the Record of Decision adopted by the Secretaries of Agriculture and the Interior. The RIEC also implements the directives of the Interagency Steering Committee, reports regularly on implementation progress, and refers issues relating to the policies or procedures for implementing the standards and guidelines to the Interagency Steering Committee. Its policy and planning decisions and recommendations are made collaboratively. Individual land management and consultation agencies retain the decision-making authority vested in them by statute.

The Regional Ecosystem Office provides staff support to expedite RIEC decision making and prompt interagency issue resolution for implementation of standards and guidelines. This Office, which reports to the RIEC, develops, evaluates, and resolves consistency and implementation issues related to specific topics. The Office also evaluates major modifications that emerge from the adaptive management process and coordinates the formulation and implementation of data standards. It does not have decision-making authority, but makes recommendations to the RIEC. In late September 1994, a new executive director of the Office was appointed.

A Research and Monitoring Committee, composed of full-time scientists in the Regional Ecosystem Office and a standing group of agency liaison officers, makes recommendations to the RIEC on implementation of standards and guidelines through monitoring and research plans. The Interorganizational Resource Information Coordinating Council is charged with addressing technical and policy issues and recommendations for the utilization of resource information, intergovernmental communications and data sharing, public access, data standards, data compatibility, geographic information systems, and related technologies.

Province-level teams comprised of representatives from federal agencies provide or coordinate analyses at the province level as the basis for amendments to forest and district plans. These teams also prepare monitoring reports for provinces. Advisory committees to each province-level team include representatives from states, tribes, affected counties, the timber industry, and environmental groups, as well as hunters, fishermen, and others.

On December 21, 1994, in his "Order on Motions for Summary Judgment Re: 1994 Forest Plan" (Seattle Audubon Society et al. v. James Lyons et al.), Judge William L. Dwyer ruled that the federal agencies were acting within the bounds of the law in implementing the Forest Plan. The judge noted that for the first time in several years, the forests that provide habitat for the northern spotted owl will be managed by the responsible agencies under a plan found lawful by the courts. In particular, the judge noted that agencies had previously operated independently and sometimes in conflict, and that "there is no way the agencies could comply with the environmental laws without planning on an ecosystem basis," given the current condition of the forests.

BUDGET ISSUES

The funds allocated by federal agencies to implement the Forest Plan are focused on two objectives: an ecosystem approach to forest management; and economic adjustment and community assistance.

During the case study interviews, budget-related discussions focused on activities to implement a forest ecosystem approach and the management of priority setting and funding of interagency offices and activities. Interviewees remarked on the lack of management flexibility under current budget structures and processes, as well as on the difficulties associated with implementing ecosystem-based management during a period of stable or decreasing budgets and agency downsizing. Whereas expenditures for some activities with well-defined outputs (such as stream restoration, stocking fish, and production of elk habitat) have well-established constituencies, equally effective constituencies need to be developed for ecosystem-based management initiatives, for which there are less well-defined, longer term outputs and a lower level of goods and services. Furthermore, there is an increased need to coordinate agency budgets for on-the-ground activities involving multiple agencies, such as Endangered Species Act section 7 consultations on stream restoration or timber sale projects. Multiagency budget coordination is difficult, because different agencies have different reviewers from the Office of Management and Budget and from the different appropriation subcommittees that fund the major federal agencies that manage federal lands in the Pacific Northwest.

Current Budget Agreements

Current budget agreements include interagency Memoranda of Understanding for economic adjustment and community assistance and for the forest ecosystem approach pursuant to the Administrations Forest Plan. Although these Memoranda provide a degree of funding for the interagency ecosystem approach in the Pacific Northwest, constraints to effective interagency funding remain.

Economic adjustment and community assistance and objectives. An Interagency Memorandum of Understanding for Economic Adjustment and Community Assistance was signed by the Secretaries of the Interior, Agriculture, Commerce, Labor, and Housing and Urban Development; the Administrator of EPA; the Deputy Director of the Office of Management and Budget; the Administrator of the Small Business Administration; the Assistant to the President for Economic Policy; the Assistant to the President for Domestic Policy; and the Director of the Office on Environmental Policy. The Memorandum committed funding to the community assistance program in the Pacific Northwest forest ecosystem.

The Forest Plan identified more than $270 million in new funding for FY 1994-$1.2 billion over 5 years. It was estimated that the Plan would directly affect approximately 6,000 jobs in 1994, create more than 8,000 jobs, and fund 5,400 additional retraining opportunities. Key elements of the Administrations Forest Plan for FY 1994 included:

- For workers and families, a 110-percent increase in funding (from $20.2 million to $42 million) for job search assistance, retraining, and relocation under the Job Training Partnership Act.
- A three-part strategy for business development in the Pacific Northwest and northern California, including improved access to capital, expanded technical assistance, and enhanced access to domestic and international markets. Overall, this represented a 47-percent increase in funding (from $163 million to $239.7 million).
- For communities, established levels of financial assistance and a reliable schedule of payments to timber counties to replace the roller coaster of payments tied to timber harvests and create a sound fiscal environment for county governments, businesses, and financial institutions. This was designed to strengthen community capacity to plan for economic development and diversification, and improve the infrastructure needed to support such development through Community Development Block Grant lending and through the Rural Development Administrations community facilities and water/wastewater program. Overall, this represents a 25-percent increase in funding (from $298.6 million to $373.6 million).
- An overall 19-percent increase in funding (from $438.2 million to $519.8 million) allocated to protecting the environment, creating jobs, investing in watershed maintenance, restoring the ecosystem, and conducting environmental research and monitoring. Assistance in all of these areas was designed to improve water quality, increase salmon stocks to avoid listing under the Endangered Species Act, and enhance commercial fishing. In addition, forest stewardship was expanded to help small landowners manage their forests.
- Support for the elimination of tax incentives for the export of raw logs. In addition, the President directed his Cabinet to study effective ways to make it more difficult for companies to avoid export limitations on raw logs.
- Priority identification and implementation of the best ways to strengthen small businesses and secondary manufacturing in the wood products industry, including a review of ways to increase the supply of federal timber set aside for small businesses and of ways to provide possible preferences for bidders who contract for domestic secondary processing. The President directed the Cabinet to handle this task, and to encourage improved and effective community partnerships between those with different perspectives on forest management.

Memorandum of Understanding for Forest Ecosystem Management. The Memorandum of Understanding for Forest Ecosystem Management, which was signed by the Director of the White House Office on Environmental Policy, the Secretaries of the Interior and Agriculture, the Administrator of EPA, and the Under Secretary of Commerce for Oceans and Atmosphere, established a framework for coordination of the ecosystem approach. This agreement did not commit funds. However, a cross-agency budget of $156.7 million was developed to support forest the ecosystem approach for FY 1995. Budgetary partners included the Bureau of Land Management, Forest Service, Fish and Wildlife Service, Bureau of Indian Affairs, National Park Service, National Marine Fisheries Service, and EPA.

Constraints

Agencies have found it difficult to set goals in an interagency fashion, then to follow through with the dollars needed to reach the goals. Many federal agency representatives consider the general lack of budget flexibility a key constraint. Some agencies have more restrictions than others. Agency budget systems are usually structured to track expenditures by counting outputs. For example, it is easier to measure the volume of timber sold and miles of boundary line surveyed than it is to measure the water quality improvement in a watershed. Ecosystem-based management goals and objectives are not yet well-defined in the traditional financial benchmarks of counting and measuring. It has been difficult to pinpoint the costs and benefits of implementing certain aspects of the plan.

In addition, some interviewees felt that the FY 1994 appropriations language in the Administrations Forest Plan was much more restrictive for the Forest Service than it was for the Bureau of Land Management. In the Conference Report for H.R. 2520, "Making Appropriations for the Department of the Interior and Related Agencies for the Fiscal Year Ending September 30, 1994" (House Report 103-299, pages H8035-56), the conferees agreed that the Bureau

could reprogram up to $17.3 million in funds from the O&C grant lands account for watershed assessment and restoration, without further restrictions. But Amendment No. 71 of the Conference Report provided much more explicit instructions on how Forest Service funds were to be transferred and used: for example, securing key watersheds was specified as first priority; and rehabilitation projects were to be undertaken only after watershed inventory and analysis were complete.

Many agency representatives noted the problems they had reorienting budgets in the middle of the year, or when new priority workloads surfaced. For example, EPA, the National Marine Fisheries Service, and the Fish and Wildlife Service have funding and workload problems due to their budget calculations based on permit, enforcement, and other requirements not directly related to ecosystem restoration. They cannot easily redirect staff away from these permit and enforcement responsibilities; EPAs budget in particular is driven by individual resource concerns, such as water, air, enforcement, waste, and research. It is difficult for these agencies to work on a geographic basis, which further complicates their participation in many assessment, planning, and implementation activities.

In addition, funding sources for research activities in the Pacific Northwest are disparate and uncoordinated. The Forest Service, National Biological Service, and EPA have several relatively autonomous internal organizations, each with its own ongoing research priorities.

Coordination of research funding and priorities within any one agency is difficult; across multiple agencies, it is much more complicated. This is partly due to the long-term nature of some of the research needed for sound ecosystem-based management. Stopping and starting research projects is often inefficient and causes the loss of valuable long-term projects. In addition, research and monitoring protocols are not fully developed for some ecosystem functions, because the functions are not fully described or understood.

Some agencies (such as the National Park Service, Fish and Wildlife Service, Bureau of Indian Affairs, and National Resources Conservation Service) wanted to participate more in the ecosystem effort, but were limited due to small budgets and staff. Some agencies felt that involvement without direct financial authorization and support posed a problem.

Tribal representatives felt hampered because limited funds did not allow as much participation as they wished in view of the many working groups and committees. Budget constraints included staff time, expert consultants, geographic information systems and information management capabilities, and travel to meetings.

Federal Agency Coordination and Support

Each agency that signed the Memorandum of Understanding provides at least one full-time person and pays certain expenses of the Regional Ecosystem Office. Moreover, the U.S. Army Corps of Engineers has agreed to equal participation in this interagency forum. The three major federal research agencies (the EPA, National Biological Service, and Forest Service) also provide staffing support to the Regional Ecosystem Office. The Regional Interagency Executive Committee has authorized a state and a tribal position in the Regional Ecosystem Office, but neither the states nor the tribes have committed funding to this effort.

Interviewee Comments

Interviewees offered the following observations:

- Tribes would like to see more cooperative activities with joint funding. In addition to the funding available through the Bureau of Indian Affairs, they would like federal agencies to provide them with direct financial support for participation in meetings, planning activities, and the like. The Forest Services employment of a tribal coordinator on the regions east side was considered a very positive step toward establishing a truer government-to-government relationship with the tribes. All 51 tribes in the affected area submitted an FY 1994 supplemental funding request for $18 million, partly to support the participation of one or more employees in this interagency ecosystem effort. No additional funding was provided. It was also suggested that activities or programs should be contracted together with appropriate expertise under Indian Self-Determination Act (P.L. 93-638) contracts.
- It was suggested that agency directors give clear direction to the region to establish priorities and develop a cohesive cross-agency budget package that will hold together throughout the budgeting process.
- Some felt that funding should be by objectives, with budget account consistency between agencies. Further work to define budget categories and output measures for ecosystem-based management will be

necessary before this can be fully implemented.

- Several interviewees felt that financial incentive programs to meet ecosystem objectives are needed for tribal, state, and private lands. These incentives may be in the form of tax incentives, easement or restoration payments, contracts, technical assistance, or matching funds. Cooperative programs can be used in conjunction with or as substitutes for financial incentives. There are many examples of partnership projects, including the National Park Services Ebys Landing in Washington and City of Rocks in Idaho. At Ebys Landing, the National Park Service provides 50 percent of the funding, and the state, county, and town provide matching support and in-kind services. Interviewees also gave examples of joint visitor centers and other federal agency-shared activities. At City of Rocks, Coopville partially funds exhibits, an interpretive brochure, and the salary of a town planner, and the National Park Service has overall management responsibility.
- Some people suggested one line item appropriation for an ecosystem to a generic interagency regional ecosystem office rather than separate line items through separate agencies. This would give more flexibility, decrease reprogramming problems and adverse effects on other areas, and more support for smaller agencies. This move would make it necessary to address the realities of agency turf-consciousness, current strategy goals and directions, and the overall pervasiveness of control and accountability reflected in the current budget structure and process.
- Numerous comments supported more funds for public involvement. A distinction must be made between "more public involvement" and "effective public involvement." Generally, interviewees agreed that there are numerous opportunities (through the National Environmental Protection Act, for example) for the public to comment on proposed agency activities. Some interviewees also noted, however, that efforts to reduce public conflict or resolve public disputes are generally not enhanced by current public participation procedures. The perception lingers that these processes are sterile and nonsubstantive.

INSTITUTIONAL ISSUES

This case study provided an opportunity to review the Administrations approach to ecosystem-based management in an area where interagency and intergovernmental relationships had been strained the most, and where the constant cycle of litigation meant that regional decision makers were under constant pressure and scrutiny. Furthermore, this is the only instance in which the President, Vice-President, and several Cabinet officers have directly participated.

The Pacific Northwest forests have, in combination, more agencies, more litigation history, more individual species assessments (more than 1,100), and more land area involved (50 million acres) than any other ecosystem surveyed. The scale of the landscape and other factors further complicate the development of a consensus-based approach. Moreover, a protracted history of interagency disagreements, including political and legal battles highlighted by media attention, have made it difficult to develop effective working relationships.

The Administrations Pacific Northwest Forest Plan is intended to be a comprehensive approach to institutional concerns, including those of a policy and programmatic nature. The Plan explicitly recognizes that its success depends upon effective communication and coordination among various federal, state, tribal, and local entities, as well as the private sector. These demands are already rigorous and will increase as specific policies, strategies, and on-the-ground management actions are developed and implemented. Accordingly, some of the most noteworthy accomplishments in the initial Plan implementation are the establishment of:

- An interagency federal executive committee to coordinate issues that cross agency jurisdictions.
- Twelve provincial federal agency executive committees.
- An intergovernmental advisory committee, including 11 federal executives and 9 representatives of the tribal, state, and local governments.
- Locally based advisory committees for each province, including environmental and industry representatives in addition to federal, state, local, and tribal governmental representatives.
- A permanent interagency and interdisciplinary staff office to help address ecosystemwide issues. This office is also a reporting conduit for an interagency research and monitoring committee and a resource information council, including a comprehensive geographic information system staff.

Shared Vision

Of all the issues covered in the interviews, the development of a shared vision of the future was mentioned most frequently as an essential ingredient to the success of ecosystem-based management.

Prior to development of the Presidents plan, there were many visions of the future, each competing for primacy. These visions reflected the influence of a variety of factors, each based on different perspectives. First, each agencys authorizing legislation set forth explicit mandates and missions (such as the Oregon and California Lands Act for the Bureau of Land Management, the Multiple Use and Sustained Yield Act and National Forest Management Act for the Forest Service, the Endangered Species Act for the Fish and Wildlife Service and National Marine Fisheries Service, and the Clean Water Act for EPA). These in turn provide the bases for the diverse, unique "corporate cultures" in each of the agencies, that is reflected in how agency personnel identify themselves. Although unique agency cultures are beneficial in many respects, they often result in inconsistent management approaches that lead to conflict, confrontation, chaos, and public confusion.

Furthermore, personal experience and training influenced how the region was viewed previously. Experts from different disciplines can look at the same plot of ground and see substantially different features. Indeed, each has a different understanding of what constitutes "sustainability." In the absence of an explicit, publicly developed shared vision for the ecosystem, there have been conflicts over the existing hierarchy of multiple uses. The long-term emphasis on commodity production, reinforced by devices such as timber volume targets, ingrained management practices tailored to timber production, and lack of overall incentives for a broader vision, did not reflect the publics increasing concern about the protection of the environment and species. The remedy was not to discard the management philosophy of multiple use, but to reorder and reinvigorate it to mirror new realities.

The development of a shared vision has been impeded by other factors. The increasing amount, sophistication, and evolving nature of information relevant to managing affected ecosystems have challenged agency capabilities. These factors have further complicated the already complex and process-dependent nature of agency land use planning.

Taken as a whole, these factors created an incomplete, inconsistent, and fragmented perspective that was infeasible to implement. Any effort to choose among these competing visions was bound to fail, since it would ignore various key components of a successful total ecosystem approach.

The Administrations Forest Plan addressed this problem in a comprehensive manner with its three main elements: an ecosystem-based management plan for the 25 million acres of federal land in the region; an economic assistance plan; and a blueprint for improved agency coordination. The land management aspects of the Plan were developed through the public notice and comment process under the National Environmental Protection Act. The framework for a shared vision and an adaptive management process has been prescribed as the course for future change.

Despite the shared vision, many interviewees still had numerous implementation questions. The development of the Forest Plan represents the first and most essential step, but there is still much to be done. The options developed for Presidential review were, of necessity, not site-specific plans, but rather broad frameworks. Furthermore, most of the options were developed and assessed by a team primarily composed of scientists, not people experienced in translating concepts into on-the-ground actions. As implementation by managers and field staff proceeds, a substantial effort is required to assure that standards and guidelines are interpreted into consistent, workable direction for field personnel in a timely manner, and that site-specific information is appropriately reflected in implementation actions.

It is apparent that a key test of ecosystem-based management in the Pacific Northwest will be to maintain the values of the plan as it is translated into explicit on-the-ground actions. This will determine whether the Presidents vision can be implemented as the shared vision for federal managers in the Pacific Northwest.

Federal Agency Processes

Each federal agency is subject to varied statutory and regulatory requirements, although some mandates (such as the National Environmental Policy Act) apply to all agencies. These requirements influence major federal agency processes, some of which are discussed below.

Forest Service planning. The Forest Service manages 19.4 million acres within the range of the northern spotted owl. Under the National Forest Management Act, the agency is required to develop 10-year plans for its national forests. National forests with approved forest plans within the range of the spotted owl include the Gifford Pinchot, Mount

Baker-Snoqualmie, Mount Hood, Olympic, Rogue River, Siuslaw, Siskiyou, Umpqua, and Willamette. National Forests with approved plans partially within the range include the Deschutes, Okanogan, Wenatchee, Winema, Lassen, and Modoc. National forests without current plans within the spotted owls range are the Klamath, Shasta-Trinity, Mendocino, and Six Rivers.

Bureau of Land Management resource management planning. The Bureau of Land Management manages 2.7 million acres within the range of the northern spotted owl. Under the Federal Land Management and Policy Act, the Bureau is required to develop 10-year plans for these lands. Bureau lands within the range of the owl that have approved resource management plans include the Redding Resource Area, the Arcata Resource Area, and the King Range National Conservation Area, all within the Ukiah District of California. Bureau districts without approved resource management plans are the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts, and the Klamath Resource Area of the Lakeview District. Draft resource management plans were published in the fall of 1992 for these districts; final plans were released in the fall of 1994, and will comply with the Forest Plan. Under the National Environmental Policy Act, these plans must go through a public notice and comment process.

Fish and Wildlife Service/National Marine Fisheries Service consultation. Under section 7 of the Endangered Species Act, agencies must consult with the Fish and Wildlife Service and/or National Marine Fisheries Service to determine whether their actions will jeopardize listed species. Currently, consultation may occur regarding actions as discrete as individual construction projects, or may encompass broader actions such as combining timber sales or management plans.

Constraints

Interviewees raised several issues regarding the land management planning and consultation processes, and their relationships to each other. They also noted challenges to interagency coordination, work force development, adaptive management, and data coordination. These clearly illustrate the complexities associated with the transition to an ecosystem-based approach.

· The Bureau of Land Management and Forest Service not only have different management outlooks and operating practices, but also use different terminologies, data standards, and data bases. These longstanding differences affect the field levels at which on-the-ground activities are managed, and even inhibit coordination on adjacent or commingled agency lands.
· Conflicts arise frequently during the Endangered Species Act section 7 consultation process, and agency perspectives differ sharply as to their nature and preferred resolution. Land management agency personnel assert that considerable effort is required to develop proposals for specific actions such as timber sales, but that the Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS) often renders judgment late in the process, at which point a "jeopardy" ruling halts the effort. They also argue that proposed actions are developed based on an understanding from FWS or NMFS of what is needed to avoid a jeopardy determination, but that late reviews by those agencies often reflect a different perspective. For their part, FWS and NMFS personnel maintain that land management agencies have a long history of delaying consultation until late in the planning process, in the belief that the FWS or NMFS will then be unable or unwilling to force significant changes.
· Planning and consultation processes are so lengthy that when new information appears, they often seem to engage a continuous "do loop" of analysis and reanalysis (including new studies, scientific information, new species listed, and critical habitat designation).
· Planning requirements for individual agencies are not only susceptible to legal challenge, they are also intricate and complex, and vary considerably among agencies. This makes process more important than substance, and discourages joint planning activities that are critical to the ultimate success of the Forest Plan.
· Agency budget and appropriations processes reflect a long history of rewarding commodity production rather than conservation activities. Also, the "balkanized" structure of agency budgets creates artificial yet imposing barriers to integrated resource management and coordination, both within and among agencies.
· Joint planning is inhibited by the statutory, philosophical, budgetary, and planning concerns noted above, which in turn discourage agency cooperation with tribes, nonfederal governmental entities, and the private sector. Given the scale of the coverage, it is imperative to address the challenge of dealing with many jurisdictions. Although a single set of policies is needed to articulate a shared vision, it is also apparent that a "top-down" approach will not effect change as much as efforts that involve all stakeholders. Administration action to effect regulatory changes could make the planning process more efficient and responsive. In addition, statutory barriers (notably in the National Forest Management Act, Federal Land Policy and Management Act,

and O&C Lands Act) to joint, provincially based planning and related adaptive management activities require examination. The existing limitations to these more comprehensive approaches have raised an interim need for interagency cooperation in the preparation of site-specific activity plans that give comprehensive direction for on-the-ground activities and for complying with section 7 of the Endangered Species Act and with the National Environmental Policy Act and other requirements.

· Agency skill mixes do not necessarily reflect the requirements for a work force that must implement an ecosystem-based approach in the Pacific Northwest. It is apparent that certain technical (e.g., geographic information system) and scientific capabilities must be increased. Also, adaptable generalists who can apply interdisciplinary approaches are required. These changes in skill mixes must take place despite decreasing budgets, which places a premium on efforts to share resources and personnel, employ them more efficiently, and improve technical assistance and training strategies. Performance incentives that are oriented toward commodity production also have discouraged personnel from placing appropriate emphasis on ecosystem-based approaches.

· The recent fire season has highlighted a significant, increasing need for an ecosystem-based approach to firefighting issues. Continued recreational and residential development in the private land/public land interface encourages land management agencies to suppress otherwise desirable wildfires, and raises difficult issues of firefighting responsibility and distribution of firefighting costs. The current status of logistical and technical integration of firefighting capability has seemingly outstripped our ability to sort through the associated roles and responsibilities. However, the Bureau of Land Management and Forest Service have recently merged their firefighting staffs, and the potential for future improvements has never been better.

· The Intergovernmental Personnel Act of 1970 authorizes the temporary reassignment of federal, state, and local government employees to offices in other levels of government (as well as tribal governments and universities) to work on areas of mutual concern to the organizations involved. The Act is an extremely useful tool for the ecosystem approach because it is a statutory mechanism for different levels of government to transfer and share expertise. State and federal resource managers in the Pacific Northwest have taken advantage of the Act to facilitate implementation of the Forest Plan. For example, an official from the Washington State Department of Wildlife is currently on detail to the Fish and Wildlife Service to work on Habitat Conservation Plans. Actions taken pursuant to the Forest Plan have increased private interest in such Plans. This detail benefits both the state and the agency, ensuring close coordination between governments, because the state official involved has a longstanding relationship with other state employees and agencies, and a good working relationship with many tribal representatives. To implement successful Habitat Conservation Plans and work with private companies, the Fish and Wildlife Service must more often coordinate closely and form partnerships with other government entities, particularly the states.

· Continued litigation has discouraged many agency personnel from making innovations in the decision-making process. This includes scientists who must defend the scientific credibility of data and assumptions, regulatory agencies that must defend their decisions, and land management agencies that are still focusing appeals and protests on the great majority of individual timber sales.

· The effective compilation, accessibility, use, and adaptation of data is critical to the success of Forest Plan implementation. In particular, the Forest Ecosystem Management Assessment Team effort underscored the need to identify data requirements, priorities, and standards for a comprehensive geographic information system. Other data sets required for specific activities such as watershed analysis, monitoring, and adaptive management also need to be outlined. Some interviewees pointed out the tension between the need for a well-maintained, centralized data base, and local access to data (e.g., via Internet) for planning and other on-the-ground implementation activities. Others noted the need for confidentiality with respect to certain information (e.g., nest sites).

· The concept of adaptive management has support, but many noted that it faces challenges comparable to those facing the planning process with which it must interface. The design of adaptive management efforts that will be scientifically credible requires planning that can be evaluated against clear benchmarks. There are widely differing views among agencies and within specific disciplines as to which benchmarks are appropriate, how to assure effective and reliable measurement, and what related monitoring needs are. Agency professionals realize that major issues require considerable accountability as well as agreement on a plan or strategy that must be strictly adhered to over a long time. Adaptive management is impeded by the long timeframe required to implement activities, and the difficulty of explaining the importance of certain benchmarks to the public or to elected officials.

The interagency and intergovernmental coordination mechanisms described here are providing initial momentum for

Forest Plan implementation. In addition, specific agencies are carrying out Plan recommendations. Individual agencies and their regional federal heads are committed (some through performance contracts) to implementing the Plan, and to resume an active timber sale program. The Regional Ecosystem Office continues to report to the Regional Interagency Executive Committee. The Office is addressing what may be generically described as a broad range of "consistency" issues, ranging from data and analytical requirements (including monitoring methodologies) to consultation concerns. The Research and Monitoring Committee, which also reports to the Regional Intergovernmental Executive Committee, is determining key research and monitoring priorities and developing ways to translate their results into planning efforts and on-the-ground practices. Furthermore, the Intergovernmental Resource Information Coordinating Council has initiated efforts to assure greater data base coordination and compatibility. The results of interagency coordination are encouraging thus far, given the fact that implementation is in its early stage. In addition, agencies are in various stages of revising budget structures to assure their compatibility, or at least comparability, with ecosystem-based approaches, which will encourage more rapid implementation of the Forest Plan.

LEGAL ISSUES

Several land management statutes and related mandates apply to the Pacific Northwest forests. The National Environmental Policy Act, with its emphasis on comprehensive analyses of the effects of federal activities on the environment, and the National Forest Management Act, with its provisions for multiple use, assist the ecosystem approach by allowing the government to consider a broad range of interests when it plans the management of natural resources, and by granting substantial flexibility in land management decisions. Perhaps because of the wide range of choices they allow, the statutes have been the basis for challenges to the Forest Plans approach and results. In some instances, citizen plaintiffs and industry plaintiffs have used identical provisions of National Environmental Policy Act and National Forest Management Act to argue for opposing results.

National Forest Management Act

The National Forest Management Act (NFMA) requires the Forest Service to develop a plan for the management of each national forest. Each plan must comply with the Multiple Use and Sustained Yield Act of 1960 (16 U.S.C. §§ 528 et seq.) and "provide for multiple use and sustained yield of the products and services" of the forest, including outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness resources. Allowable sale quantity and sustained yield must be determined for each national forest. Planning regulations promulgated pursuant to NFMA call for the Forest Service to (among other things) "maintain viable populations of existing native and desired non-native vertebrate species in the planning area" (36 CFR § 219.19). Plans for each of the 19 national forests encompassed by the Administrations Forest Plan either have been developed or are under development in accordance with NFMA.

The government believes that the ecosystem approach reflected in the Forest Plan is authorized by, contemplated in, and consistent with the agencies existing planning framework. However, current plaintiffs have used NFMA statutory and regulatory provisions as bases to challenge the Plan. For example, environmental plaintiffs claim that the Plan does not provide habitat to assure the maintenance of viable populations of the northern spotted owl and other species associated with late successional and old growth forests. On the other hand, industry plaintiffs claim that the regulatory viability provision violates NFMA on its face and that, in any event, seeking to provide habitat to maintain the viability of invertebrate species that exist in the planning area-an underlying objective of the plan-is outside the agencys authority.
Industry plaintiffs also claim that the Plan violates NFMA because it reflects comprehensive management guidance for federal lands within the range of the northern spotted owl rather than piecemeal planning for individual national forests or Bureau of Land Management districts. In addition, they allege that the Plan fails to permit sufficient timber harvest because it does not determine an allowable sale quantity for any of the 19 national forests it governs, and substitutes a "probable sale quantity" standard for the allowable sale quantity standard. They also claim that the Plans development failed to follow requisite statutory and regulatory procedures.

National Environmental Policy Act

The National Environmental Protection Act (NEPA) requires agencies to consider the environmental consequences of "major federal actions significantly affecting the human environment." Specifically, the Act requires agencies to prepare an environmental impact statement before implementing any major federal action that will significantly affect the human environment. The environmental impact statement informs the public about agency decisions, and fosters public input into the decision-making process. Under the National Forest Management Act, forest planning must be in accordance with NEPA.In the Pacific Northwest, a supplemental environmental impact statement in accordance with a court order was the foundation for the Forest Plan and Record of Decision.

The NEPA, like the National Forest Management Act, has been cited as a basis on which to challenge the Forest Plan. Environmental plaintiffs allege that the governments NEPA documentation fails to disclose all of the effects on the spotted owl and other resources in the affected area, and does not consider the cumulative impacts of logging on private and state lands. Industry plaintiffs allege that the government violated NEPA insofar as it failed to consider a reasonable range of alternatives, all of the Plans social and economic impacts, and competing scientific theories and information applicable to forest management.

Oregon and California Lands Act

The Oregon and California (O&C) Lands Act governs administration of certain Bureau of Land Management lands in Oregon and California. As noted in the introductory section, the Act states, among other things, that O&C lands "shall be managed for permanent forest production" and requires establishment of annual timber production rates. Based on these and other provisions, industry plaintiffs claim that the Forest Plan violates the Act by establishing late successional and riparian reserves, by failing to meet the Acts requirement to sell a minimum of 500 million board feet of timber per year, and by establishing so-called wildlife habitat reserves. The plaintiffs position is that there should not to be any such reserves because they will hinder the Bureau of Land Managements ability to meet board feet requirements, and that the lands at issue must be available for timber production in order to support local economies.

Endangered Species Act

The Endangered Species Act requires agencies to "seek to conserve endangered species and threatened species and utilize their authorities in furtherance of [the Act]." Section 3 of the Endangered Species Act acknowledges as a primary purpose the need to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." Although the Acts implementation and administrative processes have historically emphasized the conservation of individual species, recent Fish and Wildlife Service and National Marine Fisheries Service administrative initiatives have attempted to enhance the opportunities for ecosystem-based management approaches.

Involvement of State and Private Landowners

Although premised on principles of the ecosystem approach, the Forest Plan governs management on federal lands only. Several legal authorities allow government interaction with state and private landowners in a way that both facilitates an even broader ecosystem approach to conservation and retains landowner control and rights over private land.

Endangered Species Act. Section 10 of the Endangered Species Act (16 U.S.C. § 1539) authorizes the Secretary of the Interior to enter into agreements with private landowners under which the Secretary permits "incidental take" of listed species, and landowners agree to develop long-term, private conservation programs to protect those species. These Habitat Conservation Plans generally constitute four documents: a "planning document" that is primarily a biological opinion; a contract implementing the agreement; an environmental assessment or impact statement; and a section 10 incidental take permit.

Following issuance of the Forest Plan, private and state landowners in the Pacific Northwest have shown a strong interest in becoming parties to Habitat Conservation Plans, and the Fish and Wildlife Service is working closely with these landowners to develop agreements. Agreements with timber industry landowners (one in California, one in Oregon, and one in Washington) have been completed. Several others are in preparation with timber companies in Oregon and Washington, and with the states of Oregon and Washington. Federal officials have found the Habitat Conservation Plan process to be especially beneficial, because it allows private and government scientists to join forces to gather necessary scientific data, and because scientists, like the agencies, have taken a multispecies approach to assessing the proper method of conservation.

Tribal representatives expressed unease with the Habitat Conservation Plan process, noting that it does not sufficiently consider their concerns. One concern is that the tribes are not involved in reviewing the specifics of a Habitat Conservation Plan. Although the Plans are generally developed through the National Environmental Policy Act and have a public review and comment process, tribal representatives point out that the tribes are not simply members of the public and are entitled to a specific and direct review and comment role. This would allow them to identify any number of potential conflicts, including impacts on off-reservation hunting or fishing rights, or on sacred burial or village sites.

Several other issues have arisen in Habitat Conservation Plan negotiations. One is the legal issue of whether landowner obligations in contracts constitute covenants running with the land. Some private landowners resist such an interpretation, but the federal government generally has insisted upon it. Another issue is the length of time Habitat Conservation Plan contracts should remain in effect. The governments policy generally ensures that contracts remain in effect long enough to mitigate the effects of the take of the listed species.

Finally, landowners have been reluctant to enter into agreements without some assurance that the government will not subject landowners to more restrictions if a nonlisted species on their land is subsequently listed and requires additional protection. Secretary Babbitts recent policy on this has gone far towards addressing this concern. In 1994, the Secretary issued a policy that authorized long-term certainty for approved Habitat Conservation Plans. The policy gives private sector interests confidence that their activities will not be disrupted if they meet their obligations under the Plan, even if previously unknown species-related concerns emerge.

Although the trend towards increasing reliance on Habitat Conservation Plans is positive, another concern is that current statutes allow these Plans to be ecosystem-based (for example, focused on multiple species), but do not require it. There is also a general perception that cumulative effects may not, or will not, be adequately considered.

Natural Resources Conservation Service programs. The Natural Resources Conservation Services programs primarily focus on providing technical and financial assistance to private landowners, and on encouraging voluntary practices that result in conservation. As authorized in several laws, including the Soil Conservation and Domestic Allotment Act (16 U.S.C. §§ 590g et seq.), the Food Security Act (16 U.S.C. §§ 3811 et seq.), the 1985 and 1990 Farm Bills, and the Watershed Protection and Flood Prevention Act (P.L. 83-566), the Natural Resources Conservation Service provides assistance to and advises private landowners on a wide range of natural resource planning and conservation issues. They include flood protection, water quality improvement, water supply, wildlife habitat, pasture, range and crop management, local land use planning law, and soils and erosion control. The agency also conducts national resource inventories, soil survey, investigations, wetland identification and protection, and conservation demonstration projects, and disseminates its findings to landowners.

The Natural Resources Conservation Service views its role as beneficial, because its nonregulatory approach ensures that private landowners control activities on their lands, and are consequently willing to engage in practices that assure sustainability of natural resources. In the Pacific Northwest, the agency increasingly is using an ecosystem-based approach to assistance. This involves natural resource conservation planning and assistance to private landowners, including improving riparian habitat on a watershed basis, coordination between different disciplines within the agency, and coordination with other agencies such as the Fish and Wildlife Service.

EPAs watershed approach. The Clean Water Act, 33 U.S.C. §§ 1251 et seq., authorizes EPA to permit, enforce, and fund activities to achieve the Acts objective of restoring and maintaining the "chemical, physical, and biological integrity of the Nations waters." In its Region 10 (which includes Washington, Oregon, Idaho, and Alaska), EPA has taken a watershed approach to carrying out these authorities. This approach involves a comprehensive look at environmental problems in the watershed and further allocation of agency resources to addressing those problems. The Agency has identified approximately 35 watersheds in the region and has prioritized them according to ecological importance.

In high-priority watersheds, EPA appoints a full-time coordinator and assembles a team of agency specialists to focus on the watershed. The Agency works with other federal agencies, as well as state, local, and tribal governments and interested private parties, to address problems in the watershed. For example, the Mid-Snake River watershed in Idaho was given high-priority because of excessive nutrient releases into the river that rendered it useless for most purposes, including recreation. EPA appointed a watershed coordinator and a team that included a National Pollution Discharge Elimination System permit specialist, a water modeler, and an enforcement official. Clean Water Act initiatives in the area include more inspections of potential nutrient sources, increased administrative enforcement, and development of a total maximum daily load plan that limits discharges of all relevant point sources. In addition, local point source dischargers were able to convince dischargers of nonpoint sources (not currently covered under the Act) to implement best management practices to reduce nutrient runoff. This will assure that state water quality standards (promulgated under the Act) are met.

EPA has also addressed the water quantity issue in the Mid-Snake by assessing the impact of five proposed diversion dams on oxygen and nitrogen levels in the watershed. Because the Endangered Species Act listed species are involved, this effort has required coordination between EPA and the Fish and Wildlife Service.

State forest practices acts. State forest practices acts in Washington, Oregon, and California govern forest practices on state and private lands, including reforestation, water protection, and vegetation retention. Generally, standards are set by state forestry boards, whose membership is usually a combination of private landowners and interested parties. In some states, the standards are less stringent than Endangered Species Act standards, requiring the federal government to enforce the Act on state or private land.

According to federal officials, the National Marine Fisheries Service and Fish and Wildlife Service are attempting to get involved early in the state-run process for setting state standards to ensure that state standards meet Endangered Species Act standards. After they do, the federal government can defer to the states on the issue of what practices are compatible for complying with those standards and on enforcement of the standards. This arrangement is viewed as more desirable because it will allow local control over forestry practices and decrease federal presence on state and private lands.

Involvement of Tribal Landowners

Three legal doctrines place Indian tribes in a position different from that of the general public with respect to interaction with the federal government on natural resource issues. First, according to longstanding administrative policy and case law, the federal government has a special "trust responsibility" to tribes. Second, under treaties between the federal government and tribes, tribes have special access and use rights to natural resources. In the Pacific Northwest, several treaties signed in the mid-1800s preserve tribal rights to fish in the Columbia River, its tributaries, and the Puget Sound Watershed, and to hunt on off-reservation federal lands. Third, as a result of the treaties with the tribes, it has been longstanding government policy to treat tribes as sovereigns within a sovereign rather than as subunits of the federal government or members of the public.

Although representatives of three tribal commissions are formally involved in the Intergovernmental Advisory Committee, facilitating implementation of the Forest Plan, several others who were interviewed asserted that tribal interests have not been sufficiently considered in accordance with the above principles. For example, they felt their role in the development of the Administrations Forest Plan did not fulfill government-to-government consultation responsibilities early on in the decision-making process. Representatives also argued that the government treats tribes as members of the public rather than as sovereigns or as groups with whom the government has a trust relationship, and that the governments planning and implementation processes do not adequately consider treaty rights to fishing and off-reservation hunting.

Federal Advisory Committee Act

The Federal Advisory Committee Act (FACA), 5 U.S.C. App. 2, restricts the ability of federal agencies to solicit and receive collective advice from nonfederal parties. Among other things, an "advisory committee," as defined by FACA, must be organized under a charter, balance its membership, publicize its meetings in the Federal Register, hold open meetings, take minutes of meetings, provide transcripts of meetings upon request, and make available any documents used by the committee.

Experience in the Pacific Northwest has demonstrated that FACA presents significant challenges to the involvement of nonfederal officials and citizens in the process of implementing the ecosystem approach. A federal court has held that the Forest Ecosystem Management Assessment Team Report was prepared in violation of FACA (Northwest Forest Resource Council v. Espy (D.D.C. March 21, 1994)) because the Assessment Team was an advisory committee subject to FACA but was not chartered in accordance with it, and otherwise did not comply with the Act (for example, it included nonfederal officials or employees). The Northwest Forest Resource Council decision illustrates how difficult it can be for agencies to operate in an arena where little legal precedent exists.

Industry plaintiffs in current litigation argued that because of the Northwest Forest Resource Council holding, the governments reliance on the Forest Ecosystem Management Assessment Team Report was unlawful. Plaintiffs also argued that the Regional Interagency Executive Committee and Provisional Interagency Executive Committees were operating in violation of FACA. Those groups are currently being chartered in accordance with FACA.

In addition, many interviewees commented that FACA has complicated the ecosystem approach in the Pacific Northwest because it imposes time-consuming, costly, and burdensome procedural requirements on the federal agencies that wish to have open, ongoing discussions with outside parties. Most significantly, FACA has been construed by some to prohibit many kinds of participation by nonfederal parties in groups that are not FACA-

chartered. But participation in FACA-chartered groups is not satisfactory to some nonfederal parties. For example, state and tribal representatives seriously object to having only an advisory role.

Tribal representatives in particular claimed that FACA has been an obstacle to necessary federal-tribal communications. In their view, the sovereign-to-sovereign relationship that the federal government has with the tribes means that FACA does not apply to their communications. In connection with the issue of treaty rights in the Columbia River, federal officials have met alone with tribes in an attempt to settle an ongoing Endangered Species Act lawsuit involving treaty rights on the Columbia River and to discuss federal and tribal activities to be taken pursuant to the Endangered Species Act. But industry representatives have sued the government, claiming that these meetings violated FACA.

Many of those interviewed commented that FACA should be amended to make clear that it does not apply to meetings between the federal government and state or tribal governments.

PUBLIC PARTICIPATION

The importance of public education and participation in decision making was a major theme in the interviews. Early public participation at all stages is a key element in the successful management of ecosystems and is frequently a measure of the publics acceptance of agency policy. The public can also participate in the design and implementation of processes that seek public comment on proposed agency actions and efforts to explain agency proposals to the general public, special interest groups such as states, tribes, other government entities, and the press. Participation by an educated public is critical to the success of ecosystem-based management.

Overview of Public Involvement

In the Pacific Northwest, discussions of public involvement have focused on the Interagency Communications Plan, outreach activities by individual agencies, supplemental efforts by the Office of Forestry and Economic Development, and plans for future public involvement in forest plan activities. Discussions of public involvement that predate the Administrations Forest Plan (in the Applegate Partnership, for example) increased the teams knowledge of the positive results of efforts pertaining to this issue.

Interagency Communications Plan. The four federal signatories to the Forest Plan (the U.S. Department of Agriculture, U.S. Department of the Interior, U.S. Department of Commerce, and EPA) formed an Interagency Communications Group during the summer of 1993 to devise a communications plan for the Pacific Northwest. The Interagency Communications Plan addressed four issues identified by the Group:

1. Employee understanding
2. Public understanding
3. Public involvement
4. Multilevel, multiagency coordination

The Plan focused on activities for the following year, all of which have been completed. These included: interagency employee briefings on the draft supplemental environmental impact statement, the Administrations preferred alternative, and the interagency ecosystem approach in general; a slide presentation on the Forest Plan; employee information packets; facilitating media outreach at the field level; arranging for senior managers to conduct a series of editorial board meetings for newspapers; and the conduct of various public outreach activities including formal hearings on the draft supplemental environmental impact statement.

The Interagency Communications Group holds weekly conference calls and is reexamining its role to see if it needs to expand its communications to a broader range of issues.

Office of Forestry and Economic Development outreach. The Office of Forestry and Economic Development has engaged a full-time public affairs specialist to advise on effective means of communicating with the public, including the preparation of press releases about accomplishments under the Forest Plan for public understanding. The specialist also provides information directly to Congress, to the offices of the Governors of Washington, Oregon, and California, and to outside interest groups. In addition, the Office distributes information to federal agencies to increase support for the Forest Plan.

Plans for public involvement under the Administrations Forest Plan. The Regional Ecosystem Office is developing plans for public participation in the implementation of the Administrations Forest Plan. These plans include establishing a public Intergovernmental Advisory Committee to the Regional Interagency Executive Committee and organizing advisory committees to the Provincial Interagency Executive Committees.

The Intergovernmental Advisory Committee will have representatives from federal agency members of the Regional Interagency Executive Committee and designated representatives from the Natural Resources Conservation Service, Forest Service Research, National Biological Service, EPA Research, the states of Washington, Oregon, and California, tribes, and counties. Chartered under the Federal Advisory Committee Act, the committee will provide advice and recommendations to the Regional Interagency Executive Committee regarding the coordinated implementation of the Record of Decision and will promote better integration of forest management activities among federal and nonfederal government entities. Generally, meetings will be open to the public.

The Provincial Interagency Executive Committee advisory committees will have representatives of federal agencies that are members of the Regional Interagency Executive Committee, as well as designated representatives of the tribes, states, and counties. There will also be representatives from environmental, forest products, recreation, tourism, and other interested groups, and up to three representatives from other federal agencies.

Each Provincial Interagency Executive Committee advisory committee will have no more than 29 members. The committees will encourage public participation by opening most meetings to the public, notifying key contacts about meetings, and gathering information from the public through subcommittees.

Effective public involvement. The Applegate Partnership has been widely noted as an example of strong public participation in land management. It offers many lessons about the formation and maintenance of partnerships between the federal government and nonfederal parties. According to the Partnerships Forest Service liaison, the Partnerships success is attributable to:

- The personalities of the people involved and their abilities to focus on the common good.
- The fact that the agency representatives were "risk-takers" who knew how to listen and were able to admit that their agencies had made mistakes in the past.
- The involvement of industry representatives who were creative, bright, visionary, and good communicators.
- A unique set of forest issues, exacerbated by drought and disease, that threatened the entire community.
- An initial lack of polarization.
- A commitment to following through on commitments, which fostered a sense of shared responsibility and a shared vision.
- Technical support from the Forest Service (especially geographic information systems) that facilitated group decision making.
- The voluntary evolution of the relationship, without force or threat of legal action.

One interviewee who worked closely with the Partnership felt that the idea could be used in other areas, although no two partnerships will ever be alike. The key is to take small steps and to assure community ownership/membership in the process. Many factors (such as the issues at hand, the personalities of those involved, and a communitys history, values, and people) can dramatically influence the dynamics of a partnership.

One interviewee noted that the Little River Adaptive Management Unit provides examples of difficulties found in forming partnerships. When federal agencies attempted to replicate an Applegate-type partnership, community members saw this as an attempt to increase federal control over private lands and were not interested in participating.

Public Involvement Issues

Issues related to public participation in efforts to implement the ecosystem approach in the Pacific Northwest include weak communication between tribal governments and federal agencies, constraints to public input under the Federal Advisory Committee Act, and public mistrust of the ecosystem approach.

Weak communications between tribal governments and federal agencies. The Bureau of Indian Affairs and representatives of tribal governments indicated that they have been dissatisfied with the degree and format of

communications between tribal governments and federal agencies, and that the tribes generally mistrust the federal agencies. They feel that tribal governments have not been adequately involved in decisions about the management of federal lands in the Pacific Northwest. Federal agencies have solicited input from the tribes in the same way they solicit it from the general public. Interviewees stated that, because of the trust relationship between tribal and federal governments, tribes should contribute to decisions, instead of being limited to commenting on proposed plans and decisions. Federal agencies and the tribes should operate on a government-to-government basis, without being required to comply with the Federal Advisory Committee Act.

Tribal representatives feel they are often given insufficient materials and information on which to base a decision when they are invited to comment on proposed plans. Most tribal entities also lack the resources and personnel necessary to follow the activities of federally organized working groups, collect information, and provide informed advice to tribal leadership.

Interviewees perceive federal agency staffs as often insensitive to differences in cultural values. They feel that because of this, federal agency staffs do not attempt to get their input in ways that recognize tribal priorities for land management (which may be different from those of the federal government) and the various decision-making processes traditionally utilized by tribal governments.

Federal land managers generally supported the need for better relationships with tribes, both in terms of process and especially in developing effective personal relationships that can overcome procedural restrictions. At the same time, many treaty rights in the Pacific Northwest are being litigated, so their nature and scope are currently unresolved. Additionally, the tribal goal of comanagement is perceived as a threat to federal land managers. The current lack of clear, concise agreements on what is required of federal land managers under their "trust responsibility" or under the policy of government to government makes for a stressful relationship between tribal leaders and federal land managers.

FACA restrictions on public involvement. Interviewees from all sectors indicated that public participation in the Forest Plans implementation was severely curtailed when federal agencies began to revise public involvement strategies in order to comply with the Federal Advisory Committee Act (FACA). Some working groups with combined federal and nonfederal membership ceased to function; others either excluded all nonfederal entities or allowed only minimal or unsatisfactory involvement by nonfederal parties. Although there are plans for most of these groups to become operational again after they comply with FACA, it will take some time to develop the previous level of trust and commitment.

Discussions regarding the Applegate Partnership indicated that applying FACA to grassroots-initiated activities could have a negative impact. By making its involvement in such activities contingent upon the imposition of FACA procedures, the federal government may, in effect, be shifting the dynamics from "bottom-up" to "top-down."

Public mistrust of the ecosystem approach. Several interviewees referred to the publics mistrust of the ecosystem approach, particularly on the part of private landowners. Perceptions are a key issue to be dealt with during plan implementation. For example, private landowners see watershed analysis as a potential federal restriction on private land use.

Interviewee Comments

Interviewees had several suggestions for strengthening federal-tribal government relationships:

- Tribal representatives should be members of forest planning teams, so that they can help develop these plans.
- Federal agency employees at all levels should receive training in tribal treaty rights and the general relationship between the federal and tribal governments. At a minimum, federal representatives who work with tribal governments should receive such training.
- The Federal Advisory Committee Act should be revised to allow direct government-to-government cooperation.
- Tribes should be given adequate information and time to make decisions, when asked for them. Insufficient time and information often preclude informed input.

- In addition to the Bureau of Indian Affairs, federal agencies should directly fund tribal participation (e.g., consultant fees, staff time, and travel) in federal activities to implement the ecosystem approach.

The importance of involving the public at the earliest stages of implementing the ecosystem approach was stressed by many interviewees. It is also important to clearly delineate the roles that federal agencies expect nonfederal entities to play, and vice versa. This often takes a lot of time, but investing resources early in the process could avoid problems later, saving time and resources over the long run.

Keeping the public effectively informed and involved throughout the process is essential. As one interviewee said, "There are always public relationships; you can either choose to manage them or not." There are numerous effective public involvement theories and models.

Quick feedback to criticisms, comments, and suggestions by the public affects public interest. Some interviewees stated that the public perceives the government as a "black hole"-the government makes suggestions but does not await a response. People will lose interest if they do not receive feedback. Federal agencies must follow through on commitments in a timely, effective manner.

Involvement mechanisms should be tailored to the needs and lifestyle of the community. Electronic bulletin boards would give the public access to information at any time in some communities, and potluck dinner meetings that are open to all family members can save time for busy people in other communities.

Interviewees generally indicated that federal outreach capabilities were inadequate. All federal employees who interact with the public should be trained in public involvement techniques and communications. Also, public affairs specialists should be retrained or reoriented to take a more proactive approach. Traditionally, public affairs offices have been primarily reactive: they have responded to concerns rather than initiating dialogue and educating the public and interest groups on agency activities.

Technical and research information must be packaged so various sectors of the public can be better informed about the issues and better understand government recommendations for land management.

The term "the ecosystem approach" means different things to different people, increasing confusion and conflict. There would be better cooperation among the various interest groups if a common definition and common goals were developed at the regional and local levels. Federal agencies should involve the public in developing guidelines for monitoring the implementation of the ecosystem approach and criteria for determining whether it was successful.

SCIENCE AND INFORMATION

Many interviewees recognized that inadequate data exchange between federal managers and regulators and between other federal and nonfederal entities inhibits effective and creative evaluation of problems and the development of possible solutions. They emphasized the greater need for standardization, the establishment of common technical standards and data sets, and the collection of information on broader spatial and temporal scales.

Information Sharing and Management

Lack of consistency and compatibility in data collection and storage is a major problem. Differences in data, analysis methods, and historic records make comparisons difficult. Key ecological indicator elements must be supported by consistent information retrieval systems, particularly geographic information systems and spatial layers. Geographic information systems and other information management systems must be designed to support indicators and also protect sensitive information, such as specific locations of cultural resources and threatened or endangered species. In many cases, the data is good but needs to be organized and converted to electronic form to meet new needs.

Consequently, there is broad support for the Interorganizational Resource Information Coordinating Council, which has been established to address technical and policy issues and to make recommendations to the regional executives about the use of resource information, intergovernmental communications and data sharing, public access, standards, data compatibility, geographic information systems (GISs), and related technologies. Supported by the GIS core team and GIS administrator in the Regional Ecosystem Office, the Council handles all activities associated with the

collection, management, and use of resource information and data, including inventories, nonspatial and spatial data, analysis methodologies, and applications. Specific responsibilities include:

- Analysis. Performing and/or coordinating analyses of a regional or subregional scope involving multiple agencies for issues related to an ecosystem-based approach.
- Providing a clearinghouse. Indexing and cataloging available information to assist in locating existing geographic data and to give general guidelines and assistance to those wishing to develop systems.
- Support. Providing support to identify interagency needs in developing information standards under the ecosystem approach. The Council coordinates the development of information and data standards for metadata, data accuracy, data attributes, geodetic control, data transfer, and transactional data base updating and revision.
- Development and acquisition. Facilitating the development and coordinating the acquisition of interagency data sets.

Interviewees expressed the need for an effective electronic communication system that breaks many of the institutional barriers to linking data bases across agencies. The lack of Forest Service access to Internet is seen as a serious impediment to progress. Security concerns pose unneeded barriers to information sharing.

Cooperation and Communication

Ultimately, scientific information plays a powerful role in decision making by federal land managers. Over the past few years, however, the courts have concluded that agency trends and directions were not consistent with the legal requirements to consider and to respond to overall ecological conditions. Interviewees commented that information management needs are not met simply by developing monitoring and research agendas and protocols but must extend to include the decision-making process of land managers. It is felt that just as the ongoing research program needs to be sharpened and focused to meet new and emerging ecosystem needs, how managers use the information needs to be sharpened and focused. Good research that does not get incorporated into management decisions is not timely and may not be useful. Underlying this comment was a recognition of the tension between science and policy, an inadvertent but nevertheless very real struggle over the power to guide future agency actions.

Cooperation and coordination both within and between agencies and state and local governments and other interest groups was recognized early in the Forest Ecosystem Management Assessment Team process. Unfortunately, litigation has dramatically impacted the development of many of these critical relationships (particularly since the heightened concerns over the Federal Advisory Committee Act). Several coordinating mechanisms for scientific and information management have been set up during the implementation of the Forest Plan, including the Regional Ecosystem Office and Research and Monitoring Committee.

Regional Ecosystem Office. The Regional Ecosystem Office is a focal point for scientific and technical expertise that supports implementation of the forest management plan. It evaluates major modifications that arise from the adaptive management process and coordinates the formulation and implementation of data standards. The Office develops, evaluates, and resolves consistency and implementation issues regarding topics that include, but are not limited to, geographic information systems, prototype watershed analyses, restoration guidelines, other Record of Decision and Standards and Guidelines interpretation issues, and support of agencies to meet Endangered Species Act obligations.

Research and Monitoring Committee. The Research and Monitoring Committee is composed of research scientists and managers from various agencies and disciplines who advise the Regional Interagency Executive Committee on science issues related to implementation of the Forest Plan, including the adaptive management process and watershed assessments. The Research and Monitoring Committee will review and evaluate ongoing research, develop a research plan to address critical natural resource commodity and noncommodity questions, and address biological, social, economic, and adaptive management research questions. It will also develop scientifically credible, cost-efficient monitoring plans.

The tribes emphasized the need for close government-to-government cooperation and coordination with federal agencies. They were concerned about how management activities on federal lands would affect their off-reservation treaty rights. They felt that they had excellent technical staffs, but that their views, concerns, and information were heavily discounted by the government scientists who developed the Forest Plan effort. Until this lack of trust is bridged, coordination will be difficult.

Information Needs

The role of research under the Record of Decision is to provide scientific oversight, monitoring assistance, and research on guidance, direction, and process. Recognizing that resources are limited, many interviewees stressed the need to set priorities by identifying critical information gaps and determining what information will actually be needed first in order to implement the Forest Plan. There are obviously many more questions than answers for implementing an ecological approach to management. Highest priority needs identified by the Regional Ecosystem Assessment Project were (1) research on historic and current disturbance processes (particularly fire) to better understand ecological linkages especially at larger spatial scales, and (2) the validation of key ecosystem health indicator elements as monitoring criteria. In order to be successful in these efforts, agencies must free resources to fill in the gaps as well as cooperate more with each other by sharing resources and results, and funding projects jointly.

Consistency is essential in peer review, planning, monitoring, and protocols. Standardization of indicator definitions, monitoring methods, and collection methods will increase trust between agencies using each others data. Interviewees felt that implementation of the ecosystem approach is often hindered by lack of clear environmental goals at both the national and regional levels. Given the current state of knowledge, it is often difficult to develop a clear, concise statement about desired future conditions. Stability in management prescriptions is critical to effective implementation of the ecosystem approach, as we will be learning for a long time. It will also take time to bridge between agencies and ownerships. There are information voids and science needs, but the basic knowledge is there to design ecosystem approach systems with monitoring as an integral component and with adequate safeguards.

Multiagency support is planned to provide research and technology needed for implementation of the ecosystem approach in the Pacific Northwest. Recommendations included the formation of an interagency and interdisciplinary technical team (composed of scientists, technical specialists, and managers) as a base from which to draw and provide a floor of understanding. Decisions need to be defended in a diversified arena-the technical team should create options that allow decision makers to insert themselves into the process. The assistance and information land managers need from research include:

Technical assistance and training, such as:

- Assistance with the watershed analysis process designed to custom build riparian and stream management and protection plans.
- Assistance with the interpretation of standards and guides or other direction selected for implementation and providing scientific assessment of proposed actions.
- Assistance in developing multiagency management, planning, and information systems.
- Assistance in developing activities on adaptive management areas, or similar innovative alternatives to traditional resource management activities.

Technology development and testing, such as:

- Research and development plans that address long-term support needs and fill critical information gaps.
- More appropriate and effective mechanisms that permit the public to become directly involved in resource planning, management, and regulation.
- Values and benefits to society within the existing framework of legal, economic, social, and biological limits.
- Procedures for conducting watershed analysis that evaluate geomorphic and ecological processes operating in specific watersheds.

Research to fill gaps in such areas as:

- Restoration of damaged ecosystems and components.
- Regional information systems and data bases, and tools for regional-level analysis.
- Measures and indicators of success (including indices of resource condition).
- Species viability assessments.
- Aquatic and riparian habitats.
- Ecosystem processes and their implication for the ecosystem approach.

Because states and private landowners do not have the resources to do research on every species, they rely on government research programs for much of their information. States also want the federal government to make a

commitment to monitor and develop methodologies and standards that are acceptable and easily understood. Monitoring programs for wide-ranging species, such as the northern spotted owl, must be coordinated with state, tribal, and private landowners to be cost-efficient. Developing the technical aspects of the monitoring program is difficult, but overcoming the distrust and fear of government is an even more difficult task.

Adaptive Management

Adaptive management is conceptually simple but pragmatically complex. It proposes to treat ecosystem policy as a series of experiments whose nature must be decided in political forums. It also proposes to collect information so that policy execution can help reduce or eliminate surprises, improve operations, and gauge the policys success while it is implemented.

Adaptive management has large implications for the resource planning process. Management activities must be designed so that everything can be evaluated. There are no current examples of an adaptive management approach on the scale recommended in the Forest Plan.

In the Administrations Forest Plan, adaptive management provides a structure through which researchers, management, and cooperators can achieve the Plans general objectives. The Plan proposes 10 Adaptive Management Areas as opportunities for government officials at all levels, industry, communities, environmental organizations, tribes, and others to collaborate on developing innovative management approaches. The Applegate and Douglas Projects in Oregon and the Hayfork Adaptive Management Area in northern California are examples of the approach. The adaptive management approach allows intense experimentation and demonstration of new ways to achieve ecological, economic, and social objectives, and allows local involvement in defining the future. A rigorous monitoring and research program would ensure development and analysis of scientific data to assess the effectiveness and impact of this approach. Two important ingredients in this effort are scientifically credible experiments, including replicated experiments of major silvicultural systems, and development and testing of the major monitoring programs important to an adaptive management approach. Their overarching objective is to improve our knowledge of how to implement the ecosystem approach by using refined strategies that are closely monitored over time. Credible implementation or compliance monitoring programs are essential to the increased management flexibility envisioned for the Adaptive Management Areas. Without them, interviewees conclude that management initiatives will not pass a court challenge.

Researchers should be heavily involved in the monitoring program by helping to develop protocol and implementation for the plans, developing information storing systems, and providing systems for synthesizing and evaluating information as it is collected by land management staff. Research can define the sideboards of what is possible so managers will know the limits to their decisions. Monitoring programs should be developed carefully to ensure that they are legally and scientifically defensible and have adequate long-term funding.

There are many questions about the links between current agency planning processes and the proposed adaptive management process. In adaptive management, plan elements should have no fixed tenure; the focus should be on endpoints and developing a set of working principles. These should be milestones to assess progress to these endpoints. Resource monitoring should answer the questions we want answered and those that deal with compliance issues.

Adaptive management requires that scientists and land managers jointly assess risks that will determine the limits of uncertainty used for triggering actions that reach threshold levels. A scientific working group has developed the adaptive management process to the point that it is ready for prototype testing on simple watersheds.

RECOMMENDATIONS

After careful consideration of efforts to implement the ecosystem approach in the Pacific Northwest forests, and after discussing all concerns raised by interviewees, the survey team made the following recommendations:

1. Amend the Federal Advisory Committee Act (FACA) specifically to exempt tribes and states, or establish streamlined procedures specific to the participatory needs of the ecosystem approach.
2. Educate federal managers about FACA requirements, procedures, and limits, and on contacts permissible with states, tribes, and other publics that will not invoke advisory committee procedures under FACA.
3. Establish provisions that allow coordination with tribes on a government-to-government basis, so that they are not treated as members of the public. One possible mechanism for active involvement of the

tribes is contracting of certain forest or resource management activities under P.L. 93-638.

4. Educate federal agency employees at all levels in tribal treaty rights, federal government trust responsibilities to the tribes, and the government-to-government relationship between federal agencies and tribal governments.
5. Encourage more use of multiple-species Habitat Conservation Plans on private lands.
6. Encourage agencies to use Natural Resources Conservation Service assistance in providing information on the ecosystem approach to private landowners. This agency has ecosystem professionals, county watershed-level offices, and an extensive communication network with private and nonfederal landowners.
7. Encourage personnel exchanges under the Intergovernmental Personnel Act to achieve a broad base of experience and perspective for activities to implement the ecosystem approach and to enhance the skill mix needed for their effectiveness. This program combines some of the best aspects of permanent employee stability and personnel flexibility.
8. Encourage the use of collective actions on project, geographic, and agency levels (such as groupings of timber sales or management plans) for Endangered Species Act section 7 consultations, rather than a series of separate consultations on narrowly focused projects or plans. In many cases, this would reduce the number of consultations needed, expand the geographic area considered, and increase the number of available alternatives.
9. As early as possible, begin and maximize the communication and information flow between federal agencies proposing actions subject to Endangered Species Act section 7 consultation and the consulting agency (Fish and Wildlife Service or National Marine Fisheries Service).
10. Broaden employee performance appraisal standards that emphasize narrow agency missions with ones that recognize and reward federal managers on the basis of the key elements of the ecosystem approach, such as consultation, cooperation, and participation in interagency planning activities. Provide that future regional heads of federal agencies embrace ecosystem approaches.
11. Encourage and reward the scientists who are working on joint information management systems, including geographic information systems, that link the geographic data and mapping efforts of the federal land management agencies.
12. Place priority on making the computer-based technologies of the Forest Service, Bureau of Land Management, Fish and Wildlife Service, and National Marine Fisheries Service compatible. One short-term step may be to link the Forest Service system to Internet.
13. Develop ecosystem-based management goals and performance measures by which to monitor the cost-effectiveness of the Forest Plan.
14. Fund tribal participation in advisory committees, working groups, and committees associated with the Forest Plan. This could involve proportional contributions from the member federal agencies, as well as increased support from the Bureau of Indian Affairs.
15. Establish an ethic among the managers of federal agencies that the ecosystem approach is a way of doing business in natural resources management. Too frequently, managers expressed the notion that there is a dichotomy between activities to implement the ecosystem approach and "regular work."
16. Consider some form of budget crosscut to identify the specific roles of each federal agency, the funding each would provide to the overall effort, and the accomplishments to be achieved by each agencys contribution to achieving the Forest Plans overall ecosystem goals.
17. Among agencies, develop standard indicators of the desired future condition of the forest ecosystem, and establish monitoring systems to assess the status and trends of the forest in relation to the desired conditions.
18. Implement a training program in public involvement skills for federal employees involved in the effort to implement the ecosystem approach.
19. Identify and implement effective public involvement mechanisms tailored to the needs and lifestyles of the community, including such state-of-the-art techniques as electronic bulletin boards for both information and public comment, as well as more traditional approaches.
20. Continue near-term and midterm support for the Regional Ecosystem Office. This office provides interagency staff support to the Regional Interagency Executive Committee and provides the Committee with a staff-level forum for raising and resolving many interagency issues.

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Chapter 6: PRINCE WILLIAM SOUND

In March 1989, when the Exxon Valdez ran aground in Alaskas Prince William Sound, an enormous ecosystem was devastated by the largest tanker oil spill in U.S. history. Until then, the region had been relatively pristine, minimally influenced by human activities. A joint state/federal council with substantial resources was charged with its renewal. Prince William Sound offered optimal conditions for a case study in the ecosystem approach, providing valuable lessons for broader application. Accordingly, it was selected for study by the Interagency Ecosystem Management Task Force.

Any study on the ecosystem approach must first define the boundaries of the ecosystem and the limits of agency and stakeholder involvement. For purposes of this study (as is often the case), ecosystem boundaries were based not on interrelationships among natural, social, and/or economic resources, but rather on the area affected by a regional catastrophe, in this case the Exxon Valdez disaster. This study focused on activities designed to implement the ecosystem approach throughout the region affected by the spill, including Prince William Sound.

Efforts to implement the ecosystem approach in Prince William Sound are complicated by the fact that the major impetus for them was a catastrophic event, followed by a response and cleanup effort, then by damage assessment, and finally by restoration. The 1989 oil spill was one of the largest environmental disasters in North American history, and the settlement reached for damages to public natural resources was the largest ever. There was no model for managing a restoration effort on this scale, and the spills effects generated-and continue to generate-intense public emotion. Accordingly, the ecosystem approach in the area affected by the spill provides a case study in management of a major restoration effort that continues to be precedent-setting, evolutionary, and emotionally charged.

The Natural Resources Damage Assessment process following the oil spill set in motion a flurry of restoration, monitoring, and research activity involving federal, state, native, and nongovernmental representatives. Coordinated by the state/federal council charged with restoring the regions ecosystem, most of this activity was not necessarily designed with the ecosystem approach in mind, but rather as part of the Natural Resources Damage Assessment process. Accordingly, many comments recorded in this study specifically relate to the Natural Resources Damage Assessment process, and not to the broader concept of the ecosystem approach defined by the Interagency Ecosystem Management Task Force.

In August 1994, an interagency survey team spent a week in Alaska collecting information and meeting with representatives of federal and nonfederal agencies and organizations. The team consisted of Sean Furniss from the U.S. Fish and Wildlife Service, Diane Gelburd from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (formerly Soil Conservation Service), Roger Griffis from the National Oceanic and Atmospheric Administration, Susan Huke from the USDA Forest Service, Louise Milkman from the U.S. Department of Justices Environment and Natural Resource Division, Jim Pipkin from the U.S. Department of the Interior, and Andrea Ray from the National Oceanic and Atmospheric Administration.

Over 4 days (August 2-5), the team interviewed nearly 60 individuals from federal and state agencies, native groups, fishery management councils, local communities, the scientific community, and environmental and other interest groups. This chapter, based on interviews, phone calls, and written material collected by the survey team (see appendix at the end of this chapter for titles of selected materials), records the experiences, observations, conclusions, and recommendations of the interviewees. It includes a set of summary observations and recommendations from the team and a list of selected references.

BACKGROUND

The coastal ecosystems of the Gulf of Alaska are among the most productive to be found in the worlds high-latitude regions. Glaciers that helped form the rugged coastlines still lie above the fjords, rain forests, and coastal deltas of the lowlands. This vast area includes Prince William Sound, lower Cook Inlet and Kenai Peninsula, the Kodiak Archipelago, and portions of the Alaska Peninsula. Salmon, crabs, halibut, shrimp, and pollack are just a few of the important commercial members of the diverse and productive marine intertidal and shelf communities in the region. An estimated 100,000 marine mammals, including sea otters, sea lions, and harbor seals, live in or visit the area annually. The region has historically abundant populations of more than 100 species of migratory and nonmigratory birds, along with a diverse coastal terrestrial community. Indigenous peoples thrived around Prince William Sound for more than 5,000 years, and on the Alaska and Kenai Peninsulas for perhaps as long as 10,000 years.

Exxon Valdez Oil Spill

On March 24, 1989, when the Exxon Valdez ran aground, about 11 million gallons of North Slope crude oil spilled into Prince William Sound. The Exxon Valdez oil spill eventually contaminated 1,500 miles of coastline, affecting a surface area of approximately 75,000 square miles extending throughout southwestern Prince William Sound and along the western coast of the Gulf of Alaska (figure 1).

In spring and summer 1989, thousands were employed to contain and clean up the spill and to rescue oiled wildlife. Shoreline cleanup techniques included removing oil sediments, scrubbing oiled rocks by hand, scouring the shore with high-pressure hot water, and using fertilizer to encourage the growth of oil-eating microbes (bioremediation). Much of this cleanup activity resulted in additional damage to the marine and coastal environment.

The 68 small, relatively isolated communities in the oil spill area depend on local fish and wildlife for subsistence and cash income. Contamination, real or perceived, has greatly disrupted subsistence harvests from the area. The spill has affected local economies as well as the traditional lifestyles that have developed over 10,000 years of human habitation in the area. The spill and resulting activities during cleanup-including vandalism-have damaged many archeological and historic sites. Moreover, increased awareness of the location of these archeological sites threatens their future.

Prince William Sounds wilderness setting offers tremendous opportunities for hiking, hunting, fishing, boating, and sightseeing, and there are a number of federal and state conservation units in the area. Although most recreational areas were not directly damaged by the spill, disruption of the ecosystem has reduced the quality of recreation in the area.

Trustee Council

Following the disaster in 1989, agencies in the region immediately initiated massive response and cleanup efforts, followed by Natural Resources Damage Assessment activities under the authority of the federal Clean Water Act. On October 8, 1991, the U.S. District Court for Alaska approved an agreement to settle the claims of the United States and the state of Alaska against Exxon Corporation and the Exxon Shipping Company for various criminal violations and for recovery of civil damages to the publics natural resources resulting from the oil spill.

According to the civil consent decree, Exxon must make 10 annual payments totaling $900 million for damages to natural resources and services, for restoration of natural resources, and for reimbursement of cleanup expenses. The first payment was made in December 1991, and the final payment is due in September 2001.

The Exxon Corporation also paid federal and state governments $50 million each in restitution as part of the criminal settlement. Both governments are separately spending these funds in the spill-affected area.

The current Exxon Valdez Oil Spill Trustee Council was established to administer the civil trust funds. A formal state-federal Memorandum of Agreement defines the Trustee Council management structure and the rules for allocating the civil settlement funds.

Civil settlement funds are designated to restore spill-affected resources and services, and the Trustee Council allocates funds to projects through a deliberative proposal process. The Council uses guidelines and evaluation criteria, taking into account such factors as the degree to which a proposed project is linked to the Exxon Valdez oil spill and the recovery status of affected resources. The public has the opportunity to comment on proposals, and in many cases is actively involved in developing them. Proposals also undergo outside

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Figure 1.-The Exxon Valdez oil spill area is the area enclosed by the maximum extent of oiled shorelines, severely affected communities and their immediate human-use areas, and adjacent uplands to the watershed divide. Affected lands include national forests, parks, and wildlife refuges. (Source: Alaska Department of Natural Resources, Land Records Information Section.)
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technical peer review under the guidance of the Trustee Councils chief scientist.

The six trustees can take action only by unanimous agreement. Trustees are:

- The Administrator of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce (represented by the National Marine Fisheries Service Regional Director)

- The Secretary of the Interior (represented by the Assistant Secretary for Fish and Wildlife and Parks)
- The Secretary of Agriculture (represented by the Regional Forester of the Forest Service)
- The Commissioner of the Alaska Department of Environmental Conservation
- The Commissioner of the Alaska Department of Fish and Game
- The State Attorney General

Except for the Alaska Attorney General, trustees represented agencies with management responsibilities for resources damaged by the spill. The Trustee Council structure includes a Public Advisory Group and interdisciplinary working groups that form part of an independent scientific peer review process (figure 2). A planning structure and adaptive management process were established (figures 3 and 4), and reviewers were retained to provide independent scientific review of current and planned studies and to assist in the synthesis of results.

In summer 1989, scientists initiated studies to determine the nature and extent of damage to the areas natural resources. In 1989, researchers conducted 72 studies in 10 natural resource and related service areas. Since 1989, the number of studies in progress has declined, although research continues on the effects of residual oil in the ecosystem, on the natural recovery process, and on restoration techniques.

Scientists using available ecosystem data and models have yet to explain the wide fluctuations in fisheries stocks that occurred following the oil spill. These changes in fish populations have affected the human and wildlife communities that depend on fish for survival. There is also evidence of continuing decline in some seabird and marine mammal populations. Understanding these population dynamics is the first objective in managing the aquatic ecosystem. There is also concern about the effects of upland timber harvesting on ecosystem health in the Exxon Valdez oil spill area.

Restoration Plan

In 1990, the Trustee Council began developing a Restoration Plan that outlines how settlement funds will be spent to restore the area affected by the oil spill, including Prince William Sound. Developed in consultation with the Trustee Councils Public Advisory Group chartered under the Federal Advisory Committee Act, a draft of the plan was completed in November 1993 and submitted for public comment. Pursuant to the National Environmental Policy Act, the plan is accompanied by a draft environmental impact statement, completed in June 1994. The final environmental impact statement was issued in September 1994, and the Restoration Plan was adopted by the Trustee Council and published in November 1994.

To assist in setting priorities, the plan includes a list of injured resources, noting which ones are not recovering. Roughly 40 percent of the settlement funds will be used for land acquisitions or purchase of conservation easements for habitat protection. The remaining 60 percent is devoted primarily to research, monitoring, and general restoration activities. About half of this amount will be spent during the annual workplan process, and another third was used to reimburse the state and federal governments for cleanup, response, and damage assessment immediately following the oil spill. The remaining funds are being set aside in a Restoration Reserve account to address long-term restoration needs after the final payment from Exxon Corporation in 2001.

The Trustee Council has decided that more information is needed on the ecosystem dynamics in the oil spill area to help guide and monitor restoration efforts and to refine resource management. Accordingly, the Trustee Council is now funding (beginning in 1994) several ecosystem research programs to gain a better understanding of ecosystem processes and productivity.

BUDGET ISSUES

As an ecosystem in need of restoration, Prince William Sound is uniquely privileged: the settlement with Exxon Corporation provides unusually large amounts of funding. Budget-related questions posed by the survey team during its interviews addressed both the settlement fund allocation and spending needs for ecosystem activities. Questions were designed to solicit information and suggestions on interagency budget coordination, budgetary priority-setting, and budget needs, emphases, and constraints. Many interviewees remarked that the need to address the Exxon Valdez oil spill crisis has induced agencies and people to work together, establishing a structure for general collaboration and cross-agency funding in the future.

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Figure 2.-Management and science planning organizational diagram for the Exxon Valdez Oil Spill Trustee Council.

The Councils structure is designed to ensure public input through the Public Advisory Group into planning and management of monitoring, research, and general restoration through five interdisciplinary coordinating committees. (Source: Exxon Valdez Oil Spill Trustee Council 1994b.)

Figure 3.-Stages in the adaptive management cycle for the Exxon Valdez Oil Spill Trustee Council.
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Using Civil Settlement Funds

By September 1994, a total of $410 million in payments was received from the $900 million civil settlement with Exxon, and a total of about $309 million, approximately one-third of the civil settlement, was spent or budgeted. Of that amount, about $150 million was reimbursed to state and federal governments for oil spill-related expenditures from 1989 through 1992. In addition, about $40 million was credited to Exxon for cleanup expenses during 1991 and 1992, and approximately $119 million was spent or approved for annual restoration work.

Past and future uses of civil settlement funds as of June 1995 are shown in table 1.

About half of the annual work funds have been allocated for habitat protection (primarily through land acquisition). Monitoring, research, and general restoration projects have received another 36 percent. Twelve percent went toward public information and administration. In 1992-1993, a small proportion of annual work funds was spent on damage assessment studies.

In addition, a Restoration Reserve has been established as a set-aside for long-term restoration and research activities. Past authorizations for the Reserve amount to $24 million, with estimated future authorizations of $12 million per year through FY 2002, for a total of $84 million in anticipated funds. Altogether, authorized and anticipated funds for the Reserve amount to $108 million (Exxon Valdez Oil Spill Trustee Council 1994b).

Constraints. Many interviewees noted the difficulty of dealing with a sudden influx of money. Although the goal was to restore the spill-affected area, it was initially unclear how to use the funds to maximum effect. Moreover, the requirement that all six trustees unanimously agree on spending caused difficulties, according to interviewees, in developing a process for quickly determining priorities and beginning to allocate funds.

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Figure 4.-Key steps in the adaptive management cycle for the Exxon Valdez Oil Spill Trustee Council. The Councils annual cycle for planning and management is designed to facilitate adaptive management of science in the oil spill restoration process. (Source: Exxon Valdez Oil Spill Trustee Council 1994b.)

Table 1.-Past and estimated future uses of civil settlement funds as of June 1995

Use Dollars allocated (millions)Research, monitoring, and general restoration 218-248 Past authorizations 110.3 1992 Workplan 19.2 1993 Workplan 15.5 1994 Workplan 25.8 1995 Workplan 24.8 Alaska Sealife Center 25.0 Future authorizations 108-1381Restoration Reserve 108 plus interest Past authorizations 24.0 Future authorizations 84.02Habitat protection 342-372 Past actions 98.1 Inholdings in Kachemak Bay State Park 7.5 Seal Bay on Afognak Island 39.6 For purchase 38.7 Estimated interest 0.9 Timber rights at Orca Narrows 3.65 AKI lands within Kodiak National Wildlife Refuge 36.0 Old Harbor lands within Kodiak National Wildlife Refuge 11.3 Future authorizations 244-274Reimbursements 1773 Past 150.4 Future (estimated) 26.3Adjustments 23.04Total 900

1. Estimated future workplan authorizations are calculated as the residual of $900 million less past and estimated future authorizations for other restoration purposes.
2. Anticipated ($12 million per year through FY 2002).
3. For reimbursements to federal and state governments for past damage assessment, cleanup, response, restoration, and litigation expenses.
4. Includes $39.9 million deducted by Exxon from the 1992 payment for the costs of cleanup completed after January 1, 1991, plus court fees, minus credits for interest earned and funds not expended by agencies.
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All of those interviewed expressed frustration with the fund allocation early on in the process. Because of the difference in state and federal fiscal years, funds were initially allocated for only 6 to 8 months at a time. Although the period was later raised to 12 months, researchers complained that they spent 10-30 percent of their project time devising proposals, recalculating budgets, and writing accomplishment reports due to the unrealistically short timeframe. For most ecosystem research and monitoring, they pointed out, 6 to 12 months are not enough time to produce meaningful results. Delays and uncertainties in continued funding beyond 6-month or 1-year timeframes caused problems for applicants in managing their projects, retaining qualified personnel, and maintaining project continuity and efficiency. Such problems are particularly acute for scientists, who have trouble retaining expert research personnel and continuing long-term data collection without assured funding. With a field season of only a few months, startup (including personnel recruitment and logistics planning) for some projects had to occur almost overnight after funding was approved.

There were differing opinions on legitimate use of settlement funds under applicable consent decrees. Federal and state lawyers had much to say on which projects were funded early in the process. Both state and Native corporation representatives stated that the federal definition of what constitutes subsistence resources was too limited and not take into account damage to cultural resources.

Interviewees expressed general concerns regarding the large expenditure of funds for restoration and research without an adequate adaptive management or evaluative process. Specific concerns were expressed about problems caused by some cleanup efforts and the need to identify such problems quickly. Many interviewees applauded the Restoration Reserve fund for its ability to facilitate adaptive management by allowing money to be set aside for future use without requiring a determination now about how the money should be spent.

In November 1994, the Trustee Council adopted a Restoration Plan that sets the framework for allocating future use of Exxon Valdez oil spill funds. The Restoration Plan includes a mission statement, goals, objectives and strategies, and a set of guiding policies.

Interviewee suggestions. Most interviewees expressed the need for long-term funding of research and such related projects as damage assessment and monitoring. Damage assessment, for example, is based on 3- to 5-year planning, but funding is currently assured for no more than 1 year at a time.

Many involved in research and monitoring suggested extending grant periods from the current 12 months to 2-5 years, subject (of course) to funding availability and continued progress on the project. Lengthening funding terms would increase project efficiency by decreasing project administration. Moreover, developing comprehensive long-range funding plans for research would foster more collaborative and integrative approaches. Trustee Council representatives said that when the Restoration Plan was complete, they would be able to fund longer term projects and will establish a process for multiyear funding. Since our interviews, the Trustee Council has adopted a Restoration Plan and begun a planning process for the next 3-5 years of restoration efforts. This is intended to foster more collaborative and integrative approaches, and to increase project efficiency.

More efficient and direct funding mechanisms are needed. One researcher, for example, complained of having to submit budget proposals to both the Alaska Department of Fish and Game and the University of Alaska, rather than directly to the Trustee Council. Funding of state and federal projects is accomplished fairly easily. However, getting funds to the private sector has proven very difficult. Many researchers have recommended a National Science Foundation model of funding, with named recipients for grants. However, the Trustee Council has no authority to give out grants, and must rely on either sole-source contracts or competitive bidding processes. The difficulty of getting funds to private, nonagency entities has discouraged many in the private sector from participating in this process.

The Trustee Council has begun using a federal competitive process called the Broad Agency Announcement for research and monitoring projects. This permits agencies and private groups to compete on the basis of their proposals merit, and then allows for direct, negotiated contracts upon Council approval. However, this method cannot be used for direct restoration projects, many of which are proposals by village councils to restore subsistence resources. Some interviewees specifically identified the need for more federal matching grants to encourage more state, local, and private sector involvement and support.

Interviewees suggested placing more emphasis on funding for communication efforts. Funding should be provided to the Public Advisory Group, for example, for communication with the entities it represents. Funding should also be provided for a user-friendly information system on research results and natural resources information of interest to the

communities affected by the Exxon Valdez oil spill and to the general public. These suggestions have already been followed up on by the Trustee Council, and as of July 1995, efforts to implement them were underway.

When asked about funding priorities, most people emphasized the importance of funding land acquisition, public information and education, and research on why so many marine species (including fish, birds, and mammals) are experiencing population crashes. Some interviewees also felt that funds were needed for restoration efforts on private lands, in addition to land acquisition.

Federal Joint Funding

Prior to the Exxon Valdez oil spill, federal agencies in Prince William Sound collaborated relatively little on projects and funding activities. Now, however, a number of very positive joint activities are underway.

Collaboration. The National Biological Service, National Park Service, and Fish and Wildlife Service are working together on projects related to the oil spill and ecosystem. They are transferring funds and people between agencies to facilitate coordination.

The Forest Service and Bureau of Land Management are collaborating on a geographic information system project. They are sharing staff, expertise, and data, but are not transferring funds for data collection.

In 1994, the National Biological Service initiated a 3-year Greater Prince William Sound Ecosystem Initiative, one of 12 such agency projects nationwide (another is in Glacier Bay, Alaska). After the National Biological Service develops its approach, it will collaborate with other agencies to integrate scientific information and to close any gaps in knowledge. One reason the agency selected Prince William Sound as a project site is the potential availability of Exxon Valdez oil spill settlement funding to augment its own resources.

Constraints. Experience with the damage assessment process following the Exxon Valdez oil spill disaster indicated a need to improve ways to obtain funding in emergencies. Because the oil spill occurred in the middle of the fiscal year, no funds were available to address the emergency; agencies had to go to Congress to request additional funds. This created administrative problems and left portions of the overall assessment plan unfunded. Moreover, agencies faced the problem of deciding who funded what, and it took time for them to develop a common direction.

Without assured additional funding, federal agencies found it difficult to redirect staff to address the emergency. Because additional staff could not be hired, redirecting staff meant that their regular program activities were neglected.

Most federal agencies are limited to spending appropriations on lands and resources they manage, discouraging them from taking a broader ecosystem approach. For example, the Forest Service needs more research on land-sea ecosystem relations, but it is allowed to fund research only on national forest lands.

Each agency has separate procedures for data collection, budget review, report review, and other processes, which inhibits collaboration with other agencies, universities, and organizations. A true ecosystem approach requires collaboration with Canada, because watersheds and international parks straddle international boundaries. But collaborating on projects with Canada is impeded by the difficulty of transferring funds to Canadian agencies for collaborative research and monitoring. It is easier to collaborate with Russia, because Area 5 agreements provide for funding of Russian entities. Similar agreements are needed with Canada.

Interviewee suggestions. Interviewees felt that it should be made easier to transfer funds among agencies and organizations, perhaps through Memoranda of Agreement or eliminating the need for special interagency agreements. Broader, more credible ways of carrying out monitoring and other tasks will reduce costs, as would use of volunteers. A special agreement to exchange funds with Canada would help to facilitate an ecosystem approach across international boundaries.

Incentives for collaboration would help to optimize use of scarce resources and to mitigate competition for them. Collaborative work could be made a selection criterion for grants.

More support should be given to establishing baseline data before a crisis occurs, to facilitate analysis of disaster effects and to help measure restoration accomplishments. The assessment should be conducted collaboratively and with joint funding from all involved.

More funding is needed for research, monitoring, and restoration, and particularly for education and communication. An electronic bulletin board or data base of research reports and other information might be established. There should also be more emphasis on technological tools, such as geographic information systems, perhaps with the help of the U.S. Department of Defense.

INSTITUTIONAL ISSUES

In spite of the Exxon Valdez oil spill, Prince William Sound is still relatively pristine, with little contamination from other sources (such as nutrients or heavy metals), and with significant natural resources for extraction and tourism. The region is sparsely populated compared to other survey team study sites, such as South Florida or the Great Lakes basin (see corresponding chapters in this volume). Still, a variety of federal, state, and native institutions have long been active in the region, responsible for managing its rich natural resources. Before the disaster, there was no major interagency coordinating institution, even though agencies collaborated on various projects. The Exxon Valdez oil spill provided the impetus for the regions first concerted interagency coordination, although declines in fisheries beginning in the 1980s also demanded interagency action, according to some interviewees.

Institutional representatives in the region-and the general public-are convinced of the need to avoid the problems and conflicts over multiple resource use that have plagued other regions. Survey participants foresee continued problems in coordinating the regions diverse institutions, and they are anxious to learn from other regions how to change the culture of institutional interaction and to design effective processes for institutional coordination.

Trustee Council

The major coordinating institution in the region is the Exxon Valdez Oil Spill Trustee Council, created in 1989 immediately following the spill. Before its official inauguration in October 1991 (under formal agreement between state and federal governments), the Council coordinated activity to clean up the oil spill and to assess the extent of damage in preparation for a formal Natural Resources Damage Assessment. Survey participants voiced considerable criticism of the Natural Resources Damage Assessment process and of the poorly coordinated response to the spill, which they attributed to lack of clear leadership by any single state or federal agency.

Trustee Council authority. One problem is that the Prince William Sound ecosystem-in both scientific and institutional terms-is larger than the Exxon Valdez oil spill boundaries defined by the Trustee Council. Exxon Valdez oil spill boundaries contain a mosaic of native, state, and federal lands (such as national forests and state parks) with different purposes and trust managers. Although the Trustee Council includes members from these agencies, it lacks direct management authority. Therefore, it must depend on the cooperation of agencies and nongovernmental entities in the region. The challenge of getting various management entities to coordinate their diverse mandates and to work toward common goals has proven daunting, according to many participants.

The rule that Trustee Council decisions must be based on unanimous consent was considered an obstacle to restoration efforts by some participants, because it (in effect) gives veto power to any Council member. However, others felt that it provided an opportunity to build consensus. Council representatives considered it a major accomplishment to get agencies in the region to agree to the goals and objectives for research, monitoring, and restoration outlined in its Restoration Plan.

Ecosystem approach. The Trustee Council was not set up to implement the ecosystem approach, but rather to allocate Exxon Valdez oil spill civil settlement funds. But in its policy declarations and programmatic decisions, the Council has embraced the ecosystem approach. To address criticisms, it has evolved in important ways in both structure and process, partly by seeking to learn lessons from other regions. Trustee Council representatives specifically noted studying the structure of the U.S.-Canada International Joint Commission for the Great Lakes and how it has worked to implement the ecosystem approach.

In November 1993, the Trustee Council made several changes to improve the efficiency of its planning process and to address the issue of the ecosystem approach. An executive director was hired to develop a comprehensive ecosystem-based approach to restoring Prince William Sound. In addition, the Council established a position for a director of operations. Because these staff members, along with the chief scientist (a position created in 1990), are independent of any trustee agency, they are able to take a broader view, helping to facilitate consensus on the Council. Moreover, they are able to focus on planning and setting goals for restoration and management activities, and to work with agencies on implementing plans.

In its Restoration Plan, the Trustee Council established the ecosystem approach as a primary policy. In addition, the plan incorporated ecosystem and restoration goals and objectives that were developed during a series of workshops attended by involved scientists and members of the public. A group of core reviewers was identified, who provide individual advice to the chief scientist on the program in its entirety. Because the Trustee Council provides the major funding for ecosystem research in Prince William Sound, it is becoming the leading catalyst for a broader ecosystem approach to resource management in the area.

The Trustee Councils appraisal process for land acquisition is designed to facilitate the ecosystem approach. Land parcels considered for acquisition are evaluated in terms of their resource value and the degree of their linkage to resources affected by the oil spill. The Council considers the synergistic value of acquisitions, assigning priority to groups of parcels that, taken together, will contribute to restoration over a larger area.

Opportunities for the Ecosystem Approach

Most agencies and institutions in the region expressed clear support for the ecosystem approach. Few examples were given of agency barriers to the ecosystem approach; most survey participants were positive about agency efforts to change the way they do business, in accordance with the ecosystem approach. The U.S. Army Corps of Engineers A-95 wetlands permits were cited as one example, although no specifics were given. A number of management and planning processes in the region could be adapted to ecosystem goals, including forest management plans and recovery plans for endangered species, which should be considered in an ecosystem context. One participant called these "protoecosystem management" mechanisms, and many suggested that incorporating goals of the ecosystem approach into these processes would be a major step forward.

Interviewees offered several examples of what agencies are doing outside the Trustee Council process to incorporate adaptive management (feedback processes) and to take an ecosystem approach through coordination and cooperation with other agencies, incorporation of regional goals, and other means.

State of Alaska. The state of Alaska has a number of coordinating mechanisms, including the Alaska Water Directive, an administrative order by the Governor that is designed to avoid duplication of effort among state and federal agencies by defining and consolidating responsibilities. Implementation of the directive is assisted by the Water Management Council, which has quarterly meetings of 28 state and federal water management and research entities to discuss water issues. Alaska also has Public Information Centers distributed throughout the state to provide all the necessary information to planners and developers on permits (primarily issued by the state and Army Corps of Engineers); both state officials and members of the public urged the federal government to provide this type of "one-stop shopping" for other kinds of permits and regulatory processes.

Department of Defense. Although the survey team did not speak with officials from the Department of Defense, several interviewees mentioned the potential of military technology for environmental applications, especially remote sensing tools, in situ observing systems, and data management expertise.

Fish and Wildlife Service/National Park Service. The Fish and Wildlife Service and National Park Service manage the Alaska Peninsula, Kodiak, Kenai, and Becharof National Wildlife Refuges and the Katmai and Lake Clark National Parks, which surround much of the western oil spill area. Representatives from both agencies stated that they are working to define goals of the ecosystem approach.

Forest Service. The Forest Service is evolving a new mode of planning and decision making for its forest management plans, currently under revision for both the Chugach and Tongass National Forests. Forest management plans are an important part of the process for shaping future conditions in the Prince William Sound ecosystem, given the large tracts of public lands surrounding the Exxon Valdez oil spill area. The Forest Service recognizes that there are strong qualitative and quantitative links between forest cutting and salmon, wildlife, and water quality. To address these links, the agency is initiating ecosystem planning for both the Chugach National Forest, which surrounds much of Prince William Sound, and the Tongass National Forest. The Forest Service defines ecosystem planning using an interdisciplinary team to brings more people and issues into the forest planning process. However, the complex system of multiple owners and interests involved on most federal lands is a challenge to the process: on the Chugach National Forest, for example, there are three Alaska boroughs and three federal agencies involved, along with several Native corporations and state agencies, and the Copper River drainage basin extends into Canada. In 1989, the Forest Service established the Copper River Delta Institute in Cordova to provide increased ecological research and public interpretation on the Copper River Delta and Forest Service lands.

National Biological Service. The National Biological Services Prince William Sound-Copper River Ecosystem Partnership, begun in 1994, is designed to facilitate ecosystem-based approaches to resource management through partnerships between the National Biological Service and other agencies and organizations in the Prince William Sound drainage basin. The agencys strategy is to identify and fill in gaps in what the Trustee Council is able to do and fund under its mandate for restoration.

One of 12 such National Biological Service efforts nationwide, the Prince William Sound-Copper River Ecosystem Partnership looks beyond resources and species damaged in the Exxon Valdez oil spill. The Initiative focuses on declining populations of harbor seals and sea lions in the Gulf of Alaska, on terrestrial systems and old growth forests, and on parts of the Prince William Sound ecosystem that lie beyond oil spill boundaries (such as the Copper River basin and the Wrangell-St. Elias wilderness). Specific areas to be addressed include developing an information management system and a functional linkage model of the whole ecosystem to guide future science efforts. Information developed in partnership with other agencies will be used to influence decisions on land use, timber harvesting, oil and gas leasing, and other natural resource management issues. The National Biological Service holds workshops and synthesis conferences in the region to define emerging and critical issues.

National Oceanic and Atmospheric Administration. NOAA has several programs that contribute to, or are opportunities for, an ecosystem approach. Under the Coastal Zone Management Act, NOAA works with the Alaska Coastal Management Program to help protect coastal resources and promote sustainable development through federal grants, program review, and technical assistance. The Alaska Coastal Zone Management Program received federal approval in 1979 and has since completed 34 of 36 locally developed district coastal management programs. The Sea Grant Marine Advisory Service is another of NOAAs educational and community involvement tools, with agents in communities in all coastal states, including Alaska. Its job is to get information and technology on coastal resources into the hands of people who can use them. The Marine Advisory Program is a grassroots effort, with agents located in eight communities along Alaskas 55,000 miles of coast.

NOAAs National Marine Fisheries Service (NMFS) supports multidisciplinary research on fisheries oceanography. Cited by survey participants as an example of good interdisciplinary work, this research provides information important to broader management of marine resources in the region. Current studies focus on the influence of coastal eddy currents and other oceanographic features on the survival and maturation of larval and juvenile pollock in the Shelikov Straits and Bering Sea. Research involves models coupling biological and physical factors, and results are now being used by the North Pacific Fisheries Management Council in stock assessments. NOAA has management responsibility for living marine resources beyond 3 miles, whereas the state has primary responsibility for fisheries within the 3-mile zone, including coastal salmon.

The NMFS was praised for its research efforts, but criticized for continuing to take a single-species approach rather than expanding its scope to include broader factors such as predator/prey relationships, physical processes, and habitat. NMFS employees stated that they have not been able to adequately address habitat issues because the Auke Bay laboratory has not received funding for habitat-related work. Most such work is supported from outside the agency (by Shell Oil, the Fish and Wildlife Service, and the Army Corps of Engineers), limiting the ability to apply resources to habitat-related priorities set by the NMFS. Due to budget constraints, the NMFS is faced with difficult decisions on whether to allocate resources to such management efforts as habitat protection or to meet short- and long-term research needs.

North Pacific Fishery Management Council. The North Pacific Fisheries Management Council (NPFMC) is one of eight U.S. Regional Fishery Management Councils created under the Magnuson Fishery Conservation and Management Act. The NPFMC advises the U.S. Secretary of Commerce and the state of Alaska by assessing and developing regional fisheries management plans for several species (such as salmon, king and tanner crab, pollack, herring, and squid). The major regional coordination and management institution prior to the Exxon Valdez oil spill, the NPFMC is moving towards an ecosystem approach by supporting studies of target predator and prey species in the trophic chain of target species, issues relating to hatchery salmon and wild salmon, and predictive fishery models. It has also funded research aimed at developing information for specific management plans. The NPFMC has an executive director and staff who are not federal or state employees, a scientific and statistical panel that advises on scientific and technical matters, and an advisory panel with members representing major segments of the fishing industry, including catching and processing, subsistence fishing, consumption, and sport fishing.

The NPFMC provides fishery management plans to the Department of Commerces National Marine Fisheries Service. In accordance with adaptive management, after a plan is developed, it can be amended during an annual revision cycle, based on new scientific information collected by the scientific and technical committee, NPFMC staff, and

special advisors. Emergency provisions allow for relatively rapid responses. The NPFMC takes an ecosystem approach to setting maximum sustainable yields and optimum yields, recognizing that in order for fish stocks to be sustained, the ecosystem as a whole must be understood. Research is being funded by the NPFMC on trophic interactions related to fish, such as marine mammal feeding habits. Representatives of the NPFMC feel that the industry advisory panel has generally been interested in getting the best scientific advice and in heeding it during plan preparation.

Prince William Sound Science Center. The Prince William Sound Science Center in Cordova is a private, nonprofit corporation founded by a group of local researchers, fishermen, and public officials. The Center also administers a federally funded entity, the Prince William Sound Oil Spill Recovery Institute, mandated by the Oil Pollution Act of 1990. The Center is supported by a combination of state and federal contracts and private foundation grants, including federal appropriations from fiscal years (FY) 1991-94 to support the Oil Spill Recovery Institute, a 3-year grant from the M.J. Murdoch Charitable Trust to increase public involvement in sustainable resource use planning, and a major contract for the Trustee Council to conduct ecosystem monitoring in Prince William Sound. The Oil Spill Recovery Institute has developed a Research and Development plan for oil spill prevention and response and, in conjunction with the Science Center, developed an ecosystem research plan for the greater Prince William Sound region.

Prince William Sound Fisheries Ecosystem Research Planning Group. The Prince William Sound Science Center worked with fishery organizations and others based in Cordova to bring together commercial and recreational fishermen, native and environmental representatives, other users, scientists, and resource managers into the bioregional Prince William Sound Fisheries Ecosystem Research Planning Group. The Planning Group includes Cordova District Fishermen United, the Cordova Aquatic Marketing Association, Prince William Sound Aquaculture Corporation, the Prince William Sound Science Center, the University of Alaska at Fairbanks, Eyak Corporation, Prince William Sound Conservation Alliance, and local staff of the Alaska Department of Fish and Game.

The Planning Group has developed an ecosystem research plan with a broad-based, long-term, regional perspective: research is designed to address ecosystem goals based on local priorities (such as maintaining a sustainable fishery and a resource for tourism). The plan, called the Sound Ecosystem Assessment, proposes long-term bioregional research and monitoring of the Prince William Sound fishery ecosystem. The Planning Group hopes that agencies will consider these goals for research and monitoring in their program planning. The Sound Ecosystem Assessment deals with the difficulty of studying a whole ecosystem by concentrating on two species of concern-the pink salmon and Pacific herring-as key to understanding Prince William Sound ecosystem dynamics. In April 1994, the Sound Ecosystem Assessment began collecting data on these two species, their predators and prey at several stages in their life cycles, and the nutrient and physical regimes that influence their biology. Funded in FY 1994 by the Trustee Council, the Sound Ecosystem Assessment is one of three multi-investigator ecosystem research programs being considered for continued funding.

Organizers said that the impetus for forming the Prince William Sound Fisheries Ecosystem Research Planning Group was local concern about the Prince William Sound ecosystem, coupled with frustration over the lack of organization provided by the Trustee Council and agencies in the region early after the settlement, and the lack of interest on the part of these entities in drawing on local knowledge. Members in the Planning Group were also concerned that monitoring and research being done in the area (in which many of them were involved) was for oil spill litigation before the settlement, and not to formulate any coherent science plan. They were also motivated by the need to understand why returns of pink salmon were so aberrant in 1991-1993, and why Pacific herring stocks failed in 1993.

Based on its experience with the ecosystem approach, the Planning Group stated that the ecosystem approach must be multidisciplinary (not just concerned with multiple species) and multiorganizational, involving nongovernmental entities and industry, must involve and empower local groups and knowledge, and must be desired by the locality or region. The ecosystem approach, according to Planning Group representatives, can be facilitated in several ways:

- Provide top-down approval and support from agencies with a documented process for coordination, such as cooperative agreements or Memoranda of Agreement.
- Develop two-way communication of information and ideas (bottom-up and top-down), empowering middle and lower levels.
- Limit decisions made outside the region by people removed from the issues and local priorities, because external decision making undercuts local and regional efforts and makes public participation meaningless.
- Make regulations and guidelines flexible to allow for innovative solutions and site-specific implementation. For example, the Environmental Protection Agency (EPA) requires grinding of waste

from fish-processing plants, but in Cordova some scientists feel that dumping waste in larger pieces is environmentally better.
- Make funding sources available to support multidisciplinary and multiorganizational work, and recognize that coordination and integration require travel and synthesis conferences and funding for these activities.
- In accordance with the steps above, decrease the centralized power of individual agencies (by increasing shared information and decision making) in order to empower people and managers in the locality. Resistance to power sharing in agency culture must change if the ecosystem approach is to be implemented.

Constraints to the Ecosystem Approach

The oil spill forged unity among groups based on an immediate common goal and short-term vision: cleanup and restoration. But most survey participants saw no shared vision for the future of Prince William Sound. The goals defined in the Trustee Councils Restoration Plan are specific about restoring the ecosystem and intentionally narrow in focusing on resources injured by the oil spill. There are important resource issues that are not included in the Exxon Valdez oil spill plans, such as upland and old growth forest issues, the Copper River and the Wrangell-St. Elias ecosystems (outside the defined Exxon Valdez oil spill area), and marine species in the Gulf of Alaska.

Establishing common goals. Interviewees often pointed to a major roadblock in restoring and managing Prince William Sound: the difficulty of obtaining agreement among multiple agencies on the nature and implementation of a common set of goals. Commonly formulated goals do exist, including the goals of the Restoration Plan, the research and monitoring goals of the Sound Ecosystem Assessment, and the goals of other ecosystem plans supported by the Trustee Council. But it is still uncertain whether agencies will actually integrate their programs and plans with Restoration Plan goals, or how they will be able to direct their resources toward these regional goals. Many interviewees wonder whether-and to what extent-agencies will actually implement common program priorities. Many believe that these priorities will remain on paper only, and that they will fail to be funded through budget allocations and put into practice.

Although the Trustee Council may help to define the goals of the ecosystem approach, it is not responsible for management actions (except through funding restoration efforts), nor can it do more than encourage agencies to integrate their strategies and programs with those of the Council itself. Interviewees did not see management authority for the Trustee Council as a way of solving the problem, nor did they see lack of integration as solely a problem of the Council. Instead, they felt that agencies should take the initiative in integrating their programs with the regional goals set by the Trustee Council and other entities.

Some survey participants suggested naming a "lead" agency for programs or for restoration or cleanup efforts because it is difficult to work with six or more federal and state agencies without a lead. Both the new executive director of the Trustee Council and the National Biological Service ecosystem initiative were cited as potentially addressing this problem through the Trustee Council process.

Participants called for more collaborative development of policies and programs. Frequently, one agency develops a plan or set of priorities, then tries to "sell" it to other federal and state agencies and entities. Although the Exxon Valdez oil spill strategic restoration planning process (see figure 3) is developing goals for the ecosystem approach for the area, there is concern that narrowly interpreted agency mandates will stand in the way of their implementation. The Trustee Council will have to work diligently to see that the strategic plan is accepted and implemented by many agencies. Currently, species management is controlled by a number of different agencies:

- Hunting seasons are set by the state, but hunting access is regulated or affected by Native corporations or by federal policies under the Endangered Species Act and forest management plans.
- Hunting seasons for migratory birds are set by the state within a federal framework.
- Fishing seasons and harvests are set by the state and the National Marine Fisheries Service; although the North Pacific Fishery Management Council has only an advisory capacity, it is politically difficult to ignore.
- Approvals for land acquisitions by the Trustee Council are managed by the Forest Service, state, or Fish and Wildlife Service.
- The Trustee Council has been asked to fund hatcheries, which have drawn state funding in the past. Insufficient attention is paid, according to interviewees, to the ecosystem implications of hatchery stocks,

despite problems in the Pacific Northwest. The Council has not funded any hatcheries to date.
- The timber resource is managed by multiple entities, including the Forest Service, Native corporations, and the state of Alaska, with little coordination.

Both state officials and members of the public urged the federal government to provide "one-stop shopping" for information on regulations, on various planning documents (such as forest and other land use plans), and on permits and regulatory processes. They felt that having this information available would facilitate coordination and clarify established goals.

Native corporations and communities. Considerable land in the Exxon Valdez oil spill area is owned and managed by Native corporations (including the Chenega, Tatitlek, Eyak, and Chugach corporations in Prince William Sound). There was a general feeling among interviewees that native groups and their perspectives and interests are not as well integrated into agency activities as they should be, but few specifics were given. Three key points were made:

1. Because native lands are privately owned, one interviewee said, the National Environmental Policy Act does not apply to them, and thus native populations do not benefit from its provisions.
2. Native groups have not had some of the same tools and background as others in applying for funding from the Trustee Council. They need assistance in writing proposals that will be given equal weight by the Trustee Council.
3. Native corporations are clearcutting, mining, and drilling on lands that are not being managed sustainably or in a manner consistent with traditional hunting, fishing, or gathering practices. This may negatively affect resources and efforts in the region as a whole.

In the past year, Trustee Council staff have initiated a major outreach effort to Native organizations and communities in the spill area. Although the issues listed above are still of concern, a much larger number of Native concerns are being addressed in projects that are now being funded by the Trustee Council.

Advisory committees. Several academic survey participants complained that procedures for bringing in experts from outside a federal resource agency are weak, and that integration of research expertise from universities has therefore been limited. One impediment is the Federal Advisory Committee Act, which prohibits advice from outside scientists unless advisory committees are formally constituted. For this reason, the Trustee Council is using an informal group of nationally recognized scientists to assist the Chief Scientist in his review of proposed restoration efforts.

Federal contracting regulations. Federal contracting regulations do not allow for open competition for research, restoration, and other projects. Before an agency solicits bids for research assistance, it must determine whether the process will be sole-source (within the agency, for example) or open-bid. If sole-source, universities and private entities are excluded from competition. If open-bid, federal scientists are precluded from competing. The result is that research is not always performed by the most appropriate scientists, as determined by open competition and peer review.

Frequently, university and federal scientists collaborate through cooperative agreements, but without such agreements, collaboration is difficult. For example, in past years academic researchers had difficulty obtaining funding from Exxon Valdez oil spill settlement monies unless they were at an institution covered by one of these agreements and had a federal collaborator. Recently, the Trustee Council attempted to address this problem by issuing a separate Broad Area Announcement available to academic researchers. Council staff continue to experiment with Broad Area Announcements for research and monitoring projects. This contracting process appears to hold much promise, allowing for a more openly competitive process.

Although scientists felt that cooperative agreements and units help facilitate collaboration, the real solution to this problem, they said, is to ease federal contracting regulations to allow for free and open competition for all research and restoration funds using a National Science Foundation model. Opening the process would help to solve the problem of locating those best suited, in terms of skills, expertise, and resources, to work on a particular project. This problem is particularly acute in regions where the number of experts in any given scientific area is small.

Other ecosystems at risk. Several survey participants called for taking a proactive stance on the likelihood of future disasters, perhaps by establishing strategic environmental baselines for other areas vulnerable to similar oil spills and

contamination. Cook Inlet was one area of concern, because it receives considerable ship traffic with a variety of oil, fuel, and other cargoes. The Pribilof Islands were another area where harbor and airstrip development may lead to oil spills, disruption of rookeries, and pollution from fish processing.

Participants recommended baseline ecosystem surveys before major problems occur (or before degradation mounts), and they called for implementing disaster prevention and ecosystem management goals. Interviewees maintained that funds from agency budgets were inadequate for other areas at risk, and that the Exxon Valdez oil spill experience has shown how difficult it is to respond without adequate background information.

LEGAL ISSUES

Interviewees raised a variety of legal issues surrounding Exxon Valdez oil spill litigation, the settlement agreement, and laws pertaining to restoration activities and the ecosystem approach in the area around Prince William Sound.

Exxon Valdez Oil Spill Settlement

Many current activities in Prince William Sound had their genesis in litigation, after the federal and state governments prepared civil and criminal lawsuits against Exxon and the Alyeska Pipeline Company under the Clean Water Act and other statutes. As a result of the settlement, the restoration of Prince William Sound is funded largely by monies from Exxon. Their expenditure must conform to the consent decree governing settlement and to the Memorandum of Agreement between the United States and Alaska, over which a federal judge retains jurisdiction. A formal structure (the Trustee Council and its Public Advisory Group) was established to ensure that all expenditures conform to these documents.

Effects of litigation. Many of those interviewed said that litigation had detrimental effects on ecosystem restoration and management, primarily in two ways. First, because data collection was designed from the outset to meet litigation needs, most studies focused on the extent of oil spill damage rather than on prospects for restoration. Studies that scientists considered important were sometimes discontinued after legal review, because they were not necessary to prove the case. Lawyers directed that studies be done and information gathered on issues that would be of particular interest or understandable to a jury, rather than on issues that would provide the best information for restoration purposes. However, lawyers often felt that agencies were doing research according to their own priorities without giving sufficient consideration to litigation or restoration needs.

Second, because the issue of damage to resources was in litigation, researchers were directed to keep all studies and information on the subject confidential. This kept information from being shared, sometimes even within agencies. It also created a hardship for scientists, whose career success depends on sharing and discussing their research with other scientists and on publishing the results.

Even after the end of litigation, research remained undirected and disorganized, according to many interviewees. This was partly because no plan was in effect at the time the Exxon Valdez oil spill occurred. Some scientists wanted to continue their work, regardless of whether it was relevant to the spill. Some studies were duplicated because agencies could not agree on who should do them. Finally, agencies could not agree on who had responsibility for restoring or conducting research on particular resources. The fundamental problem was that it was often unclear what agency priorities were and who was in charge of the process. No single independent agency or person was in charge of the overall process, a problem finally addressed when an executive director was appointed to the Trustee Council (an approach that has proven successful in other interagency Natural Resources Damage Assessment and restoration planning efforts around the country).

Some interviewees recommended that the government prepare for future catastrophes by devising restoration contingency plans, akin to the response contingency plans now prepared pursuant to the Oil Pollution Act. Plans would specify such things as what short- and long-term research should be done and who would be responsible for it, where agencies should work together, how to prepare baseline information in advance and to use that information for restoration, and what research equipment would be available. Many of these suggestions are addressed in the proposed Natural Resource Damage Assessment regulations under the Oil Pollution Act. It was noted that such planning would demand extensive resources, and that the most important action would be to put one person in charge of damage assessment and restoration immediately after a spill occurs.

Use of settlement funds. The Trustee Council met with mixed reviews in its administration of Exxon Valdez oil spill settlement funds. Some praised the Trustee Council for bringing diverse state and federal parties to the table to

exchange information and resolve restoration issues, and for giving the public a chance to see how the trustee leadership works. But many criticized the unanimous consent requirement for slowing the decision-making process and eliminating individual accountability. The funding cycle was also criticized for being too short and for subjecting funding applicants to burdensome procedural requirements.

There is not enough money in the settlement to conduct all the restoration activities desired. However, the Trustee Councils Restoration Plan has developed a comprehensive, balanced approach to restoration that includes funding for all the various kinds of restoration activities. Many of the criticisms heard earlier in the process have now been addressed.

Trustee Council decisions are subject to legal review to verify that settlement fund expenditures are in compliance with the consent decree. Interviewees complained that legal opinions are slow in coming, sometimes in conflict with each other, and often at odds with the reality of the local situation. Moreover, not all parties affected by the Exxon Valdez oil spill feel that they have had adequate access to settlement funds. Representatives of the Chenega Bay Corporation, for example, complained that they had no assistance in writing funding proposals that will conform to the requirements of the consent decree and Memorandum of Agreement.

In its Restoration Plan, the Trustee Council established the ecosystem approach as a primary policy to help guide use of settlement funds. Several proposed or approved projects funded by settlement funds were praised as facilitating the ecosystem approach. For example, a long-term reserve containing funds for future research facilitates adaptive management by setting aside money for future use without stipulating now how it should be spent. The appraisal process for land acquisition also facilitates the ecosystem approach. Land parcels considered for acquisition are prioritized in terms of resource value and linkage to affected resources. Priority is given to groupings of parcels that, taken together, will enhance restoration over the largest area possible. In general, both research and monitoring are moving away from a species-by-species approach and towards an ecosystem approach.

Legal Authorities

Many complex legal issues in other regions discussed in this volume-involving the National Environmental Policy Act, the Endangered Species Act, and land management statutes-are of lesser concern in the Exxon Valdez oil spill area. This may be because the area around Prince William Sound, which includes large tracts of federal land, is still relatively isolated and undeveloped. The multiple sources of contamination found in more populated areas are largely absent here, and the environmental problems and land management conflicts resulting from heavy resource extraction are far less (with the notable exception of the Exxon Valdez oil spill). But these problems may become more prevalent in the future as logging, fishing, and other extractive activities increase. Statutes and regulations relating to the Exxon Valdez oil spill and to the ecosystem approach in Prince William Sound include the Oil Pollution Act, Federal Advisory Committee Act, Alaska Native Claims Settlement Act, and federal contracting regulations.

Oil Pollution Act. The Oil Pollution Act, 33 U.S.C. §§ 2701 et seq., which was passed by Congress in the wake of the Exxon Valdez oil spill in 1990, contains many provisions that facilitate interagency cooperation and an ecosystem response. The Act allows funds recovered in a natural resource damage lawsuit against an oil spiller to be used for restoration in the damaged area, providing a fund of money for restoration after a lawsuit is settled or otherwise resolved. This beneficial arrangement is unusual, because funds recovered by the United States in an environmental lawsuit are ordinarily deposited into the federal Treasury and cannot be used to restore the damaged resource.

Section 1006 of the Act (which provides for natural resource damage assessments), along with its legislative history, encourages interagency cooperation and federal, state, and native coordination in damage assessments and studies. The Act directs agencies to exercise joint management or control of shared resources, and it makes up to $50 million immediately available for damage assessments and emergency removal work. Title V of the Act creates and funds regional citizen advisory groups as well as the Oil Spill Recovery Institute in Cordova, associated with the Prince William Sound Science Center.

The NOAA has published proposed regulations for Natural Resources Damage Assessments under the Oil Pollution Act (59 Fed. Reg. 1062, 7 January 1994). Among other things, the regulations would encourage natural resource trustees to "coordinate among themselves, the response agencies, the public, and any potential responsible parties interested in developing contingency plans for a damage assessment." They would allow agencies to combine funds recovered in several natural resource damage cases in a region, so that the money recovered can fund a larger long-term "Regional Restoration Plan," and they would authorize state and federal trustees to establish "joint trustee accounts" to share funds recovered as a result of an oil spill.

Federal Advisory Committee Act. The Federal Advisory Committee Act (FACA), 5 U.S.C. App. 2, restricts the ability of federal agencies to solicit and receive collective advice from nonfederal parties. An advisory committee, as defined by FACA, must be organized under a charter, balance its membership, post notification of its meetings in the Federal Register, hold open meetings, take minutes of meetings, provide transcripts of meetings upon request, and make available any documents relied upon by the committee, among other things.

In the Exxon Valdez oil spill process, the Public Advisory Group was chartered under FACA, and has begun to work quite well. But agencies are concerned about FACA constraints in more routine, informal situations, where state or other outside parties would be brought in to discuss discrete issues on a short-term basis. In such cases, the time and resources required to comply with FACA may outweigh the benefits of nonfederal participation. Agencies are also concerned that groups chartered under FACA might often be too large to work efficiently and productively. Support was expressed for a legislative exemption from FACA for meetings with state officials.

Alaska Native Claims Settlement Act. The Alaska Native Claims Settlement Act, 43 U.S.C. §§ 1601 et seq., was passed in 1971. In return for almost $1 billion and 40 million acres of land in fee simple, native claims to aboriginal lands were extinguished. The Act provided for the formation of native regional and village corporations (chartered under state law) as a prerequisite to receipt of lands or benefits. Twenty-two million acres were selected by village corporations, primarily from available land in the vicinity of the villages. Remaining lands were to be distributed to regional corporations and then allocated on an equitable basis among native villages within regions. Corporations hold title to the land, control subsurface and timber rights, and administer settlement benefits.

Tribal government functions are usually vested in a village council, which is separate from the village corporation under the Alaska Native Claims Settlement Act. Corporation leadership and village council leadership do not always coincide or operate consistently. For example, a village or regional corporation may manage natural resources in a way that the village council, and the people who elected it, disagree with.

Many Native corporations have not been profitable. In recent years, many in the Prince William Sound area have intensified resource extraction, including clearcutting of timber. These activities were criticized by some native and nonnative interviewees. Members of native villages expressed concern that there is no forum for public debate or input on environmental issues (such as a counterpart to the National Environmental Policy Act),* and that decisions are made unilaterally by elected corporation boards. Nonnative people dependent on fisheries complained that native resource extraction has detrimental effects on other resources in the Sound.

Federal contracting regulations. See discussion under Budget Issues.

Local Involvement in National Rulemaking

Many interviewees suggested that interested local parties be given more of a voice in the ecosystem approach. One important role for local groups might be to ensure that federal or state laws or regulations apply properly to the ecosystem at issue, or to facilities within it. Where a federal regulatory requirement does not properly apply to a given ecosystem or facility, those affected by the requirement should be able to make their views known.

For example, for some facilities in the Prince William Sound area, compliance with a certain EPA regulation governing disposal of fish waste is neither necessary nor environmentally beneficial, according to local scientists. But local fish processors and others in the area did not find acceptance for this view in public hearings, and they had no other way to get EPA to consider it. A more powerful, recognized local "spokesgroup" for the ecosystem would be more effective in making federal regulators understand local features of the ecosystem, and in bringing local knowledge to bear on permitting decisions based on nationally applicable regulations.

International Issues

Ecosystems cross national as well as state boundaries, and efforts are underway to join with Canada and other countries to protect such ecosystems. But agency officials noted that many international agreements involving resource protection hinder coordinated bilateral efforts. For example, the United States and Canada have signed a treaty to protect the Porcupine River caribou herd, which lives in both countries. But the treaty provides no easy mechanism for joint expenditure or transfer of funds. Accordingly, when the United States wants to take a survey, it cannot charter a Canadian plane without going through time-consuming procedures involving nongovernmental parties. One solution to this problem might be along the lines of the bilateral agreement establishing the Great Lakes Fishery Commission, under which funds for expenditures go to the Commission itself. Another useful model is the

Area 5 agreement between the United States and Russia, which allows for bilateral exchanges of scientists working on environmental matters.

PUBLIC PARTICIPATION

The importance of two-way communication between the public and government was a prevalent theme of discussion during interviews for this case study. Spokespersons from federal, state, and local agencies and from nongovernment organizations all said that public input was key to a successful ecosystem approach. They also referred to the difficulty of communicating with a public as dispersed and ideologically diverse as in Alaska.

Efforts to Involve the Public

Numerous groups have solicited public input on the government response to the Exxon Valdez oil spill and on other efforts related to the ecosystem approach in Prince William Sound. These groups include the Trustee Council and its Public Advisory Group, the Alaska Department of Community and Regional Affairs, the Alaska Division of Governmental Coordination, the USDA Forest Service, the Joint Pipeline Office, the NOAA, the North Pacific Fisheries Management Council, the Prince William Sound Science Center, and the Prince William Sound Regional Citizens Advisory Council.

The Trustee Council. The Trustee Council has encouraged public input in various ways, including:

- Holding public hearings and public review of key documents. Meetings have been held on a regular basis in communities within the oil spill area.
- Opening all Trustee Council meetings (except executive sessions) to the public, and ensuring that members of the public attend and are key players in all council activities.
- Producing a bimonthly newsletter, an annual report, and other written reports to the public.
- Improving access to Trustee Council-funded reports and information through an Internet connection at the Oil Spill Public Information Center.
- Utilizing teleconferencing to encourage involvement of local communities in public meetings.
- Surveying the public regularly on how Exxon Valdez oil spill civil settlement funds paid by Exxon should be spent.
- Funding a number of projects that foster community involvement and participation.

The results of the survey on spending Exxon Valdez oil spill funds had a significant impact on the Trustee Council, causing it to shift funding priorities.

The Trustee Council was required by a Memorandum of Agreement between the United States and the state of Alaska to create "procedures providing for meaningful public participation in the jury assessment and restoration process, which shall include establishment of a public advisory group to advise the Trustees." The Public Advisory Group, chartered under the Federal Advisory Committee Act in 1992, was to provide advice on "all decisions relating to injury assessment, restoration activities, or other use of the natural resource damage recoveries obtained by the governments, including all decisions regarding the planning, evaluation, and allocation of available funds."

The Public Advisory Group, which meets 4-5 times a year, has 12 members representing a wide array of interest groups, and an additional 5 members representing the public at large. One of its primary services to the Trustee Council has been to make Council members aware of diverse points of view. According to members of the group, it has taken about 2 years for it to become productive. Two factors have contributed to its growing effectiveness:

1. Increased clarity on the role of the Public Advisory Group and its degree of influence in decision making. Members of the Public Advisory Group originally assumed that their role was to reach out to the public, providing the Trustee Council with a public perspective on cleanup and restoration issues. The Trustee Council saw the Public Advisory Group more as a sounding board than as a means of facilitating wider public involvement. But over time, the Trustee Council and Public Advisory Group reached a better understanding of how to work together. Numerous Public Advisory Group members stated that this was due to the strong leadership of Jim Ayers, who assumed the position of Trustee Council Executive Director in fall 1993.

2. Identification of common goals. One Public Advisory Group member mentioned that when the group was newly formed, each individual focused primarily on supporting and lobbying for his or her own interest group. But as the group has evolved, members have increasingly sought to identify common goals and to work towards them together.

Department of Community and Regional Affairs. The primary role of the state of Alaskas Department of Community and Regional Affairs is to advise and assist local governments. A spokesperson for the Department described two processes used to enhance public involvement in local government activities. Although they have not yet been applied to the ecosystem approach in Alaska, these processes serve to illustrate possible tools for involving Alaskas small communities in government attempts to address environmental problems.

First, after finding that the traditional system of public hearings was not useful, the Department began using an alternative model involving three phases of meetings with communities when seeking input on a particular issue. During the first phase, the community was informed about the issue; during the second, the issue was discussed and questions were answered; and during the third, the community was asked how it would like to see the issue addressed. Depending upon the complexity of the issue and the level of community interest, the total number of meetings held could be two, three, or more.

Second, the Department is working with other state agencies to coordinate and strengthen methods for initiating capital investments in Alaskas local communities. It is using a strategy recommended by a local employee of the USDA Agricultural Extension Service (based at the University of Alaska) that involves bottom-up decision making, allowing communities to define their development goals and thereby to influence agency decision making. The program is being initiated in eight Alaska communities, each with a population of less than a thousand. State agencies meet to discuss and coordinate respective plans for each community, and then meet several times with each community to develop a common vision. Next, they work with the community on action planning, identifying the roles of each agency involved and those of the community. A key factor in the success of these efforts is the ability of communities to pay staff to coordinate the effort.

Division of Governmental Coordination. Alaskas Division of Governmental Coordination works directly under the Governor, providing information on permit applications. Citizens can quickly get the information on federal, state, and local permit requirements for any development activities. Representatives of the Public Advisory Group said that Alaskans greatly appreciated this office, and they suggested that it be used as a model for similar offices in other states.

Forest Service. The Forest Service disseminates public information and solicits public input on ecosystem-related issues in Prince William Sound through its Copper River Delta Institute and activities on the Chugach National Forest.

Copper River Delta Institute. The Copper River Delta Institute was established in 1989 by the Forest Service Pacific Northwest Research Station and Alaska Regional Office to provide increased research and public interpretation on the Copper River Delta. Its mission is to improve the understanding, use, and management of natural resources in the Copper River ecosystem through basic and applied research and through education and interpretation. Research is now underway on migratory shorebirds, trumpeter swans, gray wolves, moose habitat and nutrition, plant classification and succession, nutrient cycling and primary production, nitrogen fixation, and the long-term social effects of the Exxon Valdez oil spill.

The Institutes education and interpretation program for adults and children emphasizes wetland ecology, ecosystem research, and natural resource stewardship. The Institute initiated and sponsored the annual Copper River Delta Workshop with the Cordova Ranger District. In 1993, the workshop expanded into a 5-day community-sponsored spring shorebird festival. Other educational activities have included contribution to a science lecture series and numerous public and school events. The Institute has formed partnerships with many federal and state agencies, Native corporations, local government entities, educational organizations, and environmental and natural resource interest groups. Among them are the Canadian Wildlife Service, the Chugach Alaska Corporation, the city of Cordova, Ducks Unlimited, the Eyak Corporation, the Fish and Wildlife Service, the Prince William Sound Science Center, Wrangell-St. Elias National Park and Preserve, and a variety of educational institutions, including Prince William Sound Community College, Yale University, and the Universities of Alaska, Idaho, Minnesota, and South Alabama.

Chugach National Forest. Most of Prince William Sound is surrounded by the Chugach National Forest, an important source of public information. Ranger District offices are located in Seward, Girdwood, and Cordova, and the

Supervisors Office is in Anchorage. In 1994, the Cordova Ranger District opened an information and education site in Valdez at the request of the community. Additional Forest Service information sites may be opened in Portage or Whittier.

Joint Pipeline Office. The Joint Pipeline Office was established by state and federal natural resource agencies. Activities pertinent to public involvement include a newsletter and hotline for citizen safety concerns.

National Oceanic and Atmospheric Administration. The NOAA conducts Mussel Watch, a research and monitoring project involving collection of mussel samples by local communities. Community members and schoolchildren are taught simple collection procedures, and then samples they collect are periodically retrieved by NOAA scientists. The project is designed to save taxpayer money on specimen collection, and to increase community awareness of some of the research going on in the area.

North Pacific Fishery Management Council. The North Pacific Fishery Management Council (NPFMC) is one of eight U.S. Regional Fishery Management Councils created in response to the Magnuson Fishery Conservation and Management Act. Designed to provide local and regional input into fisheries management, the NPFMC and its advisory groups are made up of people from the region. Its primary role is to determine optimum fisheries yields and to prepare and implement regional fisheries plans. In an effort to involve the public in its activities, the NPFMC conducts public hearings to gather information in developing and amending fisheries management plans, reviewing permit applications, and conducting the rest of its business, submits estimated harvest levels for public review, and makes all of its meetings open to the public.

Prince William Sound Science Center. The Prince William Sound Science Center was established in Cordova shortly after the Exxon Valdez oil spill. Its mission is to contribute to better scientific understanding of Prince William Sound ecosystems and to encourage local participation in natural resources stewardship. The Center is developing a program to share research and information from geographic information systems with the local community, thereby promoting local involvement in decision making.

In addition to its research activities, the Center has developed a cooperative education program with state and federal agencies and the local school district. Through a grant from the Pew Charitable Trust, and through funds received from the Forest Service Copper River Delta Institute and other public and private organizations, the Center has carried out a number of educational activities, including:

- A conference for scientists and the general public under the title, "Research for the 1990s in Prince William Sound and the Copper River Delta."
- A conference for a similar audience under the title, "Critical Forest Habitats and Long-term Planning in the Greater Prince William Sound."
- Preparation of a document under the title, "Prince William Sound/Copper River/North Gulf Ecosystem."
- Development of the Alaska Oil Spill Curriculum, a teaching guide for preschool through 12th grade, distributed to school systems throughout Alaska and other parts of the United States. The curriculum focuses on daily energy conservation as well as on oil spill prevention and the effects of oil spills. According to the Centers "Multi-Year Report," the curriculum has been well received, particularly in coastal communities across the United States.

The Prince William Sound Science Center has an active and expanding science education program based in Cordova, which, according to the "Multi-Year Report," could provide a model for use by other Prince William Sound communities. Components of the program include: Science Club activities for schoolchildren; a Discovery Resources and Reading Room located in the community college; and monthly programs organized by the Centers education coordinator and Forest Service staff for Cordova pupils in grade school and home schooling. Outreach workshops are also held in Chenega Bay, Tatitlek, and Whittier.

The Center had a role in coordinating development of the Sound Ecosystem Assessment, based on extensive discussions with local scientists, fishermen, and other members of the Cordova community. Discussion focused on assessing the current state of knowledge about fisheries resources in Prince William Sound, identifying information gaps, and planning for research to fill the gaps.

Regional Citizens Advisory Council. The Regional Citizens Advisory Council of Prince William Sound is an independent nonprofit organization established in 1989 to communicate with the public on oil industry decisions. The

Council is financed by the Alyeska Pipeline Company through a contract specifying its autonomy. Its stated goals include:

1. Providing a voice for local communities.
2. Advising the Alyeska Pipeline Company and the public on oil spill prevention and response, and on ways to mitigate the environmental impact of terminal and tanker operations.
3. Monitoring terminal and tanker operations and implementing oil spill prevention and response plans.
4. Increasing public awareness of Alyeskas current capabilities in oil spill prevention and response.

Members of the Regional Citizens Advisory Council are ex-officio members of the Trustee Councils Public Advisory Group. Within the last year, the Council has signed Memoranda of Agreement with EPA and the Alaska Department of Environmental Conservation to facilitate information exchange with these agencies.

Constraints to Public Involvement

There are several opportunities for strengthening public involvement in the Prince William Sound area. The various public involvement activities taking place in the area (albeit with varying degrees of success) could be strengthened and/or serve as models for other efforts. The dramatic impact of the Exxon Valdez oil spill has served to intensify public awareness and interest in the management of the Prince William Sound ecosystem. Nevertheless, interviewees mentioned a number of constraints to effective public participation in the ecosystem approach.

Public advisory groups. Discussions about the Trustee Councils Public Advisory Group and the Prince William Sound Regional Citizens Advisory Council revealed problems associated with such groups. It is difficult to put together a group small enough to be efficient, yet large enough to represent the diverse sectors of the public. Decision making is hampered by members who do not fully participate and, more often than not, some members participate fully while others merely "take up space."

Groups with members selected from above, rather than elected by the constituencies they represent, do not necessarily represent their constituents, according to one outside observer. Therefore, it was noted, the Public Advisory Group does not truly represent the public, despite its value in articulating a wide variety of interests.

Several concerns about the Trustee Councils Public Advisory Group were raised by outside observers, including nonprovision of funds for organizing and travel to meetings, and a perceived lack of impact of advice from the Public Advisory Group on Trustee Council decisions. Interviewees noted that the Memorandum of Agreement calling for the Public Advisory Groups formation failed to spell out the role of the Group and its relationship to the Trustee Council. This lack of clarity seems to have been a major deterrent to the Public Advisory Groups effective functioning, but fortunately the problem is now being addressed by the Trustee Council.

Suspicion of ecosystem management. Some view the ecosystem approach with suspicion, seeing in it an effort by the federal government to extend jurisdiction over state and private lands, and/or a form of resource management that ignores the needs of people. This attitude, also found in Southern Appalachia, deters public participation in the ecosystem approach.

Unavailability of research results. Several interviewees were frustrated by lack of public access to research and monitoring results, sometimes due to litigation. Cordovas local scientists complained that outside scientists who conducted research in Prince William Sound generally failed to provide their results to the community after their projects were completed.

Lack of confidence in the federal government. Although representatives of the community of Cordova indicated that the federal government had, in various ways, provided support for local efforts to implement the ecosystem approach, tensions were apparent. Until a year ago, local spokespersons said, when fishermen blocked the entrance to Valdez to prevent oil tanker access to the Alyeska Oil Terminal, no Exxon Valdez oil spill settlement monies paid by Exxon to the federal government had gone to benefit them, even though the Prince William Sound fisheries on which they depend had been severely depleted by the Exxon Valdez oil spill. Several interviewees complained that the federal government spends too much time telling the public what to do, and little or no time asking for input.

Little funding for native proposals. The Public Advisory Group representative for native communities indicated that few proposals submitted to the Trustee Council on behalf of native groups were being funded. Further discussions with him and with Trustee Council members revealed that this was primarily because the proposals did not meet criteria outlined by the Council. The native representative indicated that Native corporations and communities do not have the personnel or financial resources necessary to write proposals and lobby for projects. Therefore, he said, organizations with such resources were more likely to get proposals funded.

The Trustee Council has funded subsistence planning outreach efforts in the past 2 years, and much progress has been made in funding Native-sponsored proposals.

Interviewee Suggestions

Interviewees made several recommendations for increasing and strengthening the federal governments capabilities for involving the public in ecosystem restoration activities in the Prince William Sound area and elsewhere.

· Foster public involvement from the outset. Get the public involved from the very beginning of the damage assessment and restoration process. The public should be involved at the earliest stages of planning activities that will affect the natural resources on which it depends. Lack of sufficient public involvement immediately after the Exxon Valdez oil spill significantly impeded a successful response. Public participation in the process could be fostered through (1) a survey of public views on ecosystem management needs, and (2) simple, easy-to-do projects, such as the mussel collection program sponsored by the NOAA and Prince William Sound Science Center.

· Foster local control. Address the need for local control in implementing the ecosystem approach. Control should be neither entirely local nor exercised entirely by external authorities. In a meeting with the survey team, local scientists and interested individuals, along with representatives of Cordovas local fisheries and nongovernmental organizations, all stressed the need for local control over any future ecosystem management efforts in the Prince William Sound area. There seemed to be a strong consensus within the group that when local issues are elevated to higher levels (especially within state and federal agencies), there is a real loss of commitment, energy, and logic in the process, and efforts become too bureaucratic and less oriented toward production.

· Prepare a plan. Prepare a written plan for public involvement, and possibly make it available to the public. Such a plan would include (1) criteria for decision making by government agencies, (2) goals and objectives in the overall ecosystem management effort and for its public participation component, and (3) mechanisms for ensuring a two-way flow of communication between local communities and the federal government. Trustee Council staff have worked closely with the Public Advisory Group and others to develop a communications plan.

· Accommodate local schedules. Ensure that any public involvement process accommodate the work and holiday schedules of local communities. For Alaska fishermen, for example, meetings should be scheduled during the off-season (between October and April). And to accommodate the Russian Orthodox sector, meetings should not be held on Russian Orthodox holidays (one year, a public meeting was apparently held in a village that was primarily Russian Orthodox on the eve of the Russian Orthodox Christmas).

· Increase public access to information. Interviewees from all sectors recommended that the federal government facilitate public access to information. Several called for information that was easy to understand and that met the needs of different public sectors. One suggested reorganizing the Oil Spill Public Information Center in Anchorage to make information more accessible. Others recommended translating research results into forms more accessible and meaningful to nonscientists. All of these suggestions are being implemented.

· Demystify the federal role. Lack of transparency in federal decision making was named by many interviewees as a barrier to public involvement in federal land management and Exxon Valdez oil spill response efforts. Often cited as an example was the seemingly closed nature of decision making in allocating settlement funds paid by Exxon to the government. Under its new leadership, the Trustee Council is addressing this problem, according to several interviewees. The federal government must do a better job of communicating the impact that its policies will have and the rationale for them.

· Use successful models. Find good examples of strong public involvement in other parts of Alaska. An interviewee from a state land management agency suggested that those involved in coordinating the Exxon Valdez oil spill response study public involvement methods used elsewhere in Alaska, taking good examples and using

them to strengthen involvement in Prince William Sound. One example given was the Eskimo Whaling Commission.

· Test a model of the ecosystem approach. Identify an Alaskan ecosystem where a model approach to ecosystem management can be tested. This suggestion was made by an official from a state land management agency. Such an approach should be based on cooperation between state and local government and the private sector.

· Publicize the Exxon Valdez oil spill experience. Publish an overview of the Exxon Valdez oil spill response experience. Although a number of books and publications have been written about the spill, several survey participants felt that agency documents on the cleanup, its coordination and deficiencies, and how problems were handled should be pulled together into a single "how-to" handbook. Such a publication should include discussions of what occurred, problems and opportunities encountered, and lessons learned. It could be used to help people facing similar problems in other ecosystems.

· Build ties to native groups. Strengthen coordination with native groups, perhaps through Trustee Council funding for a liaison to natives, a suggestion made by the president of the Chenega Corporation. This liaison would be responsible for ensuring a two-way flow of communication between the Trustee Council and Native corporations and communities, and for helping communities prepare proposals and secure funding for activities within the scope of the Memorandum of Agreement between Alaska and the United States. State representatives and other interviewees also recommended that the federal government generally be more proactive in encouraging the participation of native peoples in restoration efforts, and that the public comment process be revised to be more consistent with native cultures. The Trustee Council has funded a Community Involvement Project, which in FY 1996 will include a Native regional facilitator to help foster two-way communication between villages and the Council.

· Strengthen public advisory groups. Strengthen the role of public advisory groups in Prince William Sound and elsewhere by implementing the following suggestions:

- Keep them small, ideally with not more than 10 people.
- Clearly define their role from the beginning.
- Ensure their ability to influence decision making by giving them some level of authority over how funds are spent by the body they are advising.
- Provide them with at least one full-time staff member to ensure their smooth, efficient functioning.
- Provide them with sufficient funds to get the job done (do not rely on volunteerism).
- Allow the constituents they represent to elect or otherwise select members (do not use a top-down approach). The Alaska Coastal Management Board was cited as a good example: it has nine locally elected and eight state agency representatives (the local vote can outweigh the agency vote).

SCIENCE AND INFORMATION

Prior to the Exxon Valdez oil spill, research in Prince William Sound was generally unconnected, limited in scope, and focused on single species rather than multiple interactions. The exception was the Bureau of Land Managements Outer Continental Shelf Environmental Assessment in the 1970s, which included considerable research in Prince William Sound and the northern Gulf of Alaska. After the Exxon Valdez oil spill, most research in Prince William Sound grew out of the Natural Resources Damage Assessment process, focusing on marine environments and resources not directly under federal control. Many interviewees commented that the Natural Resources Damage Assessment encouraged studies designed to support litigation efforts, with little or no bearing on ecosystem needs. Not until early 1994 was there a series of work sessions specifically designed to discuss an ecosystem approach to restoration activities.

Resource Information

Information about the resources in the Prince William Sound ecosystem varies greatly in quantity, quality, and consistency, depending on when the information was collected and the purpose of its collection. A variety of information is available on intertidal and subtidal communities, selected populations of shellfish, fish, birds, and mammals, archeological and cultural resources, forest insects and diseases, and the economic value of fish and

shellfish species. In many cases, however, there are few prespill data on either plant or animal communities. Without adequate prespill data, it is difficult to make definitive statements about the long-term impact of the Exxon Valdez oil spill on the environment.

Marine communities. Marbled murrelet populations have been declining since the 1970s, reportedly by as much as 40 percent, perhaps in response to declining stocks of small fish, although the cause is still unknown. Scientists and resource managers think that little can be done directly to improve recovery of seabirds in Prince William Sound.

Sea otter studies from the 1970s and 1980s did not involve repeated population surveys, and recent health indicators for sea otters have been inconclusive. No specific responses to the Exxon Valdez oil spill can be made to help sea otters recover. Long-term habitat protection is viewed as the only significant way to protect Prince William Sounds sea otters.

Harbor seal populations were showing signs of decline prior to the Exxon Valdez oil spill, for reasons not yet understood. Declines in harbor seal numbers may be related to declining fish stocks, predation by killer whales, or even harvest by humans.

Many crab species had low populations prior to the Exxon Valdez oil spill. Poor Pacific herring returns are believed to be due to natural causes, or to a combination of natural causes and oil spill effects. In 1992-1993, pink salmon runs were low, for reasons unknown. Many fish species in Prince William Sound appear to have cyclical trends in production that are poorly understood. There is a limited understanding of these and other depressed fisheries resources in the Exxon Valdez oil spill area. The only reasonable restoration means available is manipulation of human use through recreational and commercial fisheries management.

Upland communities. There is less information about upland areas than on the aquatic components of Prince William Sound, and most of it pertains to the health and economic value of the regions forests. The impact of insects on forest health and survival has been documented. Since the mid-1970s, no timber has been harvested on the Chugach National Forest in the area around Prince William Sound, and no harvests are currently planned. However, clearcutting on Native corporation lands has accelerated. The long-term impact of this general lack of planned, coordinated forest management cannot be adequately determined at this time.

Motivating Factors for Research

Underlying current research interest in Prince William Sound are two basic issues: the Exxon Valdez oil spill, and declines in populations of various species with economic value and of public interest. Research has shown that the Exxon Valdez oil spill had a significant adverse impact on the ecosystem, but that population declines in species of concern are not due solely to the oil spill. In fact, most research reports indicate an inability to explain specifically what is happening to key species.

The Trustee Councils 1994 and 1995 requests for research proposals specify that research and monitoring should focus on systemwide interactions. Although some resource-specific projects are funded, the Trustee Council recognizes that this approach is not always adequate, and that an ecosystem approach is needed. In response, several groups are developing coordinated ecosystem plans. Most research funded by the Trustee Council is coordinated by five interdisciplinary research groups (see figure 3), which focus on the following problems:

- The failure of the Pacific herring and pink salmon runs, and the factors that control their production.
- The long-term decline in marine mammals and seabirds, with emphasis on whether harvest of food resources limits recovery of damaged resources.
- Recovery problems in nearshore ecosystems, including whether toxic effects still constrain recovery of some resources.

The Alaska Department of Fish and Game, NOAA, National Biological Service, and academic institutions are major participants in these research efforts. The Trustee Council will sponsor research coordination meetings where all researchers can report their results and share information.

Natural Resources Damage Assessment. Some interviewees noted that immediately following the spill, most research in Prince William Sound initially focused on the Natural Resources Damage Assessment rather than on the need to

provide information for a broad ecosystem approach. This limited focus and lack of integration stemmed partly from the narrow, traditional topical boundaries maintained by agencies in choosing their research and designing projects. Reactive processing is driven by the legal system and limitations on use of funds. The availability of Natural Resources Damage Assessment funding and litigation issues, not the need to understand the component parts of the ecosystem, were probably the biggest factors governing the conduct of studies in Prince William Sound.

Large disasters such as the Exxon Valdez oil spill force agencies to step out of their traditional roles. The immediacy of the need to respond to the oil spill forced agencies to get things done. There was no time for arguments, discussions, or team development issues. The people involved came in with an attitude that made it work, were not involved in protecting turf, and were not concerned with what might go wrong. It was only after the crisis that role delegation and team interaction become issues.

Population declines in key species. The serious fish population declines in 1992 and 1993 focused public attention on the need to understand how this large and productive coastal environment functioned to support marine resources of immense sport, commercial, and subsistence value. In 1993, the Sound Ecosystem Assessment presented a proposal for an ecosystem-based approach for future research and restoration in Prince William Sound. The Assessment proposed a research program that "will encompass an ecosystem-level perspective to identify and analyze both physical and biological processes within the Sound that act to limit the production of the target species."

Instead of focusing on the ecosystem as a whole, monitoring plans are being developed for individual species. The current emphasis is on particular species of interest, plus their predators and prey-a set of species on a single trophic level, rather than across the entire ecosystem. Researchers argued that programs should have ecosystemwide monitoring, rather than the narrow monitoring of particular species envisioned under current plans.

Issues affecting research and monitoring. Various interviewees maintained that a clear definition of the ecosystem, or area of concern, was important in providing focus to research and management efforts. Without basic planning documents, they argued, it was difficult for agencies to show where their efforts were headed. Despite much talk about ecosystem research, they noted, not much was being done to translate results into meaningful management actions.

Some felt that interagency collaboration in Exxon Valdez oil spill studies was minimal, with much more cooperation on the ground than at upper levels of management. Several said that upper-level managers were often an impediment to getting the job done well. Relationships at the local level are being limited by managers at higher levels who do not have an adequate understanding of what is going on at the local level. Interviewees suggested that coordinating committees made up of managers, scientists, and advisory group members might be used to reduce conflict and improve communications.

Interviewees called for outside review of proposed monitoring studies, and for peer and public review of research. Currently, there is no procedure for providing briefings or summaries of proposed monitoring and research studies. Because proposed research and monitoring projects are all submitted at once, there is insufficient time for review and meaningful commentary. A nontechnical summary of proposals was called for. The Trustee Council has implemented an annual restoration workshop, open to the public, which provides the opportunity for researchers to share results, be peer reviewed in open session, and discuss ecosystem effects and opportunities. In addition, all proposals since the early days after the spill have been subject to independent scientific and technical review.

Information Management

Many interviewees perceived a lack of effective communication among the many agencies and other entities working in Prince William Sound. There was a general feeling that much work had been done in a vacuum. Members of the public maintained that effective communication was needed in order to provide some understanding of what needs to be done and why.

The six trustee agencies reportedly have six ways of collecting and storing data. Some interviewees noted that more attention should be paid to information management, because the six trustees act like six lead agencies. There seems to be a need, they said, for the six agencies to make someone responsible for coordinating and directing information flow, from collection to dissemination.

Some Alaska state representatives charged that the National Marine Fisheries Service and Fish and Wildlife Service are not sharing data outside of the Exxon Valdez oil spill process. They noted a lack of federal reciprocity in data sharing. "You can put it in," they said, "but you cant get it out!"

Data sharing. In general, there has been no cohesive structure for sharing data or reports. Although there were specific requirements for reporting data collected during the Natural Resources Damage Assessment process, there was no way of integrating information being collected outside of the Exxon Valdez oil spill process. Some called for establishing the information system earlier in the data gathering process.

Data sharing problems start with the basic issue of how to define things to ensure consistency among users, including researchers, managers, decision makers, and the public. The amount of information coming in is so vast that it is impossible to assess and use efficiently without standards. Agencies generally do not have data collecting protocols like the Exxon Valdez oil spill process to facilitate information sharing.

Neither agency representatives nor members of the public were satisfied with the information management process. Most federal and state agencies do not have an effective information management process and are overly protective of information, according to some. Agencies, it was generally felt, were willing to share information only to get more money for projects. Part of the problem, some maintained, was that agencies do not have information management and sharing requirements built into their research, monitoring, and information collection programs. However, the NOAAs oceanographic data reporting system was praised for providing ready access to shared information.

Timely data availability. Agencies are reportedly reluctant to release their data unless they are in absolute final format; yet agency data never seem to be final, interviewees complained. It was felt that information obtained from studies should be widely and promptly shared so that it can be applied to management practices and used for decision making, both inside and outside the federal government.

Data synthesis. Several groups called for making information about Exxon Valdez oil spill studies and reports available in varying forms so that scientists, managers, decision makers, and the general public can understand them. Information synthesis is needed to cope with the overwhelming volume of available data. A general level of information is especially needed; many requested readable, nontechnical information in a user-friendly system easily accessible at local libraries or on personal computers.

Centralized data distribution. Since September 1990, the Oil Spill Public Information Center has collected information and materials on Exxon Valdez oil spill cleanup, damage assessment, and restoration efforts. The Alaska Department of Fish and Game, in charge of roughly half the research and restoration projects, also has a person devoted to gathering these materials on a lesser scale.

Both the Sound Ecosystem Assessment project and the Trustee Council are initiating major electronic information sharing projects. The Councils efforts are focused on making information more easily accessible to the public, including the general scientific community, and on facilitating information transfer between researchers and resource managers as well as within the greater scientific community.

Constraints to Science and Information Sharing

Interviewees mentioned several obstacles encountered in gathering and sharing scientific information on the Exxon Valdez oil spill area.

Litigation. A major obstacle was litigation. During the legal process relating to the Exxon Valdez oil spill, information sharing outside of the trustee agencies was highly limited. Litigation issues kept them at arms length from the public, blocking effective and timely communications about study results and plans.

Lack of direction. Efforts to restore the Exxon Valdez oil spill area have sometimes failed for lack of a clear focus or unified sense of direction. Independent leadership is needed to guide restoration activities. Interviewees observed that federal legal advisors never functioned as a team or showed any leadership. Instead, they reportedly conformed to narrow agency perspectives, offering a variety of conflicting legal viewpoints that caused continuing problems. Agencies were limited by management mandates and differing missions (for example, the Fish and Wildlife Service is responsible for marine birds but not for fisheries, and the National Marine Fisheries Service is responsible for fisheries but not for birds), preventing effective teamwork.

Interviewees noted that many agencies have traditional, fixed points of view that govern their handling of specific issues. They presume the right to lead in dealing with certain specific issues (such as forage fish), expecting others to follow, rather than developing a consensus based on a broader ecosystem approach. Researchers, managers, and public groups should all be involved, interviewees urged, in dealing with specific issues.

Limited approaches. Researchers should examine key component species of ecosystems rather than focusing on single species, according to interviewees. Scientists should not do research just because it is interesting and informative; instead, they should pursue research that lends itself to applied science, to develop information that will help managers make better decisions. The focus should be on impacts to key species, the resources they depend upon, and the resources that depend upon them. The ecosystem approach should be interdisciplinary, involving industry and local communities. Good science is needed to provide a sound framework for natural resources management and decision making.

Ecosystem issues. One scientist noted that many fall into the trap of trying to figure out what the ecosystem is, rather than addressing the issues and missions it entails. This issue has organizational as well as scientific implications: several agency officials noted that there are no natural resource management objectives for ecosystems. Many tend to get bogged down in the details of defining an ecosystem in fixed terms.

Although each agency has responsibilities for certain species, it is not always clear who has responsibility in specific cases. Many agencies have been so focused on the biology of individual species or on actions within the boundaries of their jurisdictions that the larger picture escapes them. No agency has responsibility for the ecosystem approach.

Some Alaska officials observed that ecosystem designations by the Fish and Wildlife Service do not reflect state needs or priorities, but rather seem designed to extend federal agency jurisdiction. Federal agencies, they maintained, should work with the states to identify objectives for the ecosystem approach; existing land classifications, such as those defined in Alaska by the Federal State Land Use Council, should be used as the starting point for updating land classifications. States would object, they stressed, to any federally imposed management directives.

Interviewees identified several key items as necessary to any successful ecosystem response:

- A source of substantial long-term funding.
- Clearly identified objectives.
- Involvement of all potential partners early in the process.
- A meaningful plan with measurable milestones.
- A data and information management program.

Most potential partners prefer involvement during early stages of program design. Those on the ground need to buy into the ecosystem approach; they should be made to feel that they have contributed to the process by providing direction. People need to talk about what works and what does not, what can be done, what things can be resolved, how processes can be integrated, and what can be done to improve things. The Natural Resources Damage Assessment process does not allow for any of this.

Funding issues. Key to a successful ecosystem response, interviewees noted, was a source of substantial long-term funding-the overwhelming costs of the ecosystem approach prevent its more frequent use. The funding process, they urged, should involve local people and communities, with decision making delegated down to the local level. Some of these issues may be addressed through the long-term planning efforts of the Trustee Councils staff. In addition, creation of the Restoration Reserve will likely ensure that funds are available in the long term for future research needs.

Due to the Natural Resources Damage Assessment and litigation settlement, research in Prince William Sound is unusually well funded, at least temporarily; but there is no commitment to (or funding for) the long-term monitoring that virtually every scientist considers crucial. This causes serious problems for study programs, because those involved are constantly preoccupied with the search for more funding or longer term positions. Researchers expressed great frustration with the uncertainty of funding. Long-term continuity is needed to enable more cooperative research based on research completed before.

Some interviewees complained that agencies get into turf battles over limited funds, refusing to collaborate for fear of having to share limited resources. Agencies use civil settlement money, some claimed, to pay staff salaries so that appropriated funds can be used for other things.

RECOMMENDATIONS

Based on interviews conducted and materials gathered on the Exxon Valdez oil spill and ecosystem restoration in the oil spill area, the survey team developed recommendations to address problems it found facing the ecosystem approach in the region. It should be noted that these recommendations have been implemented by the Trustee Council, although there is always room for continuing improvement.

1. Provide for interagency funding. Establish a framework for sharing funds across agencies to facilitate coordination on projects related to the ecosystem approach.
2. Provide for multidisciplinary and multiorganizational funding. Make funding sources available to support work across disciplines and organizations (including nonfederal entities), and recognize that coordination and integration require travel and synthesis conferences, and funding for these activities.
3. Extend grant periods. Research, damage assessment, and monitoring require extended funding of 2-5 years to be efficient and effective. Extended grant periods should be subject (of course) to funding availability and project progress.
4. Allocate long-term research funding. Provide long-term agency funding allocations for research and such related projects as damage assessment and monitoring.
5. Open the federal research contract bidding process to all researchers. A federal research contract bidding process open to all researchers-including those from other agencies-would attract the talents of key experts, no matter what institution they are with, and to foster interagency collaboration.
6. Establish a Restoration Reserve fund. The Restoration Reserve fund under consideration by the Trustee Council would facilitate adaptive management by allowing money to be set aside for future use as needed.
7. Facilitate interagency coordination. Provide top-down approval and support from agencies with a documented process for coordination, such as cooperative agreements or Memoranda of Agreement.
8. Improve communication within organizations. Develop two-way communication of information and ideas, empowering middle and lower levels.
9. Facilitate regional decision making. Limit decisions made outside the region by people removed from the issues and local priorities. External decision making undercuts local and regional efforts and makes public participation meaningless.
10. Make regulations and guidelines more flexible. Allow for innovative solutions to problems and their site-specific implementation rather than insisting on adherence to federal regulations.
11. Decentralize decision making. Decrease the centralized power of individual agencies, and increase the sharing of information and decision making with people and managers at local levels. The agency culture of resistance to power sharing must be overcome if the ecosystem approach is to be implemented.
12. Instruct managers to implement the ecosystem approach. Through directives or other means, top federal leadership should require federal resource managers to accept, understand, and implement the principles of the ecosystem approach. State administrators should direct state resource managers to do the same.
13. Encourage public involvement from the start of a project. The public should be involved at the earliest stages of planning activities that will affect the natural resources on which it depends. Prepare written plans for informing and involving the public.
14. Accommodate local schedules. Ensure that any public involvement process accommodate the work and holiday schedules of local communities.
15. Increase public access to information. Provide information that is easy to understand and meets diverse needs.
16. Build ties to native groups. Strengthen coordination with native groups, perhaps by providing assistance to communities in preparing proposals and securing funding for restoration activities.
17. Strengthen public advisory groups. Strengthen the role of public advisory groups in Prince William Sound and elsewhere by clearly defining their role and ensuring their ability to function effectively and to influence decision making.

Appendix:

*SELECTED DOCUMENTS REVIEWED**

Exxon Valdez Oil Spill Trustee Council. April 1994. Proceedings of the Workshop: Science for the Restoration Process; 13-15 April 1994; Anchorage, AK.

Exxon Valdez Oil Spill Trustee Council. September 1994. Annual Restoration Work Allocation. Anchorage, AK.

Exxon Valdez Oil Spill Trustee Council. September 1994. Final Environmental Impact Statement for the Exxon Valdez Oil Spill Restoration Plan. Anchorage, AK.

Exxon Valdez Oil Spill Trustee Council. November 1994. Exxon Valdez Oil Spill Restoration Plan. Anchorage, AK.

Exxon Valdez Oil Spill Trustee Council. March 1995. 1995 Status Report. Anchorage, AK.

Exxon Valdez Oil Spill Trustee Council. March 1995. Invitation To Submit Restoration Projects for Federal Fiscal Year 1996 and Draft Restoration Program: FY96 and Beyond. Anchorage, AK.

Exxon Valdez Oil Spill Trustee Council. June 1995. Draft Fiscal Year 1996 Work Plan. Anchorage, AK.

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Chapter 7: SOUTH FLORIDA

South Florida is one of seven ecosystems identified for further study by the Interagency Ecosystem Management Task Force. In June 1994, a survey team traveled to Florida to conduct a series of interviews with federal and nonfederal parties. The team consisted of Diane Gelburd and Susan Huke from the U.S. Department of Agriculture (USDA), Roger Griffis from the U.S. Department of Commerce, Jim Pipkin and Mike Sweeney from the U.S. Department of the Interior, and Louise Milkman from the U.S. Department of Justice.

Over 4 days (June 13-16), the team met with federal representatives (including the U.S. Attorney and officials from the U.S. Army Corps of Engineers (Corps), National Park Service, and U.S. Fish and Wildlife Service), state officials (including the Lieutenant Governor, the Governors advisor on environmental matters, representatives of the Florida Department of Environmental Protection, and the chairman and other representatives of the South Florida Water Management District), and the chairman of the Governors Commission for a Sustainable South Florida.

The team also met with a wide variety of other interested parties: officials from Dade and Broward Counties; federal, state, and private scientists; environmental organizations; a sugar industry representative; representatives of the Miccosukee Tribe; and a real estate developer. Subsequently, the team met with the chairman of the federal South Florida Ecosystem Restoration Task Force and conducted numerous followup conversations with people it had interviewed in Florida and with others, including officials of the Environmental Protection Agency and the head of the National Marine Sanctuaries Program of the National Oceanic and Atmospheric Administration.

The case study presented in this chapter is based on those interviews and telephone calls, as well as on written material collected by the survey team. The team focused on federal contributions to the South Florida ecosystem restoration effort, identifying areas where federal involvement might be improved. Based on interviewee comments and suggestions, the team developed recommendations for improving the ecosystem approach in South Florida, which are presented at the end of this chapter.

BACKGROUND

One of South Floridas best known features is the Everglades (figure 1). Technically, the term "Everglades" refers to the vast and once uninterrupted freshwater marsh stretching from the southern shores of Lake Okeechobee to the tip of the Florida peninsula. The historic ecosystem that encompassed the Everglades, however, was a watershed comprising a variety of environments beginning at the headwaters of the Kissimmee River and spilling out into Florida Bay.

The Historic Everglades Ecosystem

The historic ecosystem of South Florida, the only subtropical climate in the continental United States, had a wide variety of subsystems, including: freshwater marshes; wetland "tree islands;" pond apple swamp (now extinct); cypress swamps; tropical hardwood hammocks; pinelands; mangrove swamps and islands; coastal saline flats, prairies, and forests; tidal creeks and bays; and shallow coastal marine waters. Water predominantly from the Kissimmee River flowed into Lake Okeechobee and then into the pond apple swamp along the lakes southern boundary. Beyond lay a vast sheet of water flowing gently through Everglades saw grass marsh and various other communities, and dropping 20 feet over the 100 miles to Florida Bay.

Average water depth in the Everglades varied with the season; during the rainy season, depths could reach up to 4-6 feet. Rain is the principal source of water in the ecosystem, with an annual average of 50-60 inches, depending on season and cycle, with most falling during the wet season (from May to October). Fire played a historically important role, maintaining open marshes and releasing nutrients into the ecosystem. Florida Bay, at the end of the system, contains coral reefs and habitat for more than 500 species of fish, more than 450 species of seaweed and seagrass, and thousands of other species.

A Century of Change

Water flowing from the Kissimmee River to Florida Bay today traverses an ecosystem shaped and reshaped over the past 100 years to accommodate the ever-growing needs of the population of South Florida. Changes began in 1882 with the channelization of the Caloosahatchee River and its connection to Lake Okeechobee, resulting in a westward outflow from the lake. Subsequently, four canals were cut from the lake southeast through the Everglades to the Atlantic Ocean. In 1916, a fifth canal was constructed from the lake due east to the ocean, and the southern rim of the lake was diked and leveed to make possible what was to become the Everglades Agricultural Area.

Over the ensuing decades, this infrastructure proved flawed for various reasons not considered during its construction: uncontrolled drainage threatening what was considered an infinite freshwater supply; inadequate flood control in wet years; huge muck fires in dry glades; and saltwater intrusion. This led Congress to authorize the Central and Southern Florida Project in 1948, major features of which were completed by the mid-1960s. This project was designed to construct a 100-mile-long levee to protect lands to the east of the Everglades from flooding and saltwater intrusion, and to create the Everglades Agricultural Area and three Water Conservation Areas separated by levees and regulated by canals and pump stations. Water Conservation Area-1 became the Arthur R. Marshall Loxahatchee National Wildlife Refuge. The Water Conservation Areas deliver water to Everglades National Park, authorized in 1934 and established in 1947.

In the 1960s, the Kissimmee River was channelized by the Corps as part of the Central and Southern Florida Project. This project reduced the rivers 103 miles of meanders through 35,000 acres of floodplain wetlands to a canal 56 miles long, 30 feet deep, and up to 300 feet wide, now known as the C-38 canal. Transportation projects over the years, such as construction of Alligator Alley and the Tamiami Trail across the Everglades, have had a tremendous impact on the ecosystem, serving essentially as dams to the southward sheet flow.

One of the most dramatic effects of the reconfiguration of the Everglades and the diversion of great volumes of water has been the precipitous decline in wading bird populations since the 1950s. By some estimates, the great rookeries in the southern Everglades may have supported as many as 2.5 million birds prior to the disruption of natural hydroperiods. The rookeries are now virtually abandoned. Far smaller, less stable rookeries have been established in some areas of the Water Conservation Areas. Overall, the wading bird population is estimated to have fallen by as much as 90 percent since the turn of the century. As for other wildlife, South Florida is now home to 56 federally listed endangered and threatened species and 29 candidate species.

Cumulative modifications to the areas hydrology have led to a severe water quality problem resulting from agricultural practices that have discharged nutrient-laden water into a naturally nutrient-poor ecosystem. Native vegetation in many areas has given way to dense stands of cattails, resulting in further decreases in populations of local wading birds and other native species.

According to some scientists, over the past 20 years the impacts of hydrological changes and agricultural discharges in South Florida have begun to manifest themselves in Florida Bay, where massive seagrass die-offs, algal blooms, and declines in populations of fish, mangroves, and other species have been documented. Explanations range from hypersalinity (due to diverted freshwater flows) and pollution to the natural impacts of hurricanes and drought.

One of the more confounding mysteries of Everglades ecology has been the increased concentration of mercury in the food chain. Bioaccumulation renders predators, such as Florida panthers, most susceptible. One theory attributes the mercury to airborne pollution; another holds that mercury occurs naturally in the soils and is released by a chemical reaction induced by drainage or the presence of nutrient pollutants.

Problems unrelated to modifications of the systems natural hydrology include introduced species, specimen collecting, and the effects of off-road vehicles. Exotic plant species, primarily Australian melaleuca and Brazilian pepper, are proving to be by far the most formidable long-term challenge. Melaleuca was introduced intentionally for its ability to "dry up" marshes, and both it and Brazilian pepper tend to form dense stands that crowd out native species. Research

is now focused on the possibility of introducing predators to combat these species. Many exotic species of fish have also been introduced in South Florida.

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Figure 1.-South Florida ecosystem.
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Toward Restoration

In 1983, Governor Bob Graham began the "Save our Everglades" campaign by committing the state to ecosystem restoration and the following six objectives: (1) restoring the Kissimmee River; (2) protecting Lake Okeechobee; (3) protecting the Water Conservation Areas; (4) protecting Big Cypress Swamp; (5) restoring Everglades National Park; and (6) protecting the Florida panther.

Restoring the Kissimmee River. Efforts to restore the Kissimmee River began in the 1970s and led to a study and restoration plan by the South Florida Water Management District, which was adopted in 1990 by the state of Florida. This plan would restore 40 square miles of the original ecosystem, 43 miles of river, and 26,500 acres of wetlands. In 1992, Congress authorized the Corps to enter into a 50/50 cost-share arrangement with the state to begin work on the project, the total cost of which is approximately $400 million. Construction of the initial test fill began in April 1994.

Protecting Lake Okeechobee. In 1979, the Florida Department of Environmental Protection took action to prevent any pumping of agricultural water from the Everglades Agricultural Area into Lake Okeechobee, except in emergencies, because the lake was suffering from an overabundance of nutrients from runoff produced by agricultural and dairy activities. (This resulted in increased discharge into the Water Conservation Areas and, thus, into the refuge and the park.) Since 1983, efforts have been focused on reducing dairy farming on lands draining into the lake and on instituting best management practices on remaining farms to improve the quality of water from agricultural discharges. In 1989, the South Florida Water Management District put into effect a Surface Water Improvement and Management plan to reduce phosphorus in the lake. Since 1983, approximately $45 million has been spent by the state, the water district, and the federal government to restore the lake.

Protecting the Water Conservation Areas. Efforts to restore the hydrology and water quality of the Water Conservation Areas have largely concentrated on regulation and treatment of agricultural surface water discharges and on land acquisition in the Areas themselves and in the adjacent Holey Land and Rotenberger tracts. Due to the vulnerability of deer in the Water Conservation Areas to heavy flooding and rapidly changing water levels, changes were made to stop rapid flooding, and deer herds have been reduced to a more sustainable size. In addition, construction of the Everglades Nutrient Removal Project, a filtration marsh for approximately one-third of the agricultural runoff into the Loxahatchee National Wildlife Refuge, has been completed.

Protecting Big Cypress National Preserve. Extensive federal, state, and local land acquisitions in the area have been supplemented by improvements in hydrology and wildlife habitat in conjunction with conversion of Alligator Alley into an interstate highway (I-75), completed in January 1993. Design improvements included bridges, culverts, and wildlife underpasses.

Restoring Everglades National Park. The restoration of natural waterflows to Everglades National Park involves increasing water delivery to Taylor Slough, Shark River Slough, the C-111 basin, Florida Bay, and the Ten Thousand Islands. Because much of the parks water originally came from what is now the Big Cypress National Preserve, increased flow between the Water Conservation Areas and the preserve has also been important. Legislation in 1989 (amended in 1993) expanded the boundaries of the park to allow for acquisition and flooding of adjacent lands to the east to feed Shark River Slough and Taylor Slough with water. In addition, actions have been taken to divert more water from the C-111 to the park and Florida Bay.

Protecting the Florida panther. About 150,000 acres of panther habitat have been acquired, including Florida Panther National Wildlife Refuge. Nighttime speed limits have been lowered and warning signs placed along I-75 and other roads. Hunting has been curtailed in Big Cypress National Preserve to preserve the panthers food supply. In addition, a captive breeding program and extensive research and monitoring are underway. Mercury poisoning remains a serious problem.

Present Situation

The principal federal agencies now engaged in ecosystem approach and restoration activities in South Florida include the Corps, Environmental Protection Agency (EPA), National Biological Service, National Oceanic and Atmospheric Administration (NOAA), National Park Service, Fish and Wildlife Service, and U.S. Geological Survey. Principal state agencies include the Florida Department of Environmental Protection and South Florida Water Management District (SFWMD). The current boundaries of the SFWMD are commonly considered to be the hydrological boundaries of the ecosystem.

In 1988, in the face of mounting evidence of damage to Everglades National Park and the Loxahatchee National Wildlife Refuge from agricultural pollution (specifically phosphorus), the federal government sued the state of Florida for failing to enforce its own water quality laws. The state, under the leadership of Governor Lawton Chiles, settled the litigation in 1991 and agreed on a plan aimed at removing 80 percent of the phosphorus flowing from the Everglades Agricultural Area by improving agricultural practices and by constructing filtration marshes called Stormwater Treatment Areas. The settlement agreement also required expanded research and monitoring, compliance by 2002 with all water quality standards in water delivered to the park and refuge, adoption of strict phosphorus limits for water in the park and refuge, and a new water delivery schedule aimed at maintaining the flora and fauna of the park and refuge. In 1992, the settlement was adopted by the federal court as a consent decree, which was subsequently tied up by 36 federal and state lawsuits, mostly brought by agricultural interests.

In April 1993, government parties to the lawsuits agreed to a proposal from agricultural challengers to stay litigation in order to pursue mediated settlement negotiations. Negotiations spanned the next 9 months, involving officials from the Corps, EPA, and U.S. Departments of Agriculture, the Interior, and Justice. In July 1993, the parties reached an agreement in principle to fund a Mediated Technical Plan, which was developed with the participation of federal and state agencies as well as the agricultural and environmental communities. The basic agreement, known as the Statement of Principles, involves a $465 million treatment system of Stormwater Treatment Areas (about 35,000 acres of filtration marshes to cleanse great volumes of water and to provide additional benefits for the Everglades in terms of water quantity, distribution, and timing) and onfarm best management practices.

Key features of the Statement of Principles were adopted in the Everglades Forever Act passed by the Florida Legislature in April 1994. The Act gives the Water Conservation Areas the same kind of protection afforded the park and refuge in the settlement agreement. The state is required to pay approximately 42 percent of the cost of the plan, farmers will pay 50 percent, and the federal government will pay 8 percent. The state is to construct five Stormwater Treatment Areas by 2003, and the Corps must build one by 2002. Stormwater Treatment Areas are to be permitted and regulated by the Florida Department of Environmental Protection, Corps, and EPA. Agricultural discharge is to be regulated by the South Florida Water Management District through permits that will impose best management practices to reduce phosphorus loads. In addition, the state is required to conduct an extensive research and monitoring program to evaluate the ecological and hydrological needs of the Everglades and to develop technology and best management practices designed to improve water quality.

In 1992, the Corps was directed by Congress to begin the Central and Southern Florida Comprehensive Review Study to determine whether and how to best modify the Central and Southern Florida Project in light of threats to the ecology and water supply of South Florida. The reconnaissance phase of the review study, which identifies problems and develops and evaluates alternatives, is fully funded by the federal government and was completed in November 1994. This will be followed by a series of 3-year feasibility studies, which will require 50-percent funding from a local sponsor and will develop the most promising alternatives and make recommendations for congressional authorization.

In June 1993, the South Florida Ecosystem Restoration Task Force was convened by the Department of the Interior. The Task Force is composed of the six assistant secretaries who together are responsible for the Corps, EPA, NOAA, National Park Service, Fish and Wildlife Service, National Biological Service, U.S. Geological Survey, Bureau of Indian Affairs, U.S. Department of Justice, and USDA Natural Resources Conservation Service (formerly Soil Conservation Service). Until now, Task Force membership has been limited to federal agencies. The goal of the Task Force is to ensure that the ecosystem restoration effort is conducted in as organized and coordinated a manner as possible through consistent policies, strategies, plans, and priorities for addressing environmental concerns in the ecosystem. Specifically, the Task Force will: (1) agree on federal objectives for ecosystem restoration to be incorporated into the Corps reconnaissance study for redesign of the Central and Southern Florida Project; (2) promote the establishment of an ecosystem-based science program that utilizes the strengths of public and private entities and includes research, inventory, monitoring, and modeling; (3) support the development of appropriate multispecies recovery plans for threatened and endangered species and candidate species; and (4) encourage expedited implementation of projects, programs, and activities included in coordinated restoration plans.

The Task Force created a Working Group, which established three subgroups (for science, infrastructure, and management and coordination) to tackle the development of a comprehensive restoration plan within 12 months. In November 1993, the science subgroup prepared a draft report on alternatives for South Florida ecosystem restoration as a contribution to the Central and Southern Florida Project workshops held in December. In March 1994, Governor Chiles established the Commission for a Sustainable South Florida. It was charged with working to "improve coordination among and within the private and public sectors regarding activities impacting the Everglades ecosystem, examine the effects of continued development and agriculture on the natural resources within the Everglades ecosystem, recommend actions for the restoration, management, preservation, and protection of these resources, recommend strategies for ensuring that the South Florida economy is based on sustainable economic activities that can coexist with a healthy Everglades ecosystem, and assist in promoting and monitoring the implementation of its recommendations." The Commission is made up of 35 representatives from state and local government as well as business and public-interest groups, along with 4 nonvoting representatives from the federal government. A final report and recommendations are due to the Governor by July 1, 1995. Several members of the federal Working Group were appointed to the Commission, providing a potential link between the Task Force and nonfederal entities.

In the meantime, South Floridas rapid population growth is likely to continue, placing strains on the natural environment. By the year 2000, according to current predictions, Florida will have the third largest population in the country, with the vast majority of it residing in South Florida.

BUDGET ISSUES

Although federal agencies are taking tentative steps toward joint project planning in South Florida, projects are still funded separately. Many interviewees saw this lack of budget coordination as a major impediment to ecosystem restoration, and they offered suggestions on how to surmount this and other budgetary barriers to the ecosystem approach.

Current Budget Management

Federal agencies in South Florida have traditionally planned and executed their budgets independently: each agency funded separate ecosystem-related projects. None of the projects shown in table 1, for example, are funded by more than one agency (although the Corps uses Department of the Interior funding to implement the East Everglades Modified Water Delivery Project). However, the Corps and National Park Service have been working together on the design of some of the projects shown, and the Fish and Wildlife Service has received Corps funds for Coordination Act reports. Moreover, the National Park Service and Fish and Wildlife Service have coordinated closely in planning to address water quality issues. In addition, the new federal South Florida Ecosystem Restoration Task Force is beginning to discuss interagency funding priorities on an ecosystemwide basis, in hopes of moving from budget "crosscuts" and accounting exercises to truly integrated budgeting.

Table 1.-South Florida projects (millions of dollars)
Federal Project Interior Dept. Corps of Engineers
OtherState/SFWMD County Private Total Kissimmee River Restoration-208-208--416Modified Water Delivery107-----107(East Everglades)Southern Glades Management Area---7--7C-111 General Reevaluation Report1359-50--122Everglades Forever Act (Stormwater--87381-232700Treatment Areas)U.S. Highway 1 Expansion--61100--161Big Cypress Land Acquisition55--28--83East Everglades Land Acquisition46--32--78Model Lands Acquisition---3030 60Total221267148836302321,734Percentage1315948213100
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Of note is the high level of state involvement in all projects shown in table 1: state funding accounts for $836 million, or 48 percent of the total. State funds for the Everglades Construction Project outlined in the Everglades Forever Act will be largely drawn from taxes on agricultural operations in the Everglades Agricultural Area. Such taxes are designed to generate an annual minimum net of $11,625,000, for a total contribution over a 20-year period of $233 to $322 million. The Everglades Forever Act also provides Everglades Agriculture Area-wide and individual incentive credits for onsite phosphorus reductions.

Budget-Related Barriers to the Ecosystem Approach

Of the many budget-related barriers to the ecosystem approach cited by interviewees, lack of interagency cooperation in budget planning was most often mentioned. This deficiency was seen as an impediment to an integrated plan to

implement the ecosystem approach that would allocate funds based on the priority needs of the ecosystem. Related to this is another perceived barrier, the fact that no federal agency has been assigned to coordinate the ecosystem approach for the region. Ideally, such an agency would plan cross-jurisdictional landscape activities, request funds for such activities, and ensure that all necessary components of a coherent, comprehensive ecosystem restoration program are funded adequately and in appropriate sequence.

Not shown in table 1 are the different congressional committee jurisdictions that address agency programs. The agencies now beginning to work together in a more concerted way in South Florida receive their authorizations and appropriations from several different committees. Lack of communication between these committees was cited as a barrier to the ecosystem approach.

Lengthy discussion with the Corps revealed a number of budget-related barriers to the ecosystem approach. Agency personnel ceilings were said to limit the ability of the Corps and National Park Service to implement projects using adaptive management, which requires changes in project implementation based on new information. Due to low personnel ceilings, much Corps work is contracted out, and federal contracting guidelines make it difficult to contract for work such that tasks can be reoriented based on new information. Reorienting contracted work can require lengthy administrative procedures, making it difficult to quickly shift the direction of project implementation. Additional problems associated with contract work include increased difficulty in coordinating project activities (it is easier to coordinate in-house activities than contracted work), and the heavy staff workload required to manage contracted projects (staff time is used more efficiently when work is carried out in-house.)

The Corps also pointed to barriers associated with Water Resources Council Principles and Guidelines, an important tool for evaluating potential project options. Because the Principles and Guidelines heavily emphasize the National Economic Development Account, the screening criteria for project options are largely based on potential economic benefits. According to some, insufficient emphasis is placed on environmental and social benefits that are difficult or impossible to quantify in economic terms. Noting the current federal funding emphasis on public works, some state officials and environmental organizations suggested that the federal government deemphasize infrastructure development and take instead a more broad-based approach, including a wider range of options aimed at achieving ecosystem sustainability.

Moreover, many interviewees, including both scientists and managers, indicated that funding for research, inventories, and monitoring is inadequate. A major research-related problem indicated by federal agencies, especially land managers, is limited funding for environmental trend analyses. Instead, funding tends to go toward solving critical problems that could have been avoided if trend analyses had been conducted. But others discounted the claim that more money is needed for research, arguing that more effective (i.e., integrated and interdisciplinary) research could make better use of the money already being spent on research in South Florida.

Citing the exotic plants that are disrupting the Everglades ecosystem, managers called for more funding for research on exotic species and techniques for their control. Funding for ecosystem modeling, a critical component of the ecosystem approach, was also called inadequate.

National Park Service staff highlighted a significant barrier to the funding of long-term research, an essential component of the ecosystem approach: funds for research cannot be carried over from one year to the next. Because research funding is part of the park operations budget-an annual appropriation-any funds not spent must be returned at the end of the fiscal year.

A final budget-related barrier to the ecosystem approach noted by interviewees from various sectors involves the general difficulty of securing funds for large-scale restoration efforts. Costs of restoration are high, potential impacts on economic development are significant, and results are often delayed. Moreover, no approach to large-scale ecosystem restoration is generally accepted as correct.

Interviewee Suggestions

Interviewees from many sectors suggested that a federal budget be prepared for the entire South Florida ecosystem. A joint budget should reflect funding priorities established jointly by all federal agencies, and/or it should indicate how each agencys budget requests relate to federal management objectives for the entire ecosystem. Interviewees also suggested that assistant secretaries from each agency involved in the ecosystem show their support for the entire South Florida budget package by meeting with the four congressional appropriations subcommittees responsible for funding their agencies.

Some suggested that all federal restoration projects require local cost-sharing and use local fiscal commitment as a priority-ranking criterion. However, such a measure might have an adverse impact on low-income areas. It was also suggested that the Water Resources Council Principles and Guidelines be revised to better account for environmental quality and other social effects, and to deemphasize the National Economic Development Account. Establishment of an entrepreneurial fund for integrated interagency activities was recommended, with funds earmarked for such underfunded activities as research, planning, and restoration. A competitive process could be used and extra credit given for involvement in ecosystem restoration initiatives by state and local government. Finally, federal agencies were urged to make full use of adaptive management techniques to determine if management solutions will work on a small scale before major public investments are made to implement large-scale management practices.

INSTITUTIONAL ISSUES

Interviewees named a number of institutional obstacles to ecosystem restoration in South Florida. Doubts were expressed about federal leadership and vision in ecosystem management, communication between and within federal agencies, timeliness of project review and approval, and intergovernmental coordination during project planning and implementation.

Leadership and Shared Vision

Many of those interviewed observed that no one federal agency has jurisdiction over an entire ecosystem or a broad mission of implementing the ecosystem approach. The agencies that do have (broadly interpreted) missions in accordance with the ecosystem approach may not have the funding required or the socioeconomic perspective needed to provide leadership on an ecosystem basis. Despite the large number of individual projects and major monetary investments in South Florida, there has been no overarching vision, process, or institutional leadership for management on an ecosystem scale.

Many interviewees called for a shared vision for the ecosystem in order to begin planning how to reach the desired state and what different participants in the ecosystem can do to move toward the goal. Interviewees stressed the importance of acknowledging the cost of restoration, and that the vision should include a shared sense of where funding will come from. It was suggested that a lead agency be named to facilitate organization and to dispense discretionary funding for travel, mailings, support staff, publications, and other logistics required for interagency efforts.

Different agencies have different missions and different definitions and perspectives on the ecosystem approach. Some interviewees pointed to the need for a shared understanding of the principles of the ecosystem approach, as well as a shared set of goals for the ecosystem. Although the federal South Florida Ecosystem Restoration Task Force, the Corps Central and Southern Florida Comprehensive Review Study, and the Governors Commission for a Sustainable South Florida all represent efforts to develop a broader vision, it is not clear that any one of them provides a total solution to the problem.

Communication

Communication within and between organizations was the subject of much discussion. Interviewees pointed out that monthly or even weekly meetings between agency staffs did not adequately afford the kind of joint planning and decision making necessary for the ecosystem approach. Interagency personnel exchanges were praised for bringing together people of different backgrounds and producing effective full-time interagency teams to address multidisciplinary problems. For example, the Corps has made 1-year transfer appointments from other agencies to form interagency teams as part of its Central and Southern Florida Comprehensive Review Study. Sharing expertise and agency perspectives opens communication and moves the planning process beyond the traditional monthly meetings and coordination letters. More full-time interagency personnel exchanges were called for to overcome lack of communication between agencies during planning processes.

Some observed that there is a need for common language and clear definitions within and between agencies. Key terms such as "ecosystem management" and "sustainable development," and terms used in agency planning and study documents, must all be plainly understood. Differences in usage may result in miscommunication and unanticipated products: for example, differences in how groups define the word "objectives" may have led the science subgroup of the South Florida Ecosystem Restoration Task Force to present a broader set of restoration alternatives in its November 1993 report than the Corps and others had expected.

The need was expressed for clear leadership and support for the ecosystem approach at every level, from the Department to the field. Unless field staff know what assistant secretaries consider important, they will not make interagency coordination a priority. It was mentioned, for example, that the USDA Natural Resources Conservation Service did not actively participate in the science subgroup, in part because USDA leadership did not show the interest necessary to inspire agency researchers and others to become more actively involved. This may reflect internal barriers to communication: departmental leadership may assume that field staff are actively engaged in a project, whereas regional leadership may not be conveying the appropriate signals to staff. The problem may lie partly within agencies themselves: inadequate definition of priorities, poor intra-agency communication of them, and a general lack of leadership on issues pertaining to the ecosystem approach.

Interviewees recommended use of new technologies, such as electronic mail and the Internet, to facilitate communication.

Agency Review Processes

Interviewees expressed concerns regarding Corps project approval, concerns that may pertain to other agencies as well. Some were also disturbed by the slow pace of reviewing documents for publication.

Corps project approval process. The main concern was the time it takes to complete the process of selecting and approving a project for the Corps. After lengthy review by the Corps, project proposals must go before Congress, and any new information can mean that the entire process must start over. The need for congressional approval, it was noted, may limit the flexibility of a project: the approval process may take so long that the project is no longer as pertinent to local conditions once finally approved. Interviewees maintained that changes made in 1986 to the Corps review process had succeeded in reforming and streamlining the process to make it more timely, efficient, and responsive to needs. Now that the Corps can continue with general project planning and evaluation while waiting for congressional and other reviews, time to project completion has dropped from an average of 26 years to as little as 7 years or less.

Coordination and review of Corps projects involve numerous evaluations and consultations on project benefits, costs, and impacts. Much of the evaluation process follows Water Resources Council Principles and Guidelines to selecting a project option. Some expressed concern that the Principles and Guidelines may require the plan to optimize economic benefits, thereby limiting the kind of plan that can be chosen. It was pointed out that basing project selection on assessments of economic benefits and costs may fail to take into account the value of noncommercial natural resources. Questions were raised about differences between using criteria from the Principles and Guidelines to select projects and using National Environmental Policy Act (NEPA) criteria or other evaluations of costs, benefits, impacts, and alternatives. Interviewees emphasized the need to foster an ethic among project designers and planners of evaluating environmental costs and benefits and selecting projects that produce a net environmental gain.

Communication between agencies is especially critical early in the project evaluation process. By distributing scoping letters as well as pre-environmental impact statement and draft-environmental impact statement information to interested parties early in the NEPA process, agencies can initiate and facilitate dialogue and coordinate diverse interests. Early discussions and material review often make later evaluations of NEPA alternatives much easier.

Authorship and publications review. For documents that list agency researchers as authors, many agencies require an internal review prior to publication, and this review can be very time-consuming, according to interviewees. A slow review process may hinder planning efforts, delay dissemination of information, and decrease the willingness or feasibility of collaborative research and publication among agency researchers. Faced with publication delays, researchers may be less willing to participate in cooperative interagency projects that may provide more efficient approaches to common research problems. The U.S. Geological Survey was named as an agency with an especially long and complex review process for reports. It was noted that some researchers elect to be listed as collaborators rather than as authors on reports in order to avoid triggering the usual review process, despite the fact that authorship of publications is commonly used to evaluate researcher productivity. In addition to its timeliness, the substance of the review process may pose a problem: one interviewee called for a special review procedure for work that might disagree with or contradict existing management.

Intergovernmental Coordination

Interviewees observed that formation of the federal South Florida Ecosystem Restoration Task Force was a positive step toward interagency coordination. But the Task Force does not include nonfederal governmental parties; despite

good relations between federal and county agencies at the staff level, some interviewees noted, local governments have been largely left out of the ecosystem restoration planning process.

Some interviewees felt that the Task Force should include a broader spectrum of federal agencies. Particularly needed, they agreed, are representatives from agencies that deal with socioeconomic factors such as development and education. Most notably absent is the U.S. Department of Transportation.

Several interviewees observed a need for greater interdisciplinary communication and exchange of ideas for a more efficient and effective ecosystem approach. Interviewees noted that more ecologists need to be involved in management efforts, and that ecological work should be better integrated with the work of engineers.

LEGAL ISSUES

Applicable legal authorities both impede and facilitate the ecosystem approach. Two major federal statutes or programs, the Federal Advisory Committee Act and the Corps Civil Works project authorities, were widely cited as impediments to the ecosystem approach. Two other major authorities, the Endangered Species Act and the Corps regulatory program pursuant to section 404 of the Clean Water Act, present certain constraints, but in other ways facilitate the ecosystem approach. In addition, several other authorities present impediments, opportunities, or both.

Federal Advisory Committee Act

The Federal Advisory Committee Act (FACA), 5 U.S.C. App. 2, places restrictions on the ability of federal agencies to solicit and receive collective advice from nonfederal parties. For example, FACA stipulates that an advisory committee must be organized under a charter, balance its membership, post notification of its meetings in the Federal Register, hold open meetings, take minutes of meetings, and (upon request) provide transcripts of meetings.

The South Florida Ecosystem Restoration Task Force convened by the Department of the Interior has no nonfederal members; and, to date, it has had no ongoing, systematic contact or discussions with nonfederal governmental parties with responsibilities affecting ecosystems. This lack of contact is largely due to FACA: any nonfederal committee established to advise federal decision makers must comply with FACA, and if nonfederal persons were part of the Task Force, FACA would apply to the Task Force itself. If the Task Force were not required to comply with the FACAs requirements, it would institute contacts with nonfederal parties, particularly state agencies and other government entities. But if the Task Force were to institute such contacts, it would either be hindered by FACAs restrictive and time-consuming requirements or be constrained to act in such a way that FACA is not implicated.

Although the concept of a federal Task Force was generally praised by those interviewed, the comment was frequently made (particularly by state officials) that lack of regular consultation with relevant state parties has limited the Task Forces effectiveness. The federal government cannot achieve its goals without integrating its activities with other key governmental players in the ecosystem. Coordination is also critical to information sharing and joint scientific research. Some people suggested that the lack of regular, formalized communication between federal and nonfederal governmental parties was one of the biggest barriers to efficient restoration and management of the South Florida ecosystem.

One creative step toward resolving this dilemma in South Florida is the evolving informal connection between the Governors Commission for a Sustainable South Florida and the Working Group of the Task Force. Some of the federal agencies represented on the Task Force are also on the Governors Commission, and recent meetings of the two groups were scheduled on consecutive days in the same location to facilitate informal interaction within the constraints of the law.

Federal interviewees indicated that an amendment to FACA allowing federal agencies to consult with state, local, and tribal officials without having to go through the FACA chartering process would make the task of implementing the ecosystem approach much easier.

Army Corps of Engineers Civil Works Programs

Federal regulations and environmental laws require the Corps to employ a lengthy and complex process whenever it considers a water resources development project. The Corps must complete a two-phase study that routinely takes up to 5 years and requires congressional approval of each phase. Significant changes in a project require the Corps to return to Congress for new authorization. Projects proceed through several sequential phases of planning, design, construction and operation, and they must meet the requirements of the Water Resources Council Principles and

Guidelines, National Environmental Policy Act, Endangered Species Act, Fish and Wildlife Coordination Act, and other statutes. In addition, projects depend on cost-sharing partnerships between the Corps and local sponsors that must be formalized in a binding legal document negotiated by the parties and reviewed for legal adequacy by the Office of the Army General Counsel.

The Corps civil works process was criticized by some as detrimental to structural aspects of an ecosystem approach because it is so rigid and time-consuming. In addition, the Water Resources Council Principles and Guidelines, which allow projects to proceed only if economic benefits outweigh costs, make it difficult to assess environmental benefits, which are hard to quantify. The Corps is currently undergoing major agencywide restructuring to improve efficiency and timeliness in developing regulations to assist in identifying and recommending projects with strong environmental benefits.

Endangered Species Act

The federal Endangered Species Act (ESA), 16 U.S.C. §§ 1531 et seq., requires, among other things, that federal agencies take measures to protect both species and the habitat of species that are listed as threatened or endangered under the Act. Because it is the listing of a single species that triggers the principal ESA obligations, the implementation of the Act has traditionally focused on protecting single species rather than ecosystems. However, the Act does allow for an ecosystem approach and, in some respects, has been the primary means of moving toward ecosystem protection. For example, the Act requires federal agencies to assess their actions in order to prevent adverse effects to listed species and their critical habitats. A logical furtherance of the ESA is to ensure that agencies act to prevent future listings so as to obviate the need to assist later in the delisting. At the same time, the habitat of some wide-ranging listed species (such as the northern spotted owl) is so widespread that protection of the single species results in the protection of hundreds of other species that are also dependent on the same habitat.

In South Florida, it is sometimes difficult to protect a single species and also restore an ecosystem. For example, the snail kite (a listed species) now lives in altered habitat. In order to restore the ecosystem, that habitat should be restored to a more natural, drier state. While that action will be beneficial for most species, it may not be best for the snail kite, which is entitled to special protection under the Act. Similarly, during the section 7 consultation process (in which federal agencies consult with the Fish and Wildlife Service on the effects of proposed agency activities on listed species), analysis is often focused on the activitys effects on a single listed species without regard to the overall effects on the ecosystem. For example, removal of a certain causeway that hinders the natural flow of water might pose a threat to manatees and American crocodiles because it could expose them to jetskiing and other human activities.

One of the goals of the federal South Florida Ecosystem Restoration Task Force is to support the development of multispecies recovery plans. A change in focus will be encouraged by the Administrations recently issued "Policy for an Ecosystem Approach to Implementation of the Endangered Species Act." The Policy recognizes that "most species will be conserved best not by a species-by-species approach but by an ecosystem conservation strategy that transcends individual species," and directs the Fish and Wildlife Service and the National Marine Fisheries Service to implement an ecosystem approach by, among other things, making group listing decisions where possible, developing partnerships with other governmental and private agencies, and developing recovery plans for whole communities or ecosystems. Nevertheless, difficult choices must still be made.

Clean Water Act

The Clean Water Act, 33 U.S.C. § 1344, may constrain some ecosystem restoration efforts in South Florida while promoting others through a variety of regulatory provisions.

Section 404 permitting. Section 301 of the Clean Water Act requires a permit issued under section 404 of the Act for the discharge of dredged or filled material into waters of the United States. The 404 regulatory program, jointly administered by the Corps and EPA, is important to South Florida, where a high percentage of the land is wetland that falls under the legal definition of "waters of the United States."

The Corps and EPA have used their 404 authority to develop watershed-based programs that facilitate the ecosystem approach. Both agencies encourage "mitigation banking"-the creation, restoration, or enhancement of wetlands to compensate for unavoidable wetland losses due to planned development. Units of restored or created wetland count as "credits" that can offset "debits" incurred at development sites. Recently, federal agencies collaborated in publishing national mitigation banking guidance.

In a related program, the Corps encourages offsite mitigation projects in compensation for section 404 violations. Such projects create or improve wetlands in the same watershed as the area affected by the violation, and often they are required in consent decrees between the government and defendants in section 404 cases. Similarly, the Corps works with section 404 permittees or violators to offset negative impacts to wetlands by conveying perpetual conservation easements on important parcels of land to water management districts or conservation organizations.

Finally, the Corps and EPA have instituted the Advanced Identification of Disposal Sites (ADID) Program, which fosters advance planning for entire watersheds, focusing on those where there is significant development pressure. Areas are designated as suitable and unsuitable for dredge and fill activities, and prioritized within a watershed for wetland purposes. This program helps property owners and prospective buyers determine the likelihood of receiving wetland permits in specific areas. The Corps and EPA work closely together in both permitting and enforcement.

Some of those interviewed stated that the ADID Program is currently of limited value for several reasons: it is cumbersome; it does not take into account such factors as the socioeconomic impact of wetland determinations; it does not allow for stays of permit applications while comprehensive analyses are underway; and it requires more resources than the Corps and EPA are able to devote. Although a full-blown ADID does take a considerable amount of time to complete, EPA has been discussing means to expedite the process by using more existing data, or, in some cases, by reducing its scale. With respect to staying permits pending ADID analysis, depending on the facts of the case, a party may raise a temporary takings claim.

The Corps is trying to follow the model of The Nature Conservancys watershed approach to the Reedy Creek/Lake Marion Creek area (which lies outside the South Florida ecosystem). The Nature Conservancy has developed what the Corps considers a highly successful comprehensive "watershed conservation plan." The plan includes an assessment of the watershed and strategies for growth management, species habitat protection, and management of water quality, quantity, and flow.

The Corps identified an impediment to the ecosystem approach relating to lawsuits against violators of section 404. The civil penalty collected cannot be used for environmental purposes in the area of the violation, but must instead be deposited in the federal Treasury. Specifically, under applicable law, civil penalties ordered by the court must go to the Treasury, and the U.S. Department of Justice applies EPAs "supplemental environmental project" policy to require that all settlements contain some penalty payable to the Treasury. The Department of Justice also has other statutory constraints limiting its flexibility with respect to assessed penalties.

Delegation of 404 programs. There is some debate in South Florida over whether 404 regulatory authority should be turned over to state or local agencies. Although the Corps and EPA are currently responsible for operating the 404 program in Florida, the state is working with them under a limited State Programmatic General Permit (SPGP) under section 404, allowing it to issue permits for certain classes of activities on wetlands in four counties in northeastern Florida. This pilot permitting program may lead to other types of SPGPs in the future. However, no SPGP is pending for fills of any size.

In order to assume the entire 404 regulatory authority, the state must develop a program that covers all of its territory and is at least as stringent as the federal program. But the state encountered a problem when the Florida legislature passed its own version of a delineation manual that left out certain types of federally regulated wetlands, rendering the states program less stringent.

The state may be able to subdelegate its general permit responsibilities to counties or water management districts. But enforcement authority is not typically subdelegated; and, according to EPA, the intention to subdelegate enforcement authority would have to be a condition of the State Programmatic General Permit (which has never been the case before) in order for it to occur. According to interviewees, delegating 404 authority to state and local officials would have advantages as well as disadvantages. Fewer permitting levels would mean more consistency, more efficiency, and less burden on the permit applicant. However, the federal government has a better grasp of the "big picture," is able to do more comprehensive planning, and is less subject to local political pressures. Although we were told by county commissioners that local requirements tend to be more stringent than state and federal requirements, environmental groups contradicted these claims, asserting that local requirements tend to be less stringent and more influenced by the orientation of some county managers in favor of development. For purposes of the ecosystem approach, the number of permitting layers required may be less critical than the amount of coordination there is between different layers of government. Currently, the Corps and the state use a joint wetlands permit application to simplify the process.

NPDES permitting of Stormwater Treatment Areas. The Clean Water Act requires a National Pollution Discharge Elimination System (NPDES) permit for all "point sources" defined by the Act (33 U.S.C. §§ 1311, 1342, 1344, and 1362). EPA is the federal agency vested with authority to issue permits, except where it has approved a state permit program.

Although EPA provided technical expertise in support of the Everglades litigation, and although the agency attended earlier settlement meetings, its role remained marginal. During the technical mediation settlement discussions, the U.S. Attorneys office was asked by one of the parties to inquire of EPA whether Stormwater Treatment Areas needed NPDES permits. Based on the facts presented, EPA determined that there would be point source discharges of pollutants into waters of the United States, and that therefore permits were required. Although Stormwater Treatment Areas are designed to purify the water flowing through them, EPA was and is concerned that water discharged from them could fail to meet water quality standards. There are two primary concerns: that residual pesticides from the days when Stormwater Treatment Areas were in agricultural use could leach into the water, and that biological and chemical changes could occur in the Areas, resulting in increased concentrations of some chemicals.

EPA issued a permit (effective June 15, 1994) for the Everglades Nutrient Removal Project, but the permit has been stayed pending requests for an evidentiary hearing filed by several parties, including Friends of the Everglades, the Miccosukee Tribe, and the Sugar Growers Cooperative. For the most part, permit requirements involve monitoring rather than numerical standards.

The determination by EPA that an NPDES permit would be required for the Everglades Nutrient Removal Project troubled some of the parties involved in mediation, particularly the state and water management district. Some found it disturbing that facilities created to treat agricultural discharges should be subject to NPDES permit requirements under the Clean Water Act from which the discharges themselves were specifically exempted by the Act. In the states view, this anomaly created a substantial disincentive for agencies interested in cleaning up water sources. Moreover, there was concern that the permitting process would cause the mediated plan to fail. EPA has worked hard to make the permitting process as smooth as possible, but certain problems persist. The Agency has stayed operation of the permit pending review of the challenges, and without an effective permit, even emergency discharges are not allowed. In the states view, disallowing these discharges could affect the usefulness of the experimental Everglades Nutrient Removal Project. In the meantime, the South Florida Water Management District, with the support of EPA, filed a pending motion to receive interim authorization for discharges while evidentiary hearings are underway. On August 8, 1994, permission was granted, and the Everglades Nutrient Removal Project began discharging within 1 month of its originally anticipated discharge date-that is, without significant delay.

Role of state water quality standards. Because the Clean Water Act exempts agriculture from its usual discharge prohibitions, the federal government has looked to state law to address water quality standards in South Florida. In 1988, it brought suit against state agencies for failing to comply with state laws requiring delivery of unpolluted water to the Everglades. The procedures and provisions of Florida water law thus became central to resolution of the ensuing litigation and to ecological restoration in South Florida generally. Under the consent decree agreed to by federal and state governments, the state was required to adopt a Surface Water Improvement and Management plan to address water quality problems caused by agricultural practices. But adoption of the plan involved a lengthy public process, and the plan was challenged in 36 separate lawsuits, primarily by the sugar industry. The resulting delay in the plan threatened to continue for years; had passage of the Everglades Forever Act not ended the dispute, the plan would still be in litigation today, at enormous cost to ecosystem restoration. Had it been possible, direct action under federal law against the polluters would have led to quicker relief, providing fewer opportunities for collateral challenge.

Federal Programs That Abet Environmentally Unsound Practices

Representatives of the Florida Department of Environmental Protection noted that federal programs (such as agricultural support programs and flood insurance) encourage practices by private landowners that may be detrimental to ecosystem management because they can be environmentally unsound.

Agricultural support programs. Sugar producers in South Florida benefit from such USDA programs as price supports and import quotas, which artificially assure the profitability of sugar. According to some interviewees, such programs encourage agricultural practices that may put pressure on natural resources. For example, low-interest loans offered by the Farmers Home Administration and crop insurance provided by the Federal Crop Insurance Corporation encourage agricultural conversion of flood-prone wetlands that might otherwise not be profitable.

Flood insurance. The National Flood Insurance Act, 42 U.S.C. §§ 4000 et seq., provides federal flood insurance to private homeowners and other landowners who develop in floodplains, on coastlines, and in other areas where eventual damage to both buildings and the environment is likely. According to the Florida Department of Environmental Protection, the vast majority of people living on Floridas coasts would not be there were it not for federal flood insurance. Such programs contribute to the urban development that has been blamed for many environmental problems, including erosion and loss of endangered species habitat.

Agency mandates. Congress has never declared that a particular federal agency has the ecosystem approach as its sole, or even primary, mission. Each agency has specific mandates governing the lands it manages and the environmental media (such as air and water) or development projects it regulates. Although statutes such as the National Environmental Policy Act and Endangered Species Act require coordination among agencies, no agency has a mission of integrating its activities with those of another agency for the sake of more effective long-term land, resource, and socioeconomic planning.

Consequently, agencies rarely apply for congressional funding to promote the ecosystem approach as such; instead, funding is sought for discrete agency functions that may or may not encourage the ecosystem approach. Moreover, no one federal agency is charged with promoting the concept of the ecosystem approach to Congress. Some view this as an impediment to adequate funding of ecosystem projects. Others believe that the problem can be resolved through interagency coordination and forceful agency leadership that embraces the ecosystem approach.

National Environmental Policy Act

The National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 et seq., requires agencies to consider the environmental consequences of "major federal actions significantly affecting the human environment." Specifically, the Act requires agencies to prepare an environmental document which could include an environmental impact statement (EIS), a Finding of No Significant Impact, or an environmental assessment (EA) before proceeding with implementation of any major federal action that will significantly affect the human environment. In addition to requiring the development and consideration of alternatives and consequences, the NEPA process serves as a means of informing the public about agency decisions and facilitates public input into the decision-making process. All federal agencies must comply with NEPA at many phases of design, planning, and construction.

NEPA was viewed as both useful for the ecosystem approach and an impediment to it. It is useful because it forces agencies to consider all of the environmental impacts of their actions, and to refrain from moving too quickly, before consequences are sufficiently analyzed.

However, it was felt that NEPA may make adaptive management difficult. As an agency increasingly employs an adaptive management approach, its approach is to plan in incremental steps and to undertake several short-term projects, rather than to plan a comprehensive long-term project and follow through with it without modification. As a result, NEPA analysis has to be done at each step of the process, because each step represents a new federal action. The time required to prepare an EIS (including substantial public comment periods and analysis of alternatives) is often almost as long as the project itself. Moreover, because the NEPA analysis is done piecemeal, it is difficult to determine cumulative effects over time and the long-term costs of a comprehensive effort. However, it was noted that NEPAs flexibility depends on how it is implemented. There are means, such as programmatic EISs, generic EISs, subject-specific EAs, or supplemental EAs, that can help move a process along.

For example, the Corps is currently making experimental water deliveries to Everglades National Park. Each experimental test lasts 2 years, after which data are evaluated and the next test is designed. The NEPA is an impediment here, because the EIS process itself can take almost 2 years, and a separate environmental impact statement must be prepared in connection with each test. The process has also resulted in criticism of the Corps for not considering the cumulative effects of the tests. Another example involves construction of the C-111 canal. The recently completed EIS lists several options for future structural modifications. Each time one or more options are chosen, the Corps will have to engage in NEPA analysis. If the complete project were decided upon at the outset, NEPA analysis would have only been required once, but the ability to adjust to new information would be limited.

Another requirement NEPA imposes is coordination among federal agencies, where, as part of an ecosystem approach, several major actions are undertaken by different agencies or different parts of one agency. This issue has arisen as a result of the Everglades Forever Act, which mandates several actions that may require NEPA analysis, namely: construction of the C-51 flood control project; Clean Water Act section 404 permitting associated with dredging and filling in the Everglades Agricultural Area, Water Conservation Areas, and some canal structures; and modification of

the federal water management system. In addition, EPA will need to issue National Pollution Discharge Elimination System (NPDES) permits for the Stormwater Treatment Areas, which could be accompanied by NEPA analysis, although this is not mandatory in this case and the state may by then have been delegated NPDES permitting authority.

One suggested approach would be to prepare one NEPA document for all of these projects, but under current Corps practice, a different Corps official would sign the Record of Decision (ROD) for each project. For example, the ROD for the C-51 flood control project would have to be signed by the Secretary of the Army. If the Secretary were to sign the RODs for all Corps projects, the 404 permitting actions could be unnecessarily delayed (normally the District Engineer would sign the ROD for the permitting action). Separate EISs and RODs for each project would consume significantly more agency resources than a joint NEPA document because of extensive public involvement that NEPA would require for each document. However, EPA suggested the possibility of combining NEPA analysis for separate kinds of projects, such as the Storm Treatment Areas.

Internal Revenue Code

In 1992, the Corps received direction from Congress to do a reconnaissance study of the Central and Southern Florida Project. The project will take 18 months, and the Corps is drawing employees from other federal agencies on temporary duty assignments to address specific issues. For example, in order to ensure that wildlife concerns are raised or addressed at all phases, the Corps has appointed a specialist from the Fish and Wildlife Service to work on the project full-time, an approach the Corps hopes to continue in the future.

However, the process has been made more difficult by recent amendments to the Internal Revenue Code (26 U.S.C. § 162 (a); Revenue ruling 93-86). The code now holds that any term of employment away from the employees home in excess of 1 year is permanent rather than temporary. Reimbursement for expenses (such as per diem payments) are considered taxable income for which the employee is liable, and expenses incurred during employment are nondeductible. Because of this new rule, the Corps was recently forced to cut short an 18-month temporary duty assignment on a Florida reconnaissance study: two employees from Washington, DC, hired for their expertise in public involvement and restoration issues (and their ability to provide a broader perspective), had to leave Jacksonville, Florida, after 12 months (before study completion) in order to avoid tax liability for reimbursement of per diem expenses. Agencies engaged in the ecosystem approach are increasingly willing to "cross-breed" employees for interagency assignments, but the Internal Revenue Service rule places considerable constraints on this practice, limiting it to local employee exchanges for assignments that exceed 12 months.

Florida Keys National Marine Sanctuary and Protection Act

The Florida Keys National Marine Sanctuary, which includes all of the Florida Keys, was designated by Congress on November 16, 1990. Funded and managed primarily by the NOAA, with major assistance from EPA and considerable management input from the state, the Sanctuary has been cited as a model of the ecosystem approach for including a wide array of interests in planning and decision making. From the beginning, a partnership of federal, state, and local agencies was created for planning and management, and representatives of local interests (citizens, scientists, environmentalists, and business leaders) have been invited to participate. For example, a Citizens Advisory Committee reviews major documents produced by government agencies, including NOAAs Comprehensive Management Plan and the Water Quality Protection Program developed by EPA and the state.

PUBLIC PARTICIPATION

Efforts to involve the public in South Florida ecosystem restoration include environmental education programs and activities designed to obtain public input into the decision-making process. Despite a wide array of federal, state, and local educational programs and initiatives, many South Florida residents-especially those in urban areas-remain uninvolved, according to interviewees. Because public support is critical to the success of efforts to restore the Everglades, federal agencies face the challenge of raising public awareness of how restoration will affect local residents and what they can do to influence the process.

Programs Underway

Efforts are underway at the federal, state, and local levels to include the public in a variety of activities related to environmental education and ecosystem restoration.

Federal level. At the federal level, the Corps, the NOAA and EPA (through NOAAs National Marine Sanctuaries Program), and the National Park Service all have programs to educate the public on the Everglades ecosystem and to solicit public feedback and encourage public involvement in restoration efforts.

Army Corps of Engineers. The Corps conducts various educational programs around Lake Okeechobee. In addition, it has traditionally held public meetings to gain input into the planning and execution of public works projects. Because these meetings did not always adequately engage the public, the Corps is experimenting with a new approach in its Central and Southern Florida Comprehensive Review Study. A public involvement specialist was appointed to work with Corps staff in developing a public involvement process. Its goals were to gather information from and develop relationships with public sectors interested in, and/or potentially affected by, Corps plans for the ecosystem. The process consisted of three rounds of workshops, during which participants were invited to: (1) identify ecosystem-related problems and opportunities; (2) identify possible solutions in problem areas; and (3) provide feedback on proposed plans addressing each problem area.

Participants at the first round of workshops were given a worksheet with the following questions:

- What are the important resources in the South Florida ecosystem?
- What are the problems and opportunities in the ecosystem?
- How does one recognize successful restoration of the ecosystem?

Based on participant responses, the Corps developed lists of important resources in the ecosystem, along with problems and opportunities. Next began a technical analysis of the problems, in order to corroborate and support public concerns (and to identify any other problems and opportunities). Problem areas analyzed included water quality, water supply, flood control, recreation, and economic and social configurations. The analyses will serve as a basis for the development of alternative plans based on concrete public concerns.

A second round of workshops was held to provide feedback on the first round and to get input into potential solutions to problems identified. This led to development of alternative conceptual plans, which were presented in a third round of public workshops.

National Marine Sanctuaries Program. Through its National Marine Sanctuaries Program, the NOAA has conducted extensive public outreach activities on Key Largo (103 square nautical miles) and Looe Key (5.3 square nautical miles), both sanctuaries in South Florida. Its activities are now expanding throughout the Florida Keys National Marine Sanctuary.

Outreach was initially focused on site interpretation and educational programs for the two smaller sanctuaries. However, with awareness growing over the past decade of the deleterious effects of outside forces on the sanctuaries (such as nutrient pollution, fresh water diversion, and damage to corals from marine traffic), this effort has been strengthened and broadened. The public outreach program now includes the following activities:

- Each year, the Coral Reef Classroom Program brings 400-450 local middle-school students to the sanctuaries for snorkeling, water quality sampling, and lessons in reef ecology and understanding threats to the reefs.
- The National Marine Sanctuaries Program works closely with the Monroe County School Systems Environmental Education Advisory Council.
- In cooperation with the Florida Institute of Oceanography, the Florida Keys National Marine Sanctuary provides onsite education about the coral reef community of the Keys to about 120 marine science teachers a year from across the state.
- The National Marine Sanctuaries Program sponsors a series of lectures throughout South Florida, and the staff gives slide presentations to various groups on request.
- Radio and television outreach are major components of the effort. In cooperation with EPA, the National Marine Sanctuaries Program has a local cable-access program in the Keys called "Sounding Line," which seeks to educate area residents about environmental problems in the Keys and about decisions being made to address the problems. Through a segment of the program devoted to live call-ins, area residents can provide input into the decision-making process. This program will soon be available on cable throughout South Florida, and the National Marine Sanctuaries Program has just hired someone to work on improving it. The National Park Service has expressed great interest in cohosting the show.

- Printed materials are made available as part of the public outreach effort. The National Marine Sanctuaries Program has just hired two public outreach specialists to focus on providing the public with information through a newsletter (with a monthly circulation of more than 3,000), news columns, and radio talk shows. Because there is no "front entrance" to the sanctuaries, local law enforcement officers distribute information on the water, and brochures are made available in dive shops, boat rental shops, and other places where users can be reached. In addition, the National Marine Sanctuaries Program intends to train "reef rangers" (initially volunteers) to conduct interpretation sessions on the water.
- The Florida Keys National Marine Sanctuary has a volunteer coordinator (a position jointly funded by NOAA and The Nature Conservancy) who has generated a great deal of volunteer support.

National Park Service. The National Park Service conducts activities designed to teach the importance of maintaining healthy ecosystems and to increase awareness of the impact that activities around the Everglades National Park have on the health and viability of the park itself. Activities at Everglades National Park include guided hikes, canoe rides, bike tours, campfire programs, teacher workshops, day visits, 3-day camping programs for schoolchildren, and tours for college and university groups.

Interviewees hypothesized that so much attention has been focused on the ecological degradation of the Everglades that many South Florida residents may have concluded that not much of the ecosystem remains left to see. This may help to explain declining numbers of visitors to Everglades National Park. If true, this could pose a serious challenge to those seeking more public involvement in ecosystem restoration efforts.

State level. Public education and public involvement in decision making are given high priority by the Florida Department of Environmental Protection. The Departments action plan for developing an ecosystem approach implementation strategy cites "an ethic within the citizenry of shared responsibility and participation in protection of the environment" as one of its three primary goals. Objectives for achieving this include:

- Revitalizing and enhancing the Departments environmental education program.
- Promoting the ecosystem approach through environmental education.
- Increasing citizen participation in agency decision making.
- Continuing and expanding use of citizen volunteers to accomplish resource management projects on public lands.
- Developing a new partnership with private landowners in managing natural systems.
- Promoting increased voluntary pollution prevention activities within the regulated community.
- Encouraging development of grassroots, citizen-based activities to implement the ecosystem approach.

Twelve committees recently formed to carry out the action plan all have responsibility for at least one of these objectives. Floridas experience in pursuing these objectives could provide useful lessons for similar efforts in other ecosystems.

The Florida Advisory Council on Environmental Education was created by the legislature in 1989 through an amendment to the Florida Environmental Education Act. Its mission is threefold: to facilitate comprehensive, coordinated environmental education for all residents and visitors to the state; to improve understanding of natural systems; and to promote natural resources management and conservation actions. The Council accomplishes its mission largely through contract agreements with government agencies, private-sector organizations, and universities. The agreements are funded through the Save Our State Environmental Education Trust Fund, which has offices in the Department of Environmental Protection and is financed through sales from manatee and panther license plates. The Council works closely with the Department of Environmental Protection in selecting and managing the activities it funds. Traditionally, it has focused its attention on the public schools, but it will now orient its educational activities more toward adults, because 75 percent of Florida households have no children.

The South Florida Water Management District (SFWMD) is engaged in numerous public education and outreach activities named in its annual report, including:

- Developing environmental education curriculum materials oriented toward water resource use for 180,000 students.
- Hosting teacher training workshops for about 500 teachers.

- Financing a Florida ecosystem exhibit.
- Supporting additional educational projects through cost-share programs.
- Participating in a mass media water conservation campaign that included setting up a special hotline to take calls from the public.
- Supporting, with community involvement, a broad new "Hispanic Awareness" campaign to promote awareness of water resource issues within the Hispanic community in Dade County.

In addition to these activities (designed primarily to inform the public), the SFWMD provides opportunities for public input through the following forums:

- Monthly meetings of the Governing Board (which are public, as required by the Florida Sunshine Law).
- Public hearings on the development of SFWMD rules and regulations.
- Public workshops to obtain input on SFWMD construction plans or permits, or to inform the public on SFWMD regulations (such as uses of SFWMD-managed greenways and linear parks).

Such meetings are usually attended not by the average citizen, but rather by interest groups, citizens with considerable technical knowledge, and/or land users most directly affected by a proposed rule. Indirectly, the SFWMD interacts with average citizens through the 134 local governing groups serviced by the water management district. District staff are responsible for communicating directly with each major city and with the farming community through farm districts, cooperatives, and an Agricultural Advisory Committee formed by the Governing Board.

Local level. Interviewees mentioned various public education efforts carried out at the local level by local governments and nongovernmental organizations. Dade County, for example, supports environmental education efforts by local community organizations and hosts an English/Spanish hotline. The National Audubon Society has produced informational materials, such as "Water for People and Wildlife: Principles for Restoring the Endangered Everglades System." In cooperation with Motorola Company, the National Audubon Society also hosts educational activities in South Floridas public schools. Clean Water Action canvasses urban areas.

Opportunities and Constraints

The tremendous variety of public education activities at the federal, state, and local levels provide opportunities for public involvement in South Floridas ecosystem restoration. But when asked about opportunities for public participation and about constraints to public involvement that might exist, most of those interviewed focused on the following constraints: inadequate communication; urban disinterest; deficient public involvement in rulemaking; lack of public access to information; insufficient emphasis on adult education; distrust of government; and language barriers.

Inadequate communication. According to interviewees, public officials are not adequately conveying the importance of environmental problems. While some interviewees suggested that this may be due to official reluctance to convey negative messages to the public, others suggested that public officials and decision makers may not be well enough informed on the issues.

Lack of urban interest or awareness. Many interviewees highlighted urban disinterest in South Floridas environmental problems as a major barrier to public involvement. Interest rises somewhat during perceived crises, such as hurricanes or periods of water rationing, and it will most likely increase in the future as greater demands are placed on the resource and as water prices increase. At present, however, the average east coast resident in South Florida does not consider ecosystem restoration particularly important or personally relevant.

Little public involvement in rulemaking. The average citizen does not attend public hearings or meetings, the usual forums for providing input to rulemaking. Even for large construction projects or projects involving a change in land use, the public generally withholds comment until permits are issued or construction begins. At this point, it is often too late to introduce substantive changes.

Lack of public access to information. Information on the ecosystem approach and/or related federal government activities is not easily accessible to the general public. There is no one point of contact for information about federal activities.

Insufficient emphasis on adult education. Although 75 percent of Floridas households do not have children, most state and federal educational efforts are targeted at schoolchildren.

Distrust of government. A number of interviewees said that distrust of government on the part of industry, landowners, and the urban public is a substantial barrier to public participation in ecosystem restoration, undermining government efforts to educate and involve the public.

Language barriers. Most educational materials are in English. Lack of translations prevents outreach to Hispanics and other nonnative-English-speakers who reside in South Florida.

Suggestions for Future Involvement

When asked about public education and involvement, most respondents called for much greater public education efforts and better coordination at state and federal levels. Interviewees offered a variety of suggestions, including: identifying needs and opportunities for federal support; circulating information on federal activities; increasing the availability of information to the general public; getting the urban sector more involved; and working closely with counties and municipalities.

Needs and opportunities for federal support. The federal government should assess the present level of public education activities and their impact, identify priority needs, and determine the needs it can best address.

Information on federal activities. The South Florida Ecosystem Restoration Task Force should keep the public and other agencies and organizations informed of its goals, objectives, and (especially) progress. Interviewees offered several suggestions for doing so, including:

1. Adding a subcommittee on public participation to the Task Force.
2. Informing nonfederal groups when decisions will be made, who will make them, and how they will be made.
3. Hiring an aggressive public relations staff that understands the federal position and can convey it to the media.

Availability of public information. Interviewees made several suggestions for improving the availability and accessibility of information for the general public, including:

- Producing and distributing public education materials on the South Florida ecosystem, including educational materials on each of its components (such as the Kissimmee River, Lake Okeechobee, and the Biscayne aquifer) and a comprehensive laypersons book on the Everglades.
- Designating a single point of contact able to provide the general public with comprehensive information on efforts to implement the ecosystem approach.
- Organizing regular public forums where people can learn about the activities of the Task Force.

Urban sector involvement. Suggestions for getting the urban sector more involved in ecosystem restoration efforts included:

- Producing educational materials in Spanish and Creole, in addition to English.
- Focusing efforts on community leaders. They have more time and resources than the average citizen, and often command the respect and attention of others.
- Working through focus groups.
- Organizing classes to educate the public by providing a balanced view of the issues (perhaps through panels representing different views).
- Having more public forums at hours and locations that are convenient to urban communities.

Coordination with counties and municipalities. There are large gaps between federal and state regulations and planning processes used by counties and municipalities. According to some interviewees, federal agencies (and perhaps the federal South Florida Ecosystem Restoration Task Force) need to work more closely with local government to ensure greater coordination.

SCIENCE AND INFORMATION

Interviewees raised a number of issues related to science and information. Until recently, litigation underway impeded the sharing of information among scientists in South Florida. Although litigation has ended, a variety of information needs remain to be addressed if ecosystem restoration efforts are to succeed. But cooperation and communication among scientists-vital to successful adaptive management-are improving.

Information Sharing

Scientists, planners, and managers agreed that data exchange and information sharing are crucial to successful discussions within the scientific community. Inadequate exchange fosters distrust and inhibits effective, creative evaluation of problems, information needs, and possible solutions. Problems result if research is conducted in isolation and used to support differing viewpoints: arguments begin to focus on data validity instead of the issues. More collaborative research might address this problem.

Cooperation and Communication

In South Florida, the past few years have been dominated by litigation surrounding efforts to protect and restore the ecosystem. Litigation issues have provided science with both opportunities and impediments. Because litigation focused on water quality and phosphorus pollution, more work was done on those issues than would otherwise have been the case. Moreover, as key witnesses in litigation, scientists played a central role in policy development. However, litigation objectives often focused research disproportionately on certain aspects of problems in the ecosystem, and researchers were often preoccupied with trying to prove partisan points. Litigation also constrained data sharing and information flow. The development of the Mediated Technical Plan designed to resolve the legal impasse was viewed as successful because it used scientific collaboration in a focused way to help educate both lawyers and policymakers. Indeed, agreement by most scientists on a Mediated Technical Plan was key to resolving the controversy through state legislation.

Interviewees praised the science subgroup of the South Florida Ecosystem Restoration Task Force for including midlevel science experts with open minds from all interested parties (including agriculture). Broad membership was key to the groups success in collecting information, evaluating problems, and developing consensus solutions. Face-to-face meetings within the scientific community are important in developing the relationships and discussion necessary for problem solving. The group has been successful in "leaving agency hats at the door" and focusing on solving the problems at hand. Interviewees urged agencies to institutionalize cooperation with staff from other agencies and organizations, and to require that staff display a nonterritorial attitude.

Some interviewees considered the science subgroup inadequate because it did not involve the majority of scientists working on ecosystem issues in South Florida, and because those included in the group were not necessarily the ones who had been working on these issues for the 6 years since the federal lawsuit began. Scientists and managers agreed that more ecologists should be involved in management efforts if the ecosystem approach is to succeed.

Some cited disagreement between managers and scientists on the kind of information required for ecosystem restoration. Managers were blamed for misusing science to justify their actions, and scientists were criticized for their frequent inability to give definite answers, resulting in an overly cautious management that accomplished too little too late. Trust was considered the key to improving the relationship between scientists and managers. Some scientists interviewed held that one cannot make a nonscientist into a scientist; and many interviewees agreed that as the debate over the future of an ecosystem heats up, science becomes a minor issue and a political tool.

Because of their important role in ecosystem analysis, scientists are sometimes accused of usurping policymaking authority. The line between science and policy is not always clear, particularly when scientists are asked to develop solutions to problems. However, if a scientific analysis is to be respected, policymakers must clearly define what scientists are asked to do, and assumptions must be clearly labeled as such.

Interviewees emphasized that the work of scientists should be more integrated into the work of engineers. Although ecologists often think that engineers do not understand ecosystems, this is starting to change.

Planners and managers offered several other suggestions:

- Federal land managers should allow more research by outside scientists.
- Scientists from the Florida Department of Environmental Protection, South Florida Water Management District, and federal agencies should work together at the technical level to expedite the process.

- Nonfederal scientists should be provided with easier access to federal lands. According to one state official, it is currently difficult for nonfederal scientists to obtain permission to conduct research on federal lands.

Finally, two forums for interaction among scientists should be acknowledged. EPA and the state, in consultation with the NOAAs National Marine Sanctuaries Program, are developing a Water Quality Protection Program for the Florida Keys. This program has a 28-member technical advisory committee of federal and private scientists to help integrate the work, affording university scientists an opportunity to use the sanctuaries as leverage to secure research funding. In addition, last year the federal Florida Bay Scientific Review Panel convened under sponsorship of the National Fish and Wildlife Foundation and National Park Service to begin assessing research needs of the ecosystem. This forum provided federal scientists with an opportunity to discuss their work.

Information Needs

A surging population in South Florida has raised deep concern regarding water availability. During interviews, the following questions surfaced repeatedly:

1. How much water will the South Florida Water Management District make available to urban communities and others in the future?
2. What are the possibilities for reuse?
3. What is the carrying capacity of the ecosystem? How much pollution, water diversion, and other forms of degradation can it tolerate before collapsing?
4. What is the range of possible water sources?
5. When might South Florida reach the point where the South Florida Water Management District cannot meet water needs?
6. What are the alternatives if this point is ever reached?
7. How should water charges be adjusted among user groups in order to facilitate sustainable development?
8. What alternatives are available to reduce the increasing discharge of freshwater eastward into tidewater?
9. What alternatives are available for increasing water storage capacity and delivery to the Everglades system to reduce the need for freshwater discharge into tidewater?

Members of the scientific community expressed a strong need for greater understanding of how the ecosystem functions, and for long-term trend analyses and ecosystem modeling. Research is needed in both basic and applied science, and more funding is needed for both. Much research initiated during litigation has since ground to a halt; the need was cited for an inventory of available inventories. Scientists suggested asking the agricultural industry for permission to use its unfinished research.

Scientists noted that politicians and others frequently ask the unanswerable question, "Do we have enough of the ecosystem left?" This question, they said, was wrong: one cannot know the minimum requirements of an ecosystem until it has collapsed, and we should not be asking at this stage in South Florida how much more we can sacrifice.

In September 1994, the science subgroup of the South Florida Ecosystem Restoration Task Force released its draft report on the ecosystems scientific information needs. According to the report, scientific studies are currently underway to: (1) characterize the original (predrainage) ecosystem and compare it to the present system, particularly hydrologically; (2) determine key characteristics of the original hydrologic system; (3) design structural and operational modifications of the Central and Southern Florida Project in order to recreate characteristics of the original hydrologic system; (4) assess the hydrologic and ecological results of these modifications through pre- and postmodification monitoring; and (5) modify the design to make improvements.

The science subgroup report named the following science and information problems and deficiencies in South Florida:

- Existing or planned monitoring activities are not completely coordinated and integrated into the South Florida ecosystem restoration effort. Gaps in coverage exist.
- Models currently existing or under development are not broad enough in geographic scope to meet regionwide needs under the ecosystem approach. This is true of the water management model, the natural

systems model, the landscape model, and the wading bird models. These models should be expanded to provide a regionwide perspective.

- Restoration using the adaptive management approach will heavily depend on simulations from models, particularly hydrologic models. But nobody experienced with the most suitable current hydrologic models has been assigned to make simulations specifically for the interagency restoration effort.
- Systems of nested models are needed, in which finer resolution can be provided to address some questions and coarser resolution to address others.
- Modeling and special studies are most effective when used complementarily, but modeling is not well integrated with present research, and funds for modeling do not usually include sufficient funds for special supporting studies, including verifications.
- Use of models as technical tools in the restoration effort requires buy-in by all parties. An objective process is needed for evaluating existing models and ensuring that necessary improvements are made, and for protecting useful models against partisan attacks on their credibility. The availability of useful, credible models should not preclude the development of new models for addressing problems of resolution, scope, and flexibility.
- Certain key species or communities that might be suitable ecological indicators because of their important roles in the ecosystem or their sensitivity to anthropogenic changes are so poorly studied that they cannot now be used. Lack of knowledge about the response of these species or communities to hydrologic variables may seriously handicap the restoration effort.
- Flexible and sustained resources are essential to an effective, comprehensive restoration effort, but there is no single funding source for South Florida ecosystem restoration. Instead, the various agencies involved have unique and complex funding strategies, and critical activities needed at early stages in the restoration process are being neglected or lack of directed resources.
- Critical linkages between subregions are not being adequately addressed within agencies. For instance, Florida Bay is perceived to be in crisis, demanding immediate attention; its decline is largely attributed to changes in its freshwater intake. Yet the models, measurements, and studies needed to estimate freshwater flow into Florida Bay are not being given high priority.

Adaptive Management

It is easy to get caught in a loop of indecision, postponing action indefinitely while awaiting more complete information. According to both scientists and managers, agencies must make the best decisions possible based on available information. Progress can then be evaluated, and activities modified if necessary based on new information that emerges as the consequences of current activity become clear. This process of "adaptive management" underscores the importance of making data and science information applicable to problems at hand and in a form useful to managers and decision makers at multiple levels.

Two of the most important tools for adaptive management, as described in the September 1994 report of the South Florida Ecosystem Restoration Task Force science subgroup, are modeling and monitoring. These are critical means of using ecological and other indicators measured against baseline conditions to continuously update information, evaluate change, and translate new data into management strategies.

Agricultural industry representatives noted that the Mediated Technical Plan and the Everglades Forever Act may not provide enough flexibility for successful adaptive management. They pointed out that the agricultural industry is always managing in an adaptive fashion and is conducting many onfarm experiments.

CONCLUSIONS AND RECOMMENDATIONS

Flexibility, communication, cooperation, leadership: these are the four main themes to emerge from this case study. Whether the subject was budgets, institutions, laws, public outreach, or science, the survey team found a consensus among interviewees that the ecosystem approach generally-and specifically in South Florida-requires leadership. Only good leadership can foster cooperation, enhance communication, and encourage the flexibility needed for a successful ecosystem approach.

This section goes beyond situational specifics to discuss the issues with the greatest potential impact on the process of implementing the ecosystem approach, and with the broadest potential applicability to ecosystems in other parts of the country. The survey teams conclusions and recommendations are as follows:

1. The Federal Advisory Committee Act (FACA) imposes restrictive and time-consuming requirements, constraining efforts to coordinate federal activities with state programs in South Florida. Time and again, communication, inclusiveness, cooperation, and consensus were cited as vital to the success of restoration efforts in the Everglades, and FACA constraints in this regard were universally acknowledged. The survey team therefore recommends that FACA be amended to exclude state and other nonfederal governmental entities from the scope of its advisory committee requirements.

   Such an amendment would, among other things, allow the Florida Department of Environmental Protection and the South Florida Water Management District to sit on the South Florida Ecosystem Restoration Task Force and to work more closely with federal agencies involved in restoring the Everglades. The lack of routine, formal communication between federal and nonfederal agencies was regarded by most interviewees as one of the biggest barriers to efficient restoration and management of the South Florida ecosystem. Amending FACA would remove this barrier.

   A South Florida Ecosystem Restoration Task Force that includes state and local governments would be able to provide greater leadership, both in terms of actual restoration work and in terms of outreach to a public that some interviewees believed to be confused by the seeming profusion of parties working at cross purposes (see recommendation below on involving the public). The Task Force would also provide an excellent forum for building long-term trust, partnerships, and communication links among all the agencies involved.

   Perhaps most importantly, however, unless the Task Force can expand to include state and local governments, it will have no direct authority to address a host of overriding issues. For example, the population of South Florida is expected to increase severalfold in future decades, especially (if present trends continue) along the lower east and southwest coasts. Within 20 to 30 years, an additional 1 million people are expected to live in what is now agricultural land immediately east of Everglades National Park. Accompanying this incremental development will be an increased need for flood control from the Central and Southern Florida Project, further lowering of the water table, less ground water recharge, increased urban water demand, more freshwater discharge into tidewater, and more pulling of ground water from the Everglades to urban wellfields. Because water supply consumptive use permitting has been delegated to the South Florida Water Management District, water issues cannot be directly addressed unless the District is part of the Task Force. Without appropriate planning involving state and local authorities, these events may undermine the success of such restoration efforts as increasing water supply to the Everglades, Shark Slough, Taylor Slough, and Florida Bay.

2. The Corps Civil Works Program was the focus of much discussion during the survey teams interviews. The laws and regulations that govern the Corps initiation and completion of a water resources development project, such as the Central and Southern Florida Comprehensive Review Study, result in a lengthy, rigid, and complicated process that often makes the project susceptible to derailment, delays it until it is no longer feasible, or makes it extremely difficult to modify after completion. Legislative or regulatory changes to this process are needed to make it more efficient and streamlined. The Assistant Secretary of the Army for Civil Works has begun a restructuring initiative for the Corps that is intended to streamline this process.

   In addition, the Water Resources Council Principles and Guidelines make environmental projects difficult to advance. Rules requiring selection of the alternative that provides the greatest economic development benefit make it difficult to address environmental values. The Principles and Guidelines should be modified to place adequate value on noncommercial project purposes. The Office of Management and Budget is in the process of reviewing the Principles and Guidelines.

3. The Endangered Species Act (ESA) is one of an array of laws, including the National Environmental Policy Act and Fish and Wildlife Coordination Act, that together provide a legal authority for the ecosystem approach. The purposes of the ESA "are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved" and "to provide a program for the conservation of such endangered species and threatened species." Thus, with the ESA comes a question of focus, because the statute emphasizes both the protection of ecosystems and of individual species, although the administration of the ESA has been focused heavily on individual species. This has

led to an occasion in South Florida where the protection of a single species, the snail kite, which has moved into an artificially maintained habitat, has impeded attempts to take a broader approach to protect the entire ecosystem. This amounts to a question of whether, in the rare instances where this pertains, it is worth risking the loss of an individual species in an effort to save the larger ecosystem on which it depends.

The current emphasis on the ecosystem approach and on multispecies recovery plans as the most effective venues for the implementation of the ESA will have to be reconciled with cases like that of the snail kite in South Florida, where the concurrent legal impetus to protect individual species also obtains.

4. A State Programmatic General Permit has been conveyed to the state of Florida by the Corps under section 404 of the Clean Water Act for permitting certain activities on wetlands in four counties in northeastern Florida. There is a question as to whether states can further delegate this authority to agencies such as the South Florida Water Management District.

   There seems to be no final and consistent answer to the question of whether state or local government entities have more stringent environmental standards. Delegation of authority may streamline the regulatory process by reducing permitting layers. However, the more regulatory authority is delegated, the more perspective is lost on the cumulative impact of activities across ecosystems. This loss of perspective seems inimical to the ecosystem approach.

5. Federal agricultural support and flood insurance programs were cited as major contributors to the ecological problems faced in South Florida. Agricultural support programs, such as low-interest loans, price supports, crop insurance, and import quotas, encourage agricultural expansion where it otherwise would not be profitable and where it results in significant negative impacts on the integrity of the Everglades ecosystem. Flood insurance provided by the National Flood Insurance Act has proved an incentive to development in flood-prone areas such as South Florida, where urbanization continues to advance on the borders of what remains of the Everglades. These programs and the statutes that authorize them should be reviewed with consideration for their environmental impacts and for long-term ecological sustainability, because they are among the driving forces behind the problems currently besetting the ecosystem of South Florida.

6. Integrated budget planning on the part of federal agencies and state and local governments is fundamental to any meaningful degree of cooperation in the ecosystem approach. The level of communication, joint planning, and prioritization required must go far beyond the current practice of packaging independently planned agency budgets (which amounts to little more than an accounting exercise). Integrated budgeting will minimize duplicative activities and maximize the funds being directed toward projects in a given ecosystem.

   The ecosystem approach calls not only for a new way of preparing budgets, but also for strong leadership in bringing agencies together and securing funding commitments. In South Florida, leadership is provided by the South Florida Ecosystem Restoration Task Force created by the Secretary of the Interior. The Presidents budget emphasizes ecosystem restoration in South Florida-an Administration priority, not the initiative of a single agency. The Task Force is attempting to address the need for a shared vision of the Everglades future, and it is imperative that this vision be translated into a truly integrated budget that spans levels of government (see recommendation above on amending FACA). Moreover, the need for communication and cooperation in budget planning applies equally to the various congressional committees with jurisdiction over the federal agencies involved. Agency collaboration cannot succeed without the involvement of the congressional authorizations and appropriations committees.

7. Adaptive management is a planning approach that is key to ensuring that progress can be made despite (for example) a lack of complete scientific information that otherwise might hinder action indefinitely. Adaptive management ensures flexibility in the face of changing circumstances by requiring incremental planning and making progress despite the fact of some degree of scientific uncertainty. It provides the potential for changing course should better or more appropriate policies or practices be needed, but it also takes a broader and longer term perspective on the organization and functioning of an agency as it relates to its capacity to accommodate such change.

   Agencies should explore the applications of the adaptive management concept in their organizations and

programs (see recommendation above on the Corps Civil Works Program). Many elements of adaptive management are addressed in the Report of the National Performance Review.

8. Science and research clearly play a central role in the ecosystem approach. Still, they have the self-nullifying potential of becoming all things to all people when different research is used by opposing sides to promote their respective agendas. The best science available must be the shared point of departure for any endeavor under the ecosystem approach, recognizing that science often cannot provide the certainty that managers and others would like (see recommendation above on implementing adaptive management). Information exchange and joint research between parties involved in the ecosystem approach-including federal, state, and local agencies, as well as industry and other private parties-are necessary in order to avoid making science itself the focus and substance of debate. Amending FACA (see recommendation above) would enable more cooperative research and exchange of information by permitting federal and state agencies to collaborate.

9. Public participation and outreach can be pivotal in achieving success and ensuring that public concerns are appropriately addressed, no matter what the scale of an initiative to implement the ecosystem approach. One of the greatest dangers in South Florida, according to many of those interviewed, is the potential for not sufficiently involving the areas growing population in Everglades restoration, and for not adequately educating people about the needs of the ecosystem and what effect the restoration will have on them-for example, in terms of the availability of water at current rates. All parties involved in the restoration need to work early on to ensure that the public does not tune out in the face of the complicated scientific, legal, political, and economic issues being addressed in South Florida. Noting the decreased visitation to Everglades National Park by residents of South Florida, some of those interviewed suggested that many residents, having been besieged with negative stories about the health of the ecosystem, may have given up on the Everglades. The South Florida Ecosystem Restoration Task Force should integrate public outreach and participation into its efforts.

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Chapter 8: SOUTHERN APPALACHIANS

The Southern Appalachians, particularly that area of the southern Appalachian Mountains that forms part of the Southern Appalachian Man and the Biosphere (SAMAB) Reserve zone of cooperation, are one of seven ecosystems selected for further study by the Interagency Ecosystem Management Task Force. In July 1994, a case study team traveled to the area to interview federal and nonfederal parties involved in the SAMAB effort or operating in the SAMAB area.

Team members included Ted Boling from the Department of Justice, Ray Clark from the Council on Environmental Quality, John Dennis from the National Park Service, and Susan Huke, Bill Sexton, and Terry West from the U.S. Department of Agriculture (USDA) Forest Service. Diane Gelburd from the USDA Natural Resources Conservation Service (formerly Soil Conservation Service), who is Co-chair of the Interagency Ecosystem Management Working Group, attended the first day.

From July 11-15, the team met with representatives from federal and state agencies, including the Economic Development Administration, Environmental Protection Agency, Extension Service, U.S. Fish and Wildlife Service, Forest Service, U.S. Geological Survey, National Biological Service, National Park Service, Natural Resources Conservation Service, USDA Office of General Counsel, U.S. Department of the Interior Solicitor, Georgia Environmental Protection Division, Georgia Forestry Division, and Georgia Pollution Prevention Assistance Program, Georgia Wildlife Resources Division, and North Carolina Department of Environment, Health, and Natural Resources.

The team also met with numerous other interested parties, including representatives from the Chattooga River Ecosystem Demonstration Project, Chattooga River Watershed Coalition, Chevron Corporation, Clemson University, Clemson University Extension Service, Coalition for Clean Air in the Southeast, Cradle of Forestry, Duke Power, Duke University, Georgia Conservancy, Georgia Power, Georgia Wildlife Federation, Land-of-Sky Regional Council, Little Tennessee River Watershed Group, National Parks and Conservation Association, The Nature Conservancy, North Carolina Arboretum, Oak Ridge National Laboratory, Sierra Club, Southern Appalachian Lumber

Manufacturers Association, Tennessee Valley Authority, University of Georgia, University of North Carolina at Asheville, Western North Carolina Development Association, and The Wilderness Society.

Meetings were held in several cities and at other sites, including: Atlanta, Georgia; Asheville and Franklin, North Carolina; the Coweeta Watershed Hydrologic Laboratory, Otto, North Carolina; Clemson University, Clemson, South Carolina; and Knoxville, Tennessee. In order to meet the largest numbers of parties, the survey team frequently split into two groups of three people each to conduct interviews.

BACKGROUND

The Southern Appalachian region, located in the Southeastern United States, extends from northern Alabama into Virginia, enveloping parts of Georgia, North Carolina, Kentucky, South Carolina, West Virginia, and Tennessee. A dominant feature of the region is the southern Appalachian Mountains, one of the oldest mountain ranges in the United States, which have supported some species continually for the past 50 million years. For this reason, the Southern Appalachians are widely recognized as one of the most important biologically diverse regions in the United States. They provide habitats ranging from high-elevation treeless "balds" to spruce-fir forests to forest wetlands and extraordinarily rich oak forests. Arctic lichens can be found on summits more than 6,500 feet high, and tropical ferns grow in the warm, moist coves at lower elevations. The mountains and surrounding areas are home to 2,245 known plant species, including 159 trees and 1,200 flowering plants-more than half the botanical species on the North American continent. In addition, 690 vertebrate species are known to inhabit the region, including 200 resident and migratory species of birds.

This area, a recognizable "bioregion," is also a distinct ecological, social, and economic unit of the United States. It is extremely popular with recreational users: hiking, white-water rafting, horseback riding, summer vacationing, scenic driving, and golf are a few of the many activities available within a days drive of more than half of the nations population. Resorts abound in the region, as do recreational cabins and second homes or retirement homes. Visitors and area residents alike value the quality and variety of the natural surroundings and associated activities.

Historical Patterns

The general area retained a sparsely populated, nonindustrial, rural character throughout the 1800s and most of the 1900s. General settlement and subsequent development were limited during most of that time. After the mid-18th century, westward-moving European settlers established widely scattered clusters of small farmsteads, first along the wider river bottoms, then later in coves and up the ridges. The few towns were small and scattered, frequently connected only by narrow, rutted roads or trails. Of necessity, most settlers were self-sufficient; the regions many parallel ridge systems isolated them from each other and the outside world.

Prior to the 1880s, resources were used mostly to meet local needs such as farming, grazing, timber harvesting, and mining. Large industry, educational institutions, and large urban centers were not prominent in the region. Following the spread of the railroad into many mountain areas during the 1880s, the extensive commercial development of coalfields, hardwood forests, and other resources dramatically altered the regions environment and population makeup. By 1900, many "outsiders" had discovered and publicized the region, drawing developers, businesses, scientists, journalists, tourists, investors, and industrialists. Landownership began to reflect these new interests, bringing a major shift in regional lifestyles. Many rural residents were forced to resettle in small towns within and adjacent to the large tracts now controlled by absentee landowners and large business interests.

By the early 1900s, new roads and a growing population had significantly altered the largely rural, forested landscape, all of which was privately owned. In March 1911, Congress passed the Weeks Act authorizing federal purchase of forested, cutover, or denuded lands. In 1924, the Clarke-MacNary Act gave the federal government additional flexibility in purchasing forest lands. The federal government has since added more than 5 million acres in the Southern Appalachians to the public domain.

During the Great Depression of the 1930s, the federal government enlarged its holdings by acquiring hundreds of small tracts from impoverished farmers for as little as $3 per acre. The Great Smoky Mountain National Park and the Blue Ridge Parkway were established during this period through land purchases and condemnation.

Forests in the South total nearly 200 million acres, about 55 percent of the total land area. About 90 percent of the areas timberlands are in private hands. Significant amounts of forest land in the area were converted to agricultural and urban use from the late 1880s through the 1920s. Since then, many marginal farmlands have been reconverted to

forests, increasing the total forest acreage. In recent decades, increasing interest in the Southern Appalachians for recreation, retirement, summer homes, and escape from deteriorating urban environments has led to the construction of extensive road systems and housing developments across this forested landscape. Improved transportation and communication have made the area considerably more available and attractive to middle classes from adjacent urban areas.

Beginning in the 1960s, a variety of legislative measures and related programs focused on developing the Southern Appalachians. Improved transportation, recreation, and infrastructure fostered greater opportunities in the area, resulting in more immigration and rising land values.

During the last 5 to 10 years, the harvest of forest products in the United States has shifted. Harvests in the western United States have declined by about 10 percent, but have increased by about the same amount in the South. In 1991, for the first time since the early 1950s, the removal of softwoods from the area exceeded their growth: as late as 1976, softwood growth had exceeded removal of forest products by 42 percent. The increasing value of forest products has renewed interest in forestry throughout the southeastern United States, especially in Southern Appalachia.

Historically rural in nature, the environment, cultures, and economies of the region have changed with the gradual influx of people and related development. Although most towns in the Southern Appalachians remain small (only Asheville, North Carolina, and Roanoke, Virginia, have populations exceeding 50,000), the historically sparse population has increased dramatically during recent decades. Urban refugees, seasonal visitors and residents, and those seeking a different lifestyle for retirement have left their mark on the landscape. A widening range of social, cultural, and economic interests are apparent throughout the region, including several established, well-respected colleges and universities, and a variety of major industries drawing on the local workforce.

Population growth has given rise to new road systems, new homes in previously forested areas, new resort complexes, rapidly expanding rural communities, and accompanying infrastructure, including water and sewage treatment facilities. Tourism, service industry, and recreation have replaced agriculture and forestry as mainstays of the areas economy.

Issues Raised by Regional Change

Growing population, extensive development, and other changes in the Southern Appalachians have created a series of environmental problems in the region. Many ownerships, economic sectors, social classes, institutions, governmental jurisdictions, and interest groups either caused these problems or arose in response to them, according to those interviewed. Although many of the major problems affected the entire Southern Appalachian region, the authority or ability to deal with them is often widely dispersed among governments and institutions. Problems include:

- Extensive water pollution. Extensive erosion from road construction and lot clearing, widespread use of septic tanks, and increased use of pesticides, herbicides, fertilizers, and other chemicals throughout the area are causing problems with water quality. Declining water quantity and quality are degrading aquatic habitats.
- Regional degradation of air quality. Acid deposition caused by automobile, industrial, municipal, and residential pollution is damaging plants, soil, and related ecological processes. Particulates have damaged visibility, and rising ozone levels have adversely affected several species and habitats.
- Introduction of exotic species. Introduced species, including plants, animals, insects, and diseases, are changing the landscapes of native communities. In some cases, exotic species limit the ranges of native species or cause their extirpation, triggering implementation of measures under the Endangered Species Act. Native biological diversity is lost, and species become established that did not evolve with the regions original ecosystems.
- Extensive forest fragmentation. Community and infrastructure expansion, resort and service facility development, and extensive road and housing construction in forest environments have caused widespread forest fragmentation. These changes have degraded terrestrial and wetland habitats, endangering or threatening species.
- Degradation and loss of archeological sites. Archeologically significant structures, sites, and areas are being lost or damaged by expanding development.
- Poor planning, zoning, and regulation. Planning, zoning, and regulatory oversight for developments have been inconsistent and uncomprehensive. Laws and regulations governing development vary among jurisdictions and across different levels of government. Diverse capabilities to enforce relevant

legislation, coupled with inconsistent approaches and oversight, make regional efforts to control development very difficult.

- Poor coordination and conflicting efforts. Existing government programs and activities are not well coordinated among levels and agencies, often resulting in ill-conceived and conflicting actions. For example: funding and support is provided for highway access to areas already plagued with extensive development and with air and water quality problems; tax and financial incentives are offered for development in areas without adequate controls on erosion or widespread use of septic tanks; and existing statutes and controls have different levels of enforcement. Agency programs, activities, and types of support often work at cross purposes with the many federal, state, county, and local efforts designed to address key environmental issues, thereby complicating the problem.
- Loss of traditional rural lifestyles and cultures. As the regions economy and inhabitants are reoriented towards recreation, tourism, and service industries, historic patterns of living and human landscapes are significantly altered. The centuries-old culture of subsistence and related skills engendered on small family farms is rapidly disappearing in the face of modernization and commercialization. Accompanying increases in land values and tax rates create an economic incentive for small farmers and woodlot owners to sell properties for development.
- Loss of agricultural and forested lands to development. Bottomlands that typically have been the areas most agriculturally productive sites have become victims of overdevelopment, and water quality has suffered due to use of drainage ways. Access roads and dwellings are being built in forested areas, fragmenting landscapes and altering forest systems. This effectively removes areas from many forest management activities, including prescribed burning for wildlife, reestablishment of natural fire cycles, forest insect and disease control, and species and stocking manipulation.
- Decline in general forest health. Lack of historic fire regimes and related landscape patterns have altered historic forest processes. Established patterns of fire and land use have greatly modified the region for more than 200 years. The effects of long-term changes in burning cycles and patterns, farming and grazing activities, and wood product harvesting have created a forest ecosystem under considerable human-induced stress.

Interviewees addressed these issues in a variety of ways. Regional issues were well documented in publications, issues papers, and problem statement documents available to the survey team before its arrival in the region. Interviewees comments were used to further define and describe individual perceptions of these issues, and to expand on the general information available in written materials.

Most important issues in the SAMAB area have environmental, cultural, social and economic aspects. Most affect large geographic areas with many ownerships and jurisdictions. Because possible solutions to environmental problems affect and involve various levels of government, issues become even more complex. Many natural resource features are also affected.

Man and the Biosphere Program

In 1971, the United Nations created the Man and the Biosphere program. The program emerged from the concept of a coordinated worldwide network of parks, biological reserves, and other protected areas serving conservation, research, and education needs. It brought together various agencies and organizations with ties to or responsibilities for natural resource management and economic development. It was believed that this closer cooperation between institutions would improve handling of common large-scale problems, such as air and water pollution, resource conservation, biological diversity, and sustainable economic growth.

This global concept was applied in local communities and areas by establishing national Man and the Biosphere organizations internationally. National organizations chartered regional organizations to work directly with area institutions and communities to complete the global network. At the heart of each regional Man and the Biosphere program are one or more biosphere reserve units designated by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Each reserve represents a unique resource that is largely shielded from the detrimental effects of surrounding development, and that provides a proving ground for ecological research and monitoring. Lessons learned from reserves are extended outward to a surrounding zone of cooperation. This is accomplished through voluntary, cooperative community and area projects.

Southern Appalachian Man and the Biosphere Cooperative. The SAMAB area was established in August 1988 with the formation of the SAMAB Cooperative. Members include: the Economic Development Administration, Atlanta

Office; Environmental Protection Agency, Region 4; USDA Forest Service, Southern Region and Southeast Forest Experiment Station; U.S. Geological Survey, Water Resources Division, Southeast Region; National Park Service, Southeast Region; U.S. Department of Energy, Environmental Services Division, Oak Ridge National Laboratories; Tennessee Valley Authority, Resources Group; state of Georgia, Department of Natural Resources; state of North Carolina, Department of Environment, Health, and Natural Resources; and National Biological Service (joined April 1994).

The zone of cooperation (figure 1) encompasses five biosphere reserve units: the Great Smoky Mountains National Park; the Oak Ridge National Environmental Research Park; the Forest Service Coweeta Watershed Hydrologic Laboratory; Mount Mitchell State Park; and Grandfather Mountain, a privately operated environmental park in North Carolina.

SAMAB Foundation. The private-sector link was created by establishing the nonprofit SAMAB Foundation, a means for many nonfederal organizations to share funds, projects, and information with other SAMAB partners. Members include private corporations, universities, interest groups, and community organizations. There are also local chapters.

The Cooperative and Foundation together define the SAMAB organization, a network of groups, businesses, and institutions across the zone of cooperation. It forms a basis for developing partnerships, sharing information, supporting cooperative planning and study efforts, and defining issues and potential strategies.

R*ole of SAMAB*

SAMAB provides a forum for cooperation between groups, organizations, and institutions with resource management and economic development concerns for an area of the Southern Appalachians that covers more than 50,000 square miles in seven states. The organization operates in various situations and capacities. Cooperators have organized joint efforts in environmental monitoring and assessment, community planning for sustainable development, evaluating and protecting biological diversity, implementing ecosystem approach activities, conducting environmental education and training, protecting and enhancing endangered species, holding conferences and workshops, raising awareness about protecting cultural resources, and focusing efforts on air and water quality problems.

SAMAB continues to adjust to changing circumstances and interests. It is and always has been a purely voluntary effort. Cooperating agencies provide funds for basic operations, redirecting them from other activities as they become available, but no "new" funds have been directed to SAMAB. Agencies and groups continue to pool funds for joint projects and to support SAMAB efforts with in-kind services.

In June 1992, SAMAB was the vehicle used to create the Southern Appalachian Mountains Initiative, a separate initiative established to bring together business, industry, environmental groups, government agencies, policymakers, and the public to address a single issue: air quality in the Southern Appalachians. Regional participation expanded to include West Virginia, Kentucky, and parties interested in the air quality issue. SAMAB partners focus on other regional issues, leaving the problem of air quality up to the Southern Appalachian Mountains Initiative.

BUDGET ISSUES

In its interviews, the survey team focused on increasing its understanding of the following budget-related issues: current interagency coordination of budget planning and execution, and the extent to which agency budget structures and procedures promote the ecosystem approach; budget-related constraints to-and opportunities for-interagency coordination and support for the ecosystem approach; and ways of strengthening budget processes to better support the ecosystem approach.

Federal Agency Coordination and Support

Numerous projects in the SAMAB area have received financial support from two or more federal agencies. Some have been facilitated by the SAMAB Cooperative and Foundation, and others have been supported independently of SAMAB.

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Figure 1.-Southern Appalachian Biosphere Reserve (zone of cooperation).
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Cooperation through SAMAB. Since the SAMAB Cooperatives inception in 1988, federal support for its activities has increased substantially. In 1989, support was limited primarily to the Tennessee Valley Authoritys (TVAs) contribution of a part-time director and the National Park Services contribution of office space. By 1994, the directors position was fully funded through contributions from the Fish and Wildlife Service, Forest Service, U.S. Geological Survey, National Park Service, TVA, and Department of Energy. Many of these agencies also contribute funds and in-kind resources to SAMAB-initiated projects.

SAMAB estimates that funding from fiscal years (FY) 1989 to 1993 totaled $377,000 for coordinating office support, and $711,000 for project expenses. None of this has been "new" money. The Environmental Protection Agency (EPA) has been a primary contributor of project activity support.

Nine of the SAMAB projects implemented between 1989 and 1993 have been supported by two or more agencies, and seven have received single-agency funding. This has been accomplished through pooling funds, direct expenditures, and/or transferring funds. The Forest Service and National Park Service, for example, transfer funds through TVA to SAMAB for air quality monitoring. Forest Service and National Park Service oversight authority is specified in the corresponding contracts. In-kind contributions from federal agencies to the SAMAB Cooperative have amounted to approximately $540,000 in value.

In an effort to encourage joint agency budgeting, the SAMAB Cooperative organized a workshop to develop a framework for interagency activities. Once finalized, this framework will be the basis for an interagency proposal for ecosystem approach activities. Funds requested in this proposal will be new; members of the cooperative feel that it is not realistic to expect agencies to redirect existing funds for this purpose.

The nonprofit SAMAB Foundation was created in 1990 to attract additional funds for the region from the private sector, but so far its success has been limited. To date, its primary role has been to facilitate workshops and conferences. One federal interviewee said that a possible reason for its limited success is that the private sector views SAMAB as a government effort and has little interest in giving more funds to the government. Private funds that have been received include a grant of $30,000 from the Georgia Power Foundation, small financial contributions (of around $1,000 each) from Chevron and others, and in-kind contributions, such as printing of brochures, duplication of educational videos, and donation of paper for educational materials.

The SAMAB Foundation recently submitted a proposal to the Energy and Water Development Appropriations Subcommittee for $1.5 million, to be included in the Appalachian Regional Commission appropriation. According to the SAMAB Cooperatives Director, the foundation would like to use this as seed money to attract private support for and interest in activities generated by the foundation.

Interagency cooperation outside SAMAB. Interviewees gave several examples of interagency coordination on budget planning and execution that did not involve SAMAB.

Transfer of funds. Interviewees from the Oak Ridge National Laboratories indicated that approximately 22 percent of Oak Ridge National Laboratories funds are transferred from other agencies requesting their services. The U.S. Geological Survey routinely carries out work for other agencies, including TVA, EPA, and the Department of Energy; mechanisms have been established within those agencies to facilitate the transfer of funds. A Geological Survey representative mentioned that the U.S. Department of Defense has an MIPR, which is a special funding mechanism that facilitates transfer of funds to other agencies for services provided. The Geological Survey has been reimbursed through this mechanism for toxic-waste-related work on Department of Defense bases.

Pooling funds. The Forest Service has allocated $365,000 to its Coweeta Hydrologic Laboratory for ecosystem research over a 5-year period. Other federal and nonfederal entities (such as the Department of Energy, Desert Research Institute, Electrical Power Institute, EPA, U.S. Geological Survey, and Oak Ridge National Laboratories) have provided an additional $1.3 million for this purpose, mostly directed toward the SAMAB area.

Tennessee Valley Initiative. The Tennessee Valley Regional Soil and Water Conservation Initiative has provided a mechanism for the USDA, EPA, TVA, and Tennessee Valley states to conduct joint programs in the 201 TVA power service counties of the Tennessee Valley region. Cooperation is focused on key watersheds, several in the SAMAB area. Traditionally, cooperation has aimed at reducing soil erosion and upstream flood damage, and maintaining or increasing farm income, but aims are expanding to include improving water quality. Participating agencies annually allocate staff and funding in close accordance with their budget cycles. Plans are underway to jointly fund a coordinator from EPA or the Natural Resources Conservation Service, who will be located in TVA offices.

Federal support for state efforts. Federal support for the Southern Appalachian Mountains Initiatives efforts to address air quality issues includes a $600,000 contribution from EPA, and additional contributions from the Forest Service, National Park Service, and TVA. These funds are disbursed to the Initiative through the SAMAB Cooperative.

Reorienting agency budgets. Discussions with federal representatives indicated that most agency budgets have not been adapted to respond to the needs of the ecosystem approach. The Forest Service Research budget is an exception. A recent strategic plan for Forest Service Research called for the formation of research core teams to facilitate an interdisciplinary approach. This in turn led to the establishment of budget structures better poised to support the ecosystem approach.

Constraints

When asked about budget-related opportunities, interviewees frequently mentioned the SAMAB Cooperative as an opportunity for further collaboration. A couple of interviewees also viewed the Natural Resources Conservation Services capability to transfer funds to the private sector as a chance to increase financial support for local efforts to implement the ecosystem approach. But most interviewees focused primarily on budgetary constraints to the ecosystem approach.

Difficulties in transferring funds. Interviewees most often mentioned the problems they had transferring funds between agencies. Even though funds have been transferred from one agency to the other, there seem to be numerous administrative and legal barriers to this process, the importance of which varies significantly within and between agencies. For example:

- It often takes 3 to 6 months to receive funds from other agencies, according to the Oak Ridge National Laboratories.
- The Forest Service and EPA are more able than agencies in the U.S. Department of the Interior to transfer funds to other agencies.
- In order for the Forest Service to receive reimbursement for work performed for the Fish and Wildlife Service, funds must be sent through a state agency.
- It is easier for agencies within the Department of the Interior to transfer funds to each other than to outside agencies.
- Forest Service Research units can transfer funds through cooperative agreements, but units in the Forest Services National Forest System cannot do so as easily. Some restrictions are administrative, and others are financial.

Agencies also have trouble using funds for projects that may greatly benefit the ecosystem, but do not fall specifically within agency mandates. One example is the difficulty the Forest Service has transferring funds to other federal agencies, such as the National Resources Conservation Service, for work focused on private lands, even though such work could eventually benefit the national forests.

The overhead charged by one agency for administering the funds of another also impedes fund transfers. As a result, an agency may decide to use its own less skilled staff for a particular project instead of more experienced personnel from another agency.

Inflexible budget structures. Numerous interviewees highlighted inflexible budget structures as a major obstacle to the ecosystem approach. Even within one agency, it is difficult to combine funds from line items managed by different divisions, due to miscommunication and varying levels of ability and interest in implementing the ecosystem approach. Interviewees estimated that this problem only worsens as overall budgets decrease. One mentioned that it seems to be easier to use funds for interdisciplinary planning than for interdisciplinary management.

Another difficulty is concern in Congress and among interest groups that their ability to control or monitor expenditures would be limited if budget structures were more flexible. Increased budget flexibility must be accompanied by strong accountability mechanisms.

Hindrances to jointly funded proposals. If one or more agencies included in a proposal do not receive the funds necessary to accomplish a cooperative project, the viability of the entire proposal can be jeopardized. Some interviewees stated that when agency staff see projects fail in this way, they are discouraged from spending the extra time and energy needed to develop joint proposals in the future.

There are numerous issues associated with the timing of the budget process. For example, not all federal agencies use the same timeframe for planning budgets. This seems to be more of a problem when jointly planning budgets with state agencies than within the federal government, because some states use a different fiscal calendar than the federal government.

Other problems arise from the need to plan budgets several fiscal years in advance. In the interval, priorities often shift. Also, many agency budgets are not approved until much of the fiscal year has already passed, leaving insufficient time for effective implementation of project activities.

Differences in regional boundaries. "Why cant we all use the same regional boundaries?" asked one interviewee. The use of different regional boundaries increases difficulties associated with interagency budgeting. The administrative boundaries of many agencies divide ecosystems, thus creating barriers to a unified approach, even within those agencies.

Lack of information on sources of federal funds. Nongovernmental organizations (NGOs) indicated that they have experience, interest, and expertise, but need more information on where and how to apply for financial support, and on how to cooperate with federal agencies in the ecosystem approach.

Obstacles to long-term research. Discussions with scientists revealed budgetary constraints to effective long-term research. Research priorities tend to change as quickly as staff turnovers, and the National Park Services 2-year funding cycle for research exacerbates this problem. Another problem is that the focus of research is often determined more by the availability of funds for a particular area than by priorities.

Interviewee Suggestions

There is a need for much more cooperation in budget planning, both within and between federal agencies, but there were few suggestions on how to accomplish this. Several interviewees mentioned the possibility of using the SAMAB Cooperative and/or Foundation as a vehicle for increased coordination.

Many interviewees recommended increases in funding flexibility and greater authority for field-level staff to shift funds quickly from one area to another. It was also suggested that federal agencies waive overhead charges when receiving transferred funds, whether within a single agency or across agencies. However, there was a consensus among federal and nonfederal interviewees that any increase in budget flexibility should be accompanied by strong reporting and accountability requirements.

Interviewees also suggested that agencies support each other during the budget process. For example, agencies participating in the Tennessee Valley Regional Soil and Water Conservation initiative appear at each others appropriations hearings. According to a spokesperson for this initiative, it is an exemplary case of agencies striving to coordinate budget planning.

INSTITUTIONAL AND MANAGEMENT ISSUES

Throughout the Southern Appalachians, the survey team heard that the lack of institutional capacity is one of the biggest obstacles to the ecosystem approach. The region has been developing institutions that support the ecosystem approach for several years. Although these institutions are not fully mature, they offer good insight into the strengths and weaknesses of different management approaches. The greatest needs, according to several regional organizations, appear to be better interagency coordination and communication, greater flexibility in planning, programming and budgeting, development and sharing of baseline environmental data, education and training, and closer coordination with regional political structures. A regional body may be the missing link that could coordinate all of these needs.

Vision and Strategy

There is great confusion in the region about the meaning of the ecosystem approach. Several individuals thought that it excludes humans. One person said that ecosystem management has "very scary ramifications." One farmer said that if the ecosystem approach treats agriculture as the problem, making farmers suffer more financially, she will sell her land to developers, causing damage to the land that will be far greater and harder to control. She said that she equated ecosystem management with returning the land to wilderness. Even those who were very supportive of ecosystem management when the term was defined in their own way were often unclear about the federal governments definition.

Although no one wanted the federal government to issue a definitive decree on the ecosystem approach, one representative from an NGO commented that there is no federal environmental strategy in the region. Survey participants throughout the region told the team that a federal vision of the ecosystem approach must be developed cooperatively, with full local public participation, and should not be completely technically driven. The federal government must also allay the fear that the federal government is out to gain control over natural resources. One way to ensure this is to empower the region to achieve its own goals. One group stated that federal land use plans have become "zoning" documents that allow, prescribe, or proscribe certain activities, without sufficient consideration of the flexibility needed to achieve management goals and directives.

Interviewees also stated that federal managers do not get any feedback on progress toward federal goals. One federal official said that if the ecosystem approach is to work, there must be a clear set of goals issued at the Assistant Secretary level in Washington, DC, to catalyze regional goal-setting. Another said that the different signals that various agencies are getting from Washington show the need for consistent policy-level guidance.

Both NGOs and federal agencies agree that without a strategy that includes institutions and provides mechanisms for taking the entire Southern Appalachian ecosystem (including private lands) into account, the vision will remain unfulfilled. One reason why private lands are an essential part of this strategy is the need for sediment control: although the Forest Service does a good job of sediment control, state and local institutions do not effectively control sediment from private lands. For example, on the Southern Plateau, there is a problem of mine drainage from private onto federal lands, causing pollution.

Another reason to include private lands in the strategy is the management of ecosystem values. One important value is the view from the Blue Ridge Parkway, and management of the view is in the hands of private landowners. According to several interviewees, regulations against using federal dollars to directly benefit private lands are an obstacle to the ecosystem approach.

Several interviewees noted that a dramatic reduction of timber sales on Forest Service lands will increase the value of timber on private lands. Preservation of rural culture is important in Southern Appalachia. Federal agencies must account for both direct and indirect effects on rural life. One family farmer stated that she would not be able to continue farming without some tax relief.

Many agencies and NGOs in the region stated that the National Environmental Policy Act process helps agency decision makers evaluate alternatives and that it involves the public in federal decision making and benefits the overall ecosystem approach. However, the National Environmental Policy Act has not been used to its full potential for strategic decisions that cut across agencies. Several NGOs stated that agencies with responsibilities for species protection, such as the Fish and Wildlife Service, need to be more involved in Forest Service environmental impact statements at an earlier stage.

Interagency Coordination and Communication

According to NGOs and state and local agencies, federal agencies traditionally have not coordinated well with one another. Most federal agencies agreed with this assessment. At times, agencies spend resources on projects that conflict with one another. For example, the Chattooga watershed is managed by three ranger districts, each on a different forest in a different state. The three forest plans, developed independently, only partially match in management area boundaries or direction.

Within the region, there are agencies with a commodities production mission, agencies with a protective mission, and agencies with an economic stimulus mission. One environmental NGO representative commented that the Fish and Wildlife Service and National Park Service need to be more actively involved in Forest Service planning. A state government official stated that there appeared to be a lack of cooperative relationships between the state and the Forest Service, except in the case of gypsy moth control.

Numerous interviewees observed that if regional sustainability is to be realized, federal agencies need to seek easier ways to develop partnerships with each other and with state and local agencies, private business and landowners, and NGOs. Several groups said that the federal government produces good information and that agency staffs know about the ecology of the region, but that programs are complicated, public information is difficult for the layman to understand, and agency staffs do not communicate well with one another or with the public.

Throughout the area, the survey team heard the need for involvement of all sectors of the regional economy and all agencies. Many ad hoc groups are already engaged in worthwhile projects that are restoring or protecting important components of the ecosystem. One bank actually held courses for developers to show them how to grade land while minimizing sedimentation.

SAMAB has the best coordination link in the region. Its members have agreed to cooperate in promoting knowledge and understanding of the regions natural resources, encouraging wise use of those resources, and fostering associated research, education, and training. One of SAMABs major objectives is to develop and maintain a dynamic regional model of cooperative integrated resource management.

SAMAB helps agencies develop public/private partnerships on any scale, and it helps to bring together agencies with similar interests, but different overall missions. Importantly, SAMAB acts at the request of local stakeholders (including NGOs, businesses, and federal and state agencies) and receives full agency support. It is not seen as an advocacy group (which lends it more credibility, according to several agencies), nor is it seen to be usurping agency decision making. Instead, it is perceived as a coordinating body for willing players, and has been described as a "catalyst organization with flexibility."

The status of the SAMAB Foundation under Tax Code section 501(c)(3) allows projects to be undertaken that could not be implemented by agencies. The team was frequently told that this is one of the most creative ways to influence land use, without the burdensome command-and-control structure that is opposed by landowners and increasingly by the courts.

The executive committee of SAMAB is strong and includes most of the regional federal agency leaders. Although the SAMAB Cooperative has worked hard to incorporate federal agencies in the region (even those that are not land managers, such as the Economic Development Administration, which pumps more than $100 million into the region each year), the Cooperative is not fully mature because all federal players in the ecosystem are not fully engaged. Those to some degree absent include the Department of Defense, National Aeronautics and Space Administration, Internal Revenue Service, and Federal Highway Administration. Significantly, the Appalachian Regional Commission and the Natural Resources Conservation Service have not yet agreed to cooperate with SAMAB (although the Commission has indicated an intent to join the SAMAB Cooperative). Another weakness is that the board does not include traditionally nonempowered people, including Native American tribes, ethnic minorities, and rural populations.

Agencies throughout the region value SAMAB and are increasingly calling upon it as a facilitator. SAMAB also helps agencies to coordinate more efficiently. For example, plans under the National Forest Management Act usually take 5 years to complete, but SAMAB has brought about joint agency planning and reduced the time it takes by easing the exchange of information and data. The Southern Appalachian Mountains Initiative grew out of SAMAB as a way of dealing with regional air quality issues that individual states or agencies were unable to address effectively. The development of the Initiative as a problem solver highlights the evolving regional perspective.

It is clear, however, that SAMAB cannot be successful without additional funding. Although agencies have received no new funding as a result of their SAMAB activities, most are sending funds to SAMAB and making in-kind contributions to keep it operating. Without this effort, SAMAB would not be as effective and the region would not have advanced ecosystem approach objectives as far as it has.

Planning, Programming, and Budgeting Flexibility

Throughout the region, agencies and other groups told the survey team that federal agencies were hampered by their planning and budgeting cycles, which do not permit flexible use of resources. Several worthwhile nonfederal projects requiring about $1,000 each in funding would have directly benefited federal government efforts to implement the ecosystem approach. But agencies could not use their appropriations to fund them, either because they were not federal or because transaction costs associated with small projects were too high.

Several interviewees saw an opportunity for the 40 to 50 regional land trusts to play an important role in the ecosystem approach, because they can react more quickly to land acquisition opportunities than can the government. They are effective and flexible, and have grassroots support. One land trust organization reported that it needs federal leverage through challenge grants. Another noted that the Land and Water Conservation Trust Fund may provide opportunities to acquire headwaters, but that more flexibility in its use is required.

Training

One state agency suggested that educating the public on the concept of the ecosystem approach may be the first priority. Although the Southern Appalachians are relatively poor (inhabitants earn about 75 percent of the national per capita income), they have a wealth of scientific institutional capability, and skills in implementing the ecosystem approach abound throughout the region. Despite the tools to effect change and to leverage resources that exist throughout the region, there has been no concerted effort to educate and train local communities. SAMAB helps agencies and private organizations to harness resources, but one untapped resource are Historically Black Colleges and Universities. These and other higher institutions of learning that serve local rural communities provide perfect opportunities for developing local populations trained and educated in principles of the ecosystem approach.

Environmental Baseline Data

Almost every agency in the region cited the lack of environmental baseline data. At present, data bases are not subject to standard formats and quality assurance. They are aggregated on significantly different scales because they are generated for specific purposes. One agency stated that the development of an environmental baseline data base is the foundation for interagency coordination. Many agencies are contributing to EPAs Regional Environmental Assessment. Several agencies suggested that federal agencies in the region should develop an environmental data base similar to The Nature Conservancys Heritage Program.

The National Biological Service is helping to develop such a data base; one of its employees will begin work at SAMAB in August. One official commented that other data bases have been created, but are not useful because they have not been maintained. Many agencies have developed their own environmental data bases (TVA has an exceptional water quality data base) that are rarely accessible by other federal agencies.

Adaptive Management

Many groups in the region are trying to understand what adaptive management means. Operating regulations for many agencies do not permit midcourse changes to adapt to changed conditions. One of the greatest barriers to adaptive management is the inability of agencies to quickly transfer funds to where they are needed most. When dogwood anthracnose (a tree disease) quickly spread throughout the entire region, it was difficult to focus money and people on the problem, because administrative procedures made it difficult to transfer money to a single lead agency. However, agencies formed an ad hoc committee that cooperatively divided up the tasks, readily shared data and information, and continues to deal with the disease.

Several nonfederal interviewees gave varying marks to the ability of agencies to adapt their management to changing conditions; managers along the Blue Ridge Parkway received high marks. Some agencies said they needed to be able to make more decisions at the field level, and that national headquarters in Washington, DC, would guide them in this.

Agencies and several NGOs said that managers who use the National Environmental Policy Act (NEPA) process as a management tool were more agile, more adaptable, and more apt to consider the publics goals and objectives in their decisions. One agency reported that the NEPA process has ensured adaptations to sound environmental management, citing as proof an environmental impact statement for the development of a military installation. This environmental impact statement allowed interagency coordination, dispute resolution, and the ability to monitor environmental commitments and to adapt when necessary. As one person put it, "NEPA adapts and improves the projects within the region." However, agencies are concerned about taking actions that were not been considered in their environmental impact analysis, and NEPA analyses that address only the environmental impact of an activity on lands within federal administrative boundaries are unlikely to fully consider how proposed actions affect ecosystems. Environmental impact statements should focus on entire ecosystems, taking regional goals and objectives into account, in order to provide accurate scientific information to policymakers, who must make the necessary tradeoffs.

Working through SAMAB, the Economic Development Administration is using the NEPA process to foster the ecosystem approach. The agency is doing this by requiring subdivision regulations and land use planning as conditions for providing economic development funds. However, agencies such as the Economic Development Administration (and perhaps the Internal Revenue Service) do not traditionally view themselves as having an environmental mission. Until they do, adaptive management under the ecosystem approach will not be fully realized. In the South, the Economic Development Administration appears to be a prototype for additional study. Adaptive management should include helping agencies like the Economic Development Administration to direct their energies strategically.

Opportunities for the Ecosystem Approach

In Southern Appalachia, it is clear that the ecosystem approach is the catalyst for improved communication and cooperation among agencies and the local population. The institutionalization of the ecosystem approach as a goal of all federal agencies will empower the officials who are closest to the daily problems facing the ecosystem. It may revitalize and change the way in which government interacts with the people in the region.

For example, red wolves were reintroduced to the region at little inconvenience to residents, and without inflicting long-term damage to domestic animals. Significant land use restrictions were not necessary, and the hunting and trapping regulations for the Appalachian Region National Wildlife Refuge remain unchanged.

The Southern Appalachians have strong institutional and management structures that can be mobilized through federal empowerment. The federal government can help further by promoting a shared vision for the future of the region, helping the inhabitants develop their own goals and objectives, and finding ways to fund small, worthwhile projects that contribute to the sustainability of the region. Information and public education about the nature of the ecosystem and what needs to be accomplished would also be appreciated.

Better use should be made of untapped resources, such as churches, Historically Black Colleges and Universities, small rural universities, and the large population of retirees. All of these groups have individuals who are concerned about their environment and would be willing to disseminate information and help restore damaged parts of the ecosystem.

LEGAL ISSUES

The legal framework in the Southern Appalachians contains numerous provisions for information management, federal administration, and coordination of state and local authorities with their federal counterparts. These provide opportunities to address the regions environmental problems, but also constraints to a coordinated ecosystem approach to natural resource management.

Man and the Biosphere Program

The Man and the Biosphere program is a unique experiment in international environmental law that focuses international scientific attention on areas that are significant to biodiversity conservation and sustainable development. The biosphere reserve program associated with Man and the Biosphere uses protected areas and their surrounding landscapes as "landscape[s] for learning and a bioregional focus for cooperation among protected area administrators, scientists, economic interests, and local people in conserving biological diversity by finding solutions for interrelated environmental, land use, and socioeconomic problems." Designation of an area as part of the Man and the Biosphere program does not require new legal restrictions on development there. Several countries have adopted special legislation to protect their bioreserve sites. However, the Man and the Biosphere program requires only that the agency responsible for administering a countrys biosphere reserve program agree to promote Man and the Biospheres fundamental goals of allowing research and conservation within the reserve, and participation in the international biosphere reserve network. States also sign a "moral commitment" to implement the Action Plan for Biosphere Reserves, which was adopted by the UNESCO General Conference in 1985. (UNESCOs Second International Conference on Biosphere Reserves will meet in March 1995 to evaluate the Action Plan and to discuss a draft statutory framework that would give Man and the Biosphere some legal authority to address Action Plan failures.

The SAMAB program was established by an interagency cooperative agreement between six federal agencies with land management responsibilities. That agreement formed the governmental portion of SAMAB, known as the SAMAB Cooperative. The SAMAB Reserve was endorsed by the U.S. Man and the Biosphere in 1988 and formally adopted by UNESCO as part of the Man and the Biosphere network in December of that year. In support of Man and the Biospheres goals, SAMAB acts as an information facilitator among federal agencies operating in the area and between these agencies and state or local counterparts and NGOs. The program is governed by the Cooperatives executive committee, which has representatives from each of the member agencies. Six operating committees, staffed by technical experts from member agencies, do most of SAMABs work. The structure of the SAMAB program allows these staff-level committees to identify issues to be addressed by the executive committee, which establishes priorities. The executive director of SAMAB is the only person working full-time on the SAMAB program. No permanent, regular legal counsel for SAMAB has been established.

In March 1992, SAMAB sponsored a forum on air quality to address chronic air quality problems in the region. Under the aegis of SAMAB, state air quality agencies organized a regional partnership, the Southern Appalachian Mountain Initiative, to study air quality impacts and solutions. The organization operates under a governing body composed of state agency members and nonvoting representatives from the Forest Service, EPA, National Park Service, industry, and public interest groups. To address the issue comprehensively, the Initiatives regional scope extends beyond SAMAB boundaries to include the states of West Virginia and Kentucky and other parties interested in air quality.

The SAMAB Foundation was chartered in Tennessee in 1990 to complement the work of the SAMAB Cooperative by involving private industry, universities, and other nonprofit organizations and special interest groups. As a nongovernmental, tax-exempt organization under section 501(c)(3) of the Tax Code, the Foundation can undertake activities that federal agencies cannot, including acceptance of donations and financing of projects that go beyond an agencys budget or legal authorities. The Foundation directly supports the work of agencies in the Cooperative through public involvement, education, and the solicitation of support for agency projects and priorities.

Currently, the Foundation operates as a group of volunteers. The Foundation and Cooperative work together to identify important natural resource and economic development issues, and the means for addressing them. Both groups recognize the need for an integrated assessment of agency authorities and issues, but have not had funding for such a project. Foundation members anticipate that the Foundation will become the principal coordinating and administrative arm of the SAMAB program.

Information and Coordination Requirements

Much of the agency participation in the SAMAB Cooperative and associated efforts under the ecosystem approach are attributable to the information and coordination requirements of various federal statutes, including the National Environmental Policy Act, National Forest Management Act, and Clean Air Act. Participation at this level is intended to meet the requirements of law efficiently and effectively. These information requirements are also the legal basis for evaluation of ecosystem impacts that are beyond the capacity of any one agency to control.

The National Environmental Policy Act. The National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 et seq., gives all federal agencies authority to evaluate their activities on an ecosystem basis. Under NEPA, all proposals for "major federal actions significantly affecting the quality of the human environment" must include a detailed statement of the environmental impact of the proposed action and an evaluation of alternatives (42 U.S.C. § 4322(2)(C)). Ecosystem impacts are specifically included in the range of environmental impacts considered under NEPA (42 U.S.C. § 4322(2)(H); 40 CFR 1508.8).

In addition to evaluating the direct and indirect effects of the proposed action, the environmental impact statement must disclose possible conflicts with "federal, regional, state, and local . . . land use plans, policies and controls for the area concerned" (40 CFR 1502.16(c)). Coordination with other governmental entities is also required in order to evaluate "cumulative impact," which is defined as the "incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). At a minimum, the draft environmental impact statement must be circulated for comment by any federal agency with "jurisdiction by law or special expertise with respect to any environmental impact involved," and to federal, state, and local agencies that are authorized to develop and enforce environmental standards (40 CFR 1502.19).

Interviewees generally supported NEPA, describing it as a means to improve both information flow between agencies and (indirectly) project design. Some noted that federal agencies may learn of a significant impact of a planned activity on federal resources only through NEPA compliance by other agencies. For example, public interest groups heard through the NEPA process about a dam to be financed by the USDA Farmers Home Administration upstream from what is classified as a Wild and Scenic River. These groups informed the National Park Service. After hearing National Park Service comments on the proposal, the Farmers Home Administration decided that a full environmental impact statement was necessary to evaluate the projects impacts.

In other cases, agencies have used NEPA as a general planning authority, employing the programmatic environmental impact statement as their management plan. The TVA, a government corporation with multiple mandates and a variety of authorities, used NEPA to guide its Sound River Management strategy for operating its reservoir and navigation system and for environmental restoration in the Tennessee River watershed. The TVA has no direct environmental regulatory authority over the impairment of water in the Tennessee River watershed, but it uses its water quality

monitoring programs and public involvement through the NEPA process to find solutions to point and nonpoint source pollution.

Most survey participants noted that NEPA coordination should be improved. The chief complaint was that agency administrative requirements are often time-consuming and cumbersome. Some agencies require that decisions and their associated NEPA documents be reviewed by several layers of supervisory management before final authorization by someone not associated with those who will be responsible for administering the decision. For example, the National Park Service requires any decisions involving NEPA documentation to be made by Regional Directors, not by Park Superintendents. By contrast, the Forest Service places most decision-making responsibility on the District Ranger or Forest Supervisor, both local line officers.

Others claimed that NEPA was poorly tailored to relevant decision making, arguing that NEPA documentation of statutory planning decisions that have no direct impact on the environment merely provided opportunities for litigation. They maintained that public participation and environmental analysis are better focused when NEPA is used for decisions that have concrete consequences. Although statutory evaluations of ecosystem health or agency plans are considered more costly than they are worth, these critics noted that programmatic NEPA processes would be more useful for coordination if they were not subject to litigation.

The National Forest Management Act. The National Forest Management Act, 16 U.S.C. §§ 1600 et seq., requires the Forest Service to develop "land and resource management plans for [national forests], coordinated with the land and resource management planning processes of state and local governments and other federal agencies" (16 U.S.C. § 1604(a)). The development of these forest plans must be based on a "detailed inventory" of national forest resources and an "integrated consideration of physical, biological, economic, and other sciences" (16 U.S.C. §§ 1603, 1604(b)). SAMAB is considered the best avenue for sharing data on these resources. It is expected that national forest planning can be done significantly faster through interagency coordination to identify issues and share data on impacts.

The Clean Air Act. The Clean Air Act, 42 U.S.C. §§ 7401 et seq., requires consultation over air pollution control measures and consistency between them. Members of the SAMAB Cooperative noted that information collected and pooled among agencies (through efforts like the Forest Services Forest Inventory Assessment and EPAs EMAP) can be used by federal land managers in providing information under the Clean Air Act and in planning their individual land management activities. From the perspective of federal land managers in the Southern Appalachians, the most significant provision of the Clean Air Act affecting them is the requirement to protect values related to air quality in certain national park and wilderness areas, defined as Class I areas (42 U.S.C. § 7472(a)). Major stationary sources of air pollution cannot be located or modified near a Class I area if they will adversely impact values related to air quality in the area. With their power to define these values in an area and to object to specific permits (42 U.S.C. § 7475(d)), federal land managers have a significant opportunity to influence the air quality debate.

Beginning in 1990, federal land managers in Great Smoky Mountains National Park and other Class I areas made several adverse-impact determinations in their review of several proposed permits under the Clean Air Act. Participants in the Southern Appalachian Mountains Initiative noted that these adverse-impact determinations brought states in the Initiative together to study the effects of air pollution on the Southern Appalachian highlands. However, because federal land managers do not have an absolute veto over these decisions, this provision in the Clean Air Act functions-in effect-as an information requirement. (The burden of proof for demonstrating the presence or absence of adverse impacts on values related to air quality depends on whether the proposed permit would violate Class I standards. If there is no violation, the federal land manager has the burden of proving the adverse impact on air-quality-related values.)

The Clean Air Act (42 U.S.C. § 7410(a)(2)(D)) also requires states to adopt State Implementation Plans to ensure that in-state emissions will not contribute to an areas "nonattainment" of National Ambient Air Quality Standards, cause significant deterioration where these standards are met, or interfere with the air quality of another state. These provisions motivate states to consult with each other regarding the effects of emissions on specific ecosystems. Related requirements of the Clean Air Act and the Intermodal Surface Transportation Efficiency Act are also seen as a major catalyst for bringing state and federal transportation agencies into the SAMAB program. Section 134 of the Intermodal Surface Transportation Efficiency Act (23 U.S.C. § 134) requires transportation plans for metropolitan areas (defined to encompass certain Clean Air Act nonattainment areas) and prohibits federal funding of highway projects that will significantly increase traffic, unless a project is part of an approved plan.

Federal Coordination With State and Local Counterparts

Several survey participants asserted that efforts of federal agencies to implement the ecosystem approach should not be limited to specific federal programs, but should be coordinated with related state and local efforts that address common concerns. Some suggested that federal land management agencies should act in their capacities as landowners to enforce state and local laws regarding ecosystem impacts from neighboring lands. Others see these agencies more as advocates for the enforcement of state laws and local ordinances. Most states in the region have enacted laws to address ecosystem impacts not dealt with under federal law, but federal authorities generally have not taken advantage of them. For example, participants noted that strong laws in some states governing soil erosion and stream sedimentation are not enforced locally. Enforcement of these laws is generally delegated to local governments that do not have the resources to ensure compliance with required soil management plans. It was suggested that federal agencies could address these problems by assisting in law enforcement, by reporting violations to the authorities and the public, and through general education of local authorities and the public.

In addition to state sedimentation laws, there are various federal authorities and programs that could be coordinated to complement state and local efforts. Although the Clean Water Act does not directly regulate nonpoint source pollution (as it does pollution from point sources), EPA has authority to provide grants and technical assistance to all agencies under section 319 of the Clean Water Act (33 U.S.C. § 1329). Many participants noted that the Natural Resources Conservation Service has an extensive network of personnel and a mixture of funding and regulatory authorities. However, the agencys programs focus on agricultural sources of pollution to the exclusion of nonagricultural sources that are increasingly significant, such as construction sites and low-standard roads. Participants encouraged the Natural Resources Conservation Service to address all aspects of soil conservation and to balance its regulatory and consultative roles. Regulatory programs, such as enforcement of the wetlands protections of Clean Water Act section 404, must be conducted judiciously to ensure that cooperative efforts with citizens are not jeopardized. Statutes must be consistently enforced against significant offenders and coordinated with a program to inform and assist the general public in compliance with the law.

Barriers to the Ecosystem Approach

Federal agencies face legal barriers to an effective ecosystem approach in the Southern Appalachians and to coordination with federal and nonfederal agencies and organizations. Agency activities are restricted in ways that constrain the ecosystem approach by agency mandates and by federal administrative laws.

Agency mandates. Under their mandates, federal agencies may be restricted from taking a comprehensive approach to adverse impacts on ecosystems.

Limited focus. Agencies address only some aspects of ecosystem impacts, lacking the legal mechanisms to address impacts comprehensively. Representatives from agencies that must meet specific statutory demands noted that the statutory focus of their agencies impedes their participation in the ecosystem approach. For example, the Fish and Wildlife Service administers the Endangered Species Act, 16 U.S.C. §§ 1531 et seq. Statutory requirements related to conservation of listed species, combined with limits on budget and personnel resources, make it difficult for the agency to participate in large-scale interagency efforts. Other agencies use the services of the Fish and Wildlife Service primarily when required under Endangered Species Act section 7 (16 U.S.C. § 1536) to consult with the agency on adverse impacts that their activities might have on specific species at a specific site. Survey participants stated that this approach is often frustrating for both the Fish and Wildlife Service and the consulting agency, because resources are already committed or options already limited by the time an agency action has reached the stage that consultation is required. The Fish and Wildlife Service has found that participation in SAMAB has allowed it better to inform agencies outside the formal consultation process.

Participants noted that EPA has significant resources and authorities to address many impacts on ecosystems. But its priorities, they said, are generally influenced by media-specific statutes that focus on particular risks to human health, often neglecting wider public welfare concerns regarding impacts on ecosystems. For example, air quality impacts on forest health are of particular concern in the Southern Appalachians. However, the requirements of the Clean Air Act focus EPAs attention on more substantially degraded airsheds that do not meet the National Ambient Air Quality Standards for the protection of public health, drawing resources from areas where the Clean Air Act requires only "prevention of significant deterioration." This is partly attributable to the standard-setting mechanisms of the Clean Air Act, which set deadlines for achieving primary National Ambient Air Quality Standards based on human health considerations, but set no firm deadlines for meeting secondary National Ambient Air Quality Standards designed to protect public welfare (42 U.S.C. § 7502).

Moreover, the Clean Air Acts requirement that national standards be uniform does not afford the flexibility needed to address regional differences in pollutant sources and ecosystem sensitivity. Survey participants from the Southern Appalachian Mountains Initiative noted that national standards for ozone pollution are based on studies of the Los Angeles airshed, an urban and desert environment where control of anthropogenic volatile organic compound emissions was identified as the primary means for controlling the creation of tropospheric ozone. However, in the Southern Appalachians, the abundant vegetation and forest cover contribute significantly to the atmospheres ambient volatile organic compound level. Therefore, the Southern Appalachian Mountains Initiative is searching for ways to control the other component of ozone pollution, nitrogen emissions. Such controls are not required by the Clean Air Act and would have to be adopted voluntarily by member states in the Initiative.

Permit criteria. Pollution permit criteria do not take ecosystems or the perspective of federal land managers into account. Several survey participants noted that there is no mandate to consider the perspective of federal agencies or land managers in many environmental laws. For example, although the Clean Air Act requires federal land managers to comment on proposed permits, the Clean Water Act contains no requirement that they be consistently involved in state stream water quality designations or National Pollution Discharge Elimination System permit decisions. Similarly, information about listed and candidate threatened or endangered species is not obtained from the Fish and Wildlife Service because state permitting agencies do not consider themselves subject to the consultation requirements of the Endangered Species Act (16 U.S.C. § 1536).

Many of these gaps could be closed by regulation under existing authority. For example, in devising solid waste management plans, states are not currently required to consider how federal land managers view the impact of local solid waste management decisions on biological resources. This proved to be a serious problem when a county decided to locate a landfill near the area used by Great Smoky Mountains National Park for relocating black bears. Under the Solid Waste Disposal Act, 42 U.S.C. § 4002, EPA is authorized to establish standards for locating landfills that take ecosystem impacts into account, using the same authority under which EPA has established other location standards (see 40 CFR 258.10-258.16, citing restrictions for floodplains, wetlands, and geologically unstable areas). EPA could add ecological considerations to these criteria. None of these statutes appear to prohibit interagency coordination, so agencies should be able to address these concerns through memorandum agreements.

Requirements for planning and decision making. Requirements for planning and decision making take up agency resources that could be used for coordination and organization on an ecosystemwide or regional basis. Statutes and regulations that micromanage agency planning decisions were generally criticized as requiring an inefficient use of administrative resources and creating opportunities for litigation. Notably, planning requirements under the National Forest Management Act take up agency resources that could be allocated to address issues that are more directly relevant to the ecosystem approach.

For example, the National Forest Management Act and its regulations require planning to determine the suitability of forest lands for timber production, allowable sale quantity, and timber sale schedules (16 U.S.C. §§ 1604(f)(2), (k), (m); 1611; 36 CFR 219.3). The resulting forest plan is intended to function like a zoning ordinance for the forest, describing for a 10- to 15-year period what activities are and are not permissible by specifying different "management areas" defined in terms of resource emphasis. All management activities and uses of the forest must conform to the standards and guidelines of the forest plan. The forest plan also indicates the desired future condition of the forest and identifies management activities necessary to achieve that goal. However, the plan is not self-executing and does not constitute a mandate to undertake any of the activities that it describes. Subsequent analysis or new information may show that another strategy is needed for a particular area. A separate decision-making process is required, involving a separate environmental assessment based on the forest plan, before there is any ground-disturbing activity, such as a timber sale. Nevertheless, these forest plans have been the subject of intense litigation.

Participants also argue that National Forest Management Act planning is conducted on a temporal and geographic scale that is not adapted to ecosystems. The Act requires forest plans for each national forest, the boundaries of which are determined by congressional designation and adjacent private lands (16 U.S.C. § 1604(f)(1); 36 CFR 219.4(b)(3)). Unlike forest planning area boundaries, ecosystem boundaries do not respect such borders. The scope of the ecosystem may change according to the characteristics that are considered relevant. Also, forest plans under the National Forest Management Act are revised every 10 to 15 years (16 U.S.C. § 1604(f)(5)). Significant new information about an ecosystem that is broad in geographic scope or substantially affects commodity production may require significant changes to the forest plan (16 U.S.C. § 1604(f)(4)). Both revision and significant amendments require an intensive planning process and allow administrative appeal and litigation opportunities.

Because agency decisions and analysis under the National Environmental Policy Act must be based on sound, current science, statutory planning tools such as forest plans are now only a part of overall planning and management efforts. Forest Service representatives noted that where a forest plan becomes outdated, documents used in specific project decisions can no longer be "tiered" to the forest plan analysis, but must incorporate their own evaluation of impacts. This increases the administrative burden on project decisions. Moreover, because forest plans may not address ecosystem characteristics on a scale that is useful for project decision making, additional levels of analysis are needed. For example, the Chattooga River Ecosystem Project area generally follows the outlines of the planning unit used by the Forest Service prior to enactment of the National Forest Management Act. The Act may actually allow the Forest Service to plan on an ecosystem scale. Some participants noted that this flexibility exists because the National Forest Management Act does not require a separate forest plan for each national forest, but rather speaks in terms of "plans" that "form one integrated plan for each unit of the National Forest System" and may be one document or a set of documents (16 U.S.C. § 1604(f)(1)).

Administrative laws. The ability of federal agencies to coordinate activities and information with nonfederal agencies and organizations in a way conducive to the ecosystem approach is hampered by two federal laws, the Freedom of Information Act and the Federal Advisory Committee Act.

Freedom of Information Act. The Freedom of Information Act (FOIA), 5 U.S.C. § 552, states that any person has a right, enforceable in court, to obtain federal records, except those specifically protected from disclosure under FOIAs nine exemptions or three law enforcement record exclusions. The FOIA exempts from disclosure interagency and intra-agency memoranda and other documents that are part of a government deliberative process (5 U.S.C. § 552(b)(5)). However, this exemption does not generally apply to purely factual information, or to factual portions of deliberative documents.

The FOIA is regarded as a significant threat to any agency that collects information about the location of sensitive or overexploited species. Depending on how it is used, this information may be considered purely factual and not be protected from public disclosure under FOIA. For example, the National Park Service may not be able to protect information about the location of wild ginseng, a plant that grows in the Great Smoky Mountains National Park and is widely poached for its valuable root. And the National Biological Service has found that private landowners (such as timber companies) are reluctant to allow it to survey their lands, because public access to the information may encourage trespassing to take species. Moreover, data shared with or among government scientists could be used by outside scientists before originators can publish findings for professional credit. Among scientists, the sharing of data depends on trust, easily destroyed by even the threat of public disclosure.

Survey participants declared that legislative action is probably necessary to address this problem effectively. Under exemption 3 of the FOIA (5 U.S.C. § 552(b)(3)), factual or other information that must be withheld under another statute is exempted from disclosure. A model for such legislation is provided by the Archeological Resources Protection Act, 16 U.S.C. §§ 470aa et seq. This Act requires federal land managers to withhold information concerning the nature and location of archeological resources, unless that information is needed to protect a site from destruction, or unless disclosure would not create a risk of harm to the resources (16 U.S.C. § 470hh).

Federal Advisory Committee Act. Congress enacted the Federal Advisory Committee Act (FACA) to control the growth and operation of the "numerous committees, boards, commissions, councils, and similar groups which have been established to advise officers and agencies in the executive branch of the Federal Government" (5 U.S.C. App. 2 § 2(a)). An "advisory committee" is defined as "any committee, board, commission, council, conference, panel, task force, or other similar group, or any subcommittee or other subgroup thereof" that is "established or utilized" by the President or an agency "in the interest of obtaining advice or recommendations for the President or one or more agencies or officers of the Federal Government" (5 U.S.C. App. 2 § 3(2)).

FACA places a number of procedural restrictions on bodies that constitute "advisory committees." Every advisory committee must file a charter (5 U.S.C. App. 2 §§ 9(c), 10(a)(2)); its meetings must be open to the public (id. § 10(a)(1)); it must keep "[d]etailed minutes" of its meetings (id. § 10(c)); and it must generally permit "[i]nterested persons . . . to attend, appear before, or file statements" with it (id. § 10(a)(3)), unless a decision is made to close the meeting (id. § 10(d)). In addition to governing how the group functions, FACA also requires an advisory committee to make publicly available "the records, reports, transcripts, minutes, appendixes, working papers, drafts, studies, agenda, or other documents which were made available to or prepared for or by [the] advisory committee" (id. § 10(b)). This obligation exists only "until the advisory committee ceases to exist" and is no longer subject to the provisions of the Freedom of Information Act.

FACA also imposes a number of requirements on federal officials regarding creation and use of advisory committees. A committee must specifically be authorized (either by statute or by the President), or be determined by an agency head to be in the public interest (id. § 9(a)); it must be "fairly balanced in terms of the points of view represented and the functions to be performed" (id. § 5(b)(2)); and precautions must be taken to assure that an advisory committee is not "inappropriately influenced by the appointing authority or by any special interest" (id. § 5(b)(3)).

FACA is generally regarded as a hindrance to agencies efforts to obtain information from the scientific community and stakeholders. Several survey participants argued that it should be amended to specifically exclude ad hoc agency efforts to obtain information from the public, state or local authorities, and scientists. They maintained that FACA should be limited to situations where an agency seeks the opinion of an advisory committee as an authoritative, expert source, consistent with the original intent of Congress.

Budgetary restrictions. Section 611 of the Treasury Postal Appropriations Act for FY 1994, P.L. 103-123, prohibits interagency financing of "boards, commissions, councils, committees, or similar groups (whether or not they are interagency entities) which do not have a prior and specific statutory approval to receive financial support from more than one agency or instrumentality" (107 Stat. 1261). This requirement could be a significant impediment to agency coordination and cooperation, because it requires each agency either to find a statutory basis for work that is generally accepted to be within the agencys scope, or to coordinate with other agencies by some other means. Statutory authority must be enacted to allow money to be pooled for projects that meet the needs of more than one agency.

Many agencies are required to fund projects based on statutory criteria that do not consider the wider ecosystem implications of those projects. The Office of Surface Mining, for example, funds the abatement of acid mine drainage at coal mining sites, an important water quality impact in the Southern Appalachians. The Surface Mining and Reclamation Act, which provides for this funding, requires treatment of sites with human health implications before sites where the only impact is ecological (30 U.S.C. § 1233(a)). Under these restrictions, the Office of Surface Mining may be able to coordinate its use of funds with other agencies, but it has not yet participated in any SAMAB-sponsored effort.

PUBLIC PARTICIPATION

Team members surveyed participants on the effectiveness of current regional public involvement efforts. The focus of survey findings are on SAMAB because of its role in coordinating regional interagency cooperation and its designation as a regional demonstration model for other biosphere reserves.

The primary response from every federal agency consulted in the study was that there is a need for greater public involvement. The most common reason cited for limited current efforts is the lack of specialized staff able to devote full time to the work. Typically, public involvement work is a secondary assignment for a staff member with expertise in natural resource management, not education. The result is that public education and/or involvement is often limited to one or two standard media, such as brochures, videos, or blurbs in internal newsletters.

Cooperative partners in ad hoc environmental projects often hold conferences related to the projects, which attract interested parties and publish proceedings that primarily interest scientists and specialized audiences. The general public is seldom a target for education by these partners, whether they are NGOs or federal and state agencies. Agency officials, however, recognize that public affairs work (such as marketing or opinion surveys) is important for getting the publics informed consent for projects.

Public Education Efforts

Efforts to educate the public on environmental issues in the Southern Appalachians range from individual initiatives by NGOs or federal agencies to joint programs under the SAMAB umbrella.

SAMAB programs. In SAMABs original 1988 charter, the cooperative agreement work plan calls for "developing and implementing a voluntary environmental education program with the public school systems of the region and with other interested organizations." The organizational chart of SAMAB includes public affairs as one of six standing committees, and a proposal is being considered to add a marketing committee that would "promote the organization within the region and pursue linkages with major national initiatives." In its May 1994 newsletter, SAMAB identifies "insufficient public education" as a cultural issue that "merits attention and resources." Apparently, there is a necessity for more effort in this area to meet SAMABs objectives.

SAMAB sponsors videos and publications designed to educate the public. Its most recent successful effort was an Emmy Award-winning video titled "Front Runner," about the reintroduction of the red wolf on the Great Smoky Mountain National Park. SAMAB prepared an accompanying teachers guide and a highly popular poster. A SAMAB-sponsored publication on the demise of the dogwood was so successful that the Izaac Walton League reprinted 250,000 copies. The 1993 video "Downstream from the Mountains to the Ocean" has been popular at public meetings because it illustrates the concept of a watershed ecosystem by tracing a raindrops path from a mountain stream to the sea.

But SAMABs primary outreach efforts and strength lie in the conferences and workshops that it sponsors. In March 1992, for example, a SAMAB-sponsored forum on air quality held in Gatlinburg, Tennessee, drew attendees from a wide array of stakeholder groups, including citizens associations, academic institutions, private industries, and federal and state agencies. Due to its nonpartisan reputation, SAMAB was able to bring to the table groups that had not been cooperative in the past, resulting in the formation of the Southern Appalachian Mountains Initiative.

Publications and proceedings from these gatherings help develop a data base as the foundation for a regional program under the ecosystem approach that coordinates the efforts of federal and state agencies, private industry, environmental groups, and interested citizens. But one limitation of such workshops and conferences is that the specialists there usually talk among themselves. Science must be translated so it can guide policy decision making and be integrated into educational materials for the public.

Federal agencies. The Oak Ridge National Laboratories are aware of the need to gather socioeconomic data in order to include public opinion in plans related to the ecosystem approach. Toward that end, the Laboratories are conducting an EPA-funded collaborative research project. Called "Relating Ecological Indicators to Societal Values," the project involves researchers from the Institute for Public Policy Studies at Vanderbilt University. A similar study that considers area political economy as it relates to national forests in the region is "The Living Landscape, Charting a New Course: National Forests in the Southern Appalachians" (Wilderness Society 1994). The impact on TVA of proposals to reinvent the government is reported in "Sound River Management: Fiscal Year 1994 Pilot Program Plan." Narrower in scope are articles such as "Whats Killing All the Fir Trees?" and "Fungal Disease Kills Park Dogwoods" in the National Park Service newsletter "Smokies Guide." A Great Smoky Mountains National Park employee mentioned that other general public education is in the hands of park interpreters. The Fish and Wildlife Service educates the public about endangered species through information sheets prepared in its Asheville, North Carolina, office. Although outreach efforts are varied overall, most are in the form of a specialized publication that reaches a limited audience. However, it was reported that NGOs receive environmental information from federal agencies very quickly.

Nongovernmental organizations. At the local level, NGOs offer interested residents a chance to participate in meetings on specific topics of immediate concern. The Little Tennessee Watershed Group, based in Franklin, North Carolina, is one such group. A chapter of the Western North Carolina Alliance motivated many local residents to work together with city officials on river cleanup projects. The partnership is largely successful because the leader of the local chapter is an active facilitator.

Opportunities

Several opportunities and suggestions for public outreach on environmental problems and initiatives in the region were brought out during interviews and are summarized below, in no particular order.

- A positive characteristic of the region is that different groups have not become as polarized over environmental issues as in some other areas. The success of SAMAB in promoting cooperation among so many diverse groups can serve as a model for the future.
- The recent Executive Order on Environmental Justice provides an broad opportunity that has yet to be more narrowly specified for the region. Increased public awareness of its significance for low-income communities may help foster local efforts to retain historic land use patterns and ways of life.
- The National Environmental Policy Act continues to promote public participation by federal land management agencies. The compliance process ensures the public the opportunity to comment on proposed projects. The role of the National Environmental Policy Act could be more fully publicized to provide even more opportunities for public involvement, especially to those who have not understood this opportunity.
- One-stop information centers could be established in rural areas to allow local residents to channel their information needs. Federal agencies could coordinate this activity and staff it with people trained to

respond to diverse questions on natural resource issues as they apply to local landowners. Related to this would be technology transfer and/or translation of environmental publications. Organizations such as the Forest Service, SAMAB, and TVA publish excellent research papers on topics of concern in natural resources, such as soil erosion, but the jargon of these scientific works limits their readability. In addition, readers remain unclear as to how their actions might help mitigate the problem identified, be it air pollution or solid waste disposal. People want to do what is best, but sometimes require clear, easy-to-follow directions that are applicable to their own daily routines. County extension and/or Natural Resources Conservation Service offices and staff are ideal candidates for providing such services.

- SAMAB could fund a "circuit rider" public affairs specialist who would travel on a scheduled basis to rural areas in the region. This person would perform an agency outreach role through talks at civic forums and in schools and other public arenas.
- SAMAB could sponsor a study of land use planning for the tristate area of Georgia, North Carolina, and Tennessee that currently takes the brunt of urban flight. The counties in question desperately need an overview of the challenges they face and the decisions they must make to implement zoning for the future. A coordinated interagency task force should be established to assist counties or towns in devising an action plan. The regions biggest problem is its lack of established education on land use planning for local officials. Such a system might be modeled on the planning outreach done by Oregons Department of Environmental Quality in the 1970s.

Constraints

Constraints to public outreach efforts on environmental issues in Southern Appalachia are embedded in the regions history and the fundamental socioeconomic changes currently underway.

Rapid transformation in the Southern Appalachians political economy has created an urgent need to educate the public about the need for a healthy natural resource base as the key to preserving quality of life. Local economies are swiftly changing from farming to tourism and recreation, a change brought on by the regions major new highways, which are bringing an influx of tourists, seasonal residents, and retirees, who now have easier access to the region. In addition, the traditional absence of opportunities to generate income from manufacturing remains.

As a result, local officials tend to view subdivisions as another source of growth, ignoring the limited ability of rural ecosystems to support unregulated development. In order to build consensus between feuding developers and environmentalists, both sides must be persuaded that there cannot be a long-term stable economic base without strong measures to natural resources, and that the environment cannot be protected without a strong economy.

Communication is most needed at the county level, where federal and state land use policy and programs are not always enforced. The desire of local officials to boost the areas economy by fostering urban-rural migration, the need for cash by traditional landowners whose children no longer view farming as a viable occupation, and a tradition of independence among rural residents who believe strongly in private property rights contribute to this problem.

Attitudes do vary, of course, resulting in different kinds of development, ranging from the extreme strip commercialism found in Pigeon Ford and Gatlinburg, Tennessee, to the nearby planned community of Pittman Center. Community planning or zoning is still rare in the region, but education may induce people to endorse planned development, as long as it is perceived as originating locally and not imposed by government regulation.

Government regulation is strongly resisted in this region. The private sector fears the idea of ecosystem management, but is receptive to the concept of sustained-use stewardship. Property owners are sometimes reluctant to permit biological surveys on their lands, fearing that if federally listed threatened and endangered species are found, their property rights will be restricted. As a result, SAMAB has focused on federal lands, leaving an information gap in the natural history record. This issue poses problems for the National Biological Service, as well. Any public education in the region must consider the views of local landowners and stress cooperative stewardship.

Many people in the region distrust ecosystem management because they think it puts the interests of wild species ahead of those of people. If all federal agencies (including those that support economic development, social services, and similar programs) were involved in a coordinated effort to address ecological principles as they apply to human needs (such as affordable housing and transportation), ecosystem management could be made more inclusive. This could make the ecosystem approach seem more people-friendly-more favorable to economic interests-and resistance to ecosystem management in the region might be overcome.

SCIENCE AND INFORMATION

During its interviews, the survey team focused on increasing its understanding of how interorganizational coordination of science and information benefits current practices under the ecosystem approach, and what opportunities for-and constraints to-the ecosystem approach emerge from interorganizational coordination of science and information. In addition, the survey team elicited suggestions from participants on improving science and information contributions to the ecosystem approach.

Coordination of Science and Information Activities

The survey team learned that there is a wealth of regional scientific information that is being shared with nonscientists throughout the region. Research and monitoring examples come primarily from Oak Ridge National Laboratories and Forest Service researchers. Interviews revealed that common resource problems, such those affecting bears and neotropical migratory birds, have helped to bring the Forest Service, National Park Service, and states together on research projects. Threatened and endangered species and opportunities for the ecosystem approach have motivated agencies to cooperate on larger scales than found in any single land management unit.

The team learned that research at Oak Ridge National Laboratories is driven more by science issues than by policy needs, focuses on national issues, does not have a specific regional interest in Southern Appalachia, and does not focus its resources solely within the region. When its research interests do coincide with those of others in the region, the Oak Ridge National Laboratories cooperate and become very much involved. Scientists from the Laboratories do not rely extensively on SAMAB to coordinate research or to provide advice or consent, and they have not yet been brought through the National Biological Service to work extensively with researchers on Great Smoky Mountains National Park. Similarly, Great Smoky Mountains National Park cannot usually postpone park work to release people for interagency research work.

The Forest Service Coweeta Research Station supports interdisciplinary watershed research through a terrestrial and aquatic ecosystem management research program that started in 1990. This program involves forest supervisors in its planning stages, and facilitates information sharing through semiannual meetings. The Coweeta Station also sponsors research on ecological classification systems. It gets guidance from the SAMAB research and monitoring committee and through its partnership with the Oak Ridge National Laboratories and Great Smoky Mountains National Park in the interorganizational neotropical migratory bird program Partners In Flight. Rather than seeking competitive funding on its own, the Coweeta Station works through SAMAB to secure cooperative and leveraged funding relationships. It contributes to a nationally focused interdisciplinary project that relates economic and social factors to land use and landscape patterns and to their effects on regional sustainability in Southern Appalachia and on the Olympic Peninsula in Washington. The Forest Service also participates in air quality projects and in a research-oriented regional forest health monitoring program. However, the Coweeta research program has a somewhat limited interaction with Great Smoky Mountains National Park, even though some of its research is of direct value to park management.

In their programs, the Oak Ridge National Laboratories and Coweeta Station work together and with other federal and state agencies as well as NGOs. Federal partners include the Department of Energy, EPA, U.S. Geological Survey, U.S. Global Change Research Program, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, National Park Service, National Science Foundation, and TVA. State partners include Tennessee and Georgia. The Coweeta Station and Oak Ridge National Laboratories also maintain relationships with a host of NGOs, including the Electric Power Research Institute, The Nature Conservancy, and many universities.

There is much more research that is focused on specific areas and contributes to the ecosystem approach in the region. The Nature Conservancy conducts aquatic mussel surveys and relies on SAMAB to provide necessary extensive contacts with landowners throughout the area. The state of Georgia coordinates trout management studies with the Forest Service and works with SAMAB to study and monitor dogwood anthracnose and forest health. The National Biological Service is developing a monitoring program for Great Smoky Mountains National Park and the Blue Ridge Parkway, and it relies on SAMAB to help integrate park information into a larger monitoring program.

Research information is exchanged throughout the region among scientists, between scientists and managers, and between scientists and citizens. Information sharing among scientists is continual and generally operates on trust because of individual interests in the SAMAB region. The sharing of data ownership among scientists is less open.

General information is shared through several mechanisms, including: annual research symposia focused either on research topics sponsored by the Oak Ridge National Laboratories, or on SAMAB-sponsored research sites within

Southern Appalachia; annual meetings attended by federal, state, and university scientists; science education programs provided by the Oak Ridge National Laboratories onsite to students from elementary through high school and through a high school honors program; Great Smoky Mountain National Park science meetings; newspaper stories; and hiker education by researchers on park trails.

In other cases, research information is disseminated through the Natural Resources Conservation Service or state forestry programs. The Forest Service also disseminates technical information through its Cradle of Forestry Center, which focuses on environmental education, forestry in transition, the ecosystem approach, and species and environmental relationships. The Centers programs teach the teacher, relate to the North Carolina school curriculum, and function as part of a group of environmental education sites that include the Bent Creek Demonstration Forest, North Carolina Arboretum, Blue Ridge Parkway, and North Carolina State Fish Hatchery.

Efforts aimed at synthesizing information and assessing the regions current condition include:

- EPA-sponsored workshops to encourage information exchange, involving all interested parties.
- Cooperation of five organizations in assessing global change and ecosystem vulnerability (to include SAMAB as part of a broader effort throughout the Southeast).
- Forest Service establishment of three physiographic teams for the entire Southeast to bring research and forest management together.
- The work of nine organizations to advance direct and regular interaction among managers and scientists during assessments at three scales: the Clinch-Powell watershed, the SAMAB region, and the SAMAB and mid-Atlantic highlands regions taken together.
- The maintenance of a summary of all published documents about Great Smoky Mountains National Park, by the National Biological Service unit at the University of Tennessee in Knoxville.

The state of North Carolina, with support from the U.S. Department of Transportation, is developing a geographic information system with land use classifications that will improve the capability to conduct assessments within the region. However, existing classification systems used by at least five organizations in the region may be different from one another. North Carolina state personnel maintain that the existing scientific information base is adequate for assessing the effects of land use changes on the regional forest industry.

The purpose of SAMAB is to promote the sharing of scientific and management information and to increase environmental awareness in both natural and cultural resource arenas. The organization fulfills its purpose through its extensive regional network and through its easy mechanism for transferring research funds among partners. In fulfilling its purpose, SAMAB conducts or coordinates research communication, environmental monitoring and assessment, air and water quality monitoring, environmental education and training, and data management. To date, SAMAB has focused primarily on natural resources and has not directed any measurable effort to sustainable development or economic issues.

Opportunities

The geographic breadth and diversity of the SAMAB Cooperative give organizations in Southern Appalachia a real opportunity to expand cooperation in science and information dissemination. SAMAB presents this opportunity because it is viewed as a resource and a facilitator, not as a threat. It is accepted as a translator of technology and can motivate agencies to refocus their efforts on joint projects, rather than on independent operations. It can address issues without additional bureaucracy and can make a difference with meager resources, guiding land trusts to become effective partners. It demonstrates that federal science and education organizations can work with other federal, state, and private organizations. Overall, it helps to coalesce the many separate mandates of participating groups. It advances science by increasing awareness about what other agencies are doing, helping to eliminate duplication of effort and to encourage software compatibility for data sharing.

The SAMAB Foundation brings together federal and nonfederal funds to support regional activities, to fund worthy projects outside the domain of federal members, and to stimulate public involvement and partnership in projects. Because it is viewed as a facilitator, SAMAB keeps research and scientific facts and discussions from becoming embroiled in political debate. Moreover, SAMAB activities complement the capabilities that TVA brings to the region. Because TVA is both a federal agency and a utility, it can cooperate in research with other federal organizations and with the utility industry.

The Forest Service assessment of regional forests will go beyond individual forest boundaries. This ecosystemwide approach affords several opportunities: to make the assessment interagency and to focus on all relevant scales; to do better inventories; to use existing data from cooperators rather than to collect new data; to speed up application of data to planning; and, by providing analysis results for all forests at the same time rather than piecemeal, to place forest planning into a broader context.

Constraints

Problems related to science and information in the Southern Appalachians originate both within the region and outside of it. Following are examples:

- Most federal organizations active in the region have other responsibilities that divert attention from the region. For example, the TVA Land and Water 201 initiative focuses on the 201 counties in which TVA works, involving the National Park Service, Forest Service, and others in eliminating nonpoint source pollution. However, not all SAMAB agencies are involved, and the initiative potentially competes with SAMAB programs; Moreover, because it does not include watersheds that drain into the Atlantic Ocean, it excludes part of the SAMAB area, focusing primarily on specific aquatic systems rather than on the entire ecosystem.
- Although EPA is an active member of SAMAB, its research capability at the Research Triangle Park in North Carolina does not yet fully address the research needs of Southern Appalachia.
- Some federal research agencies use Research Grade Evaluation procedures to reward their scientists for efforts to transfer information from individual research results, but not from the general body of technical knowledge that underlies those results. As a result, the evaluation process does not motivate scientists to provide technical extension assistance to managers and others.
- Data management constraints are felt throughout the region. The size of the region and the voluminous amount of available information require extensive computer management of data, which is hard to achieve. Although the National Biological Service has agreed to assign a data management specialist to the region to help deal with the workload, more attention to this is needed. Similarly, although research can develop predictively useful models, they are not very useful for management predictions when the models users do not collect the data necessary to run them.
- Long-term maintenance of data bases is a real problem, largely due to a lack of dedicated funds. In one case where a research agency committed 10 percent of the research budget to data management, it received good results. Lack of consistent data standards and data sets impedes the ability to create common data bases and share data.
- Use of global positioning systems is complicated by the current practice of scrambling the information, causing locational information to be up to 100 meters in error. Scrambling characteristics change daily, and information from the global positioning system base station is not shared very often.
- Because SAMAB is focused on providing technical expertise and not on enforcing regulations, efforts to induce information sharing can be jeopardized if potential participants believe that such efforts will utilize information obtained through SAMAB.
- Local conservation districts can receive federal funds to work with private landowners. However, provisions of the 1985 Farm Bill have reduced private landowner acceptance of conservation districts, impeding communication between them. In addition, proposed reductions in the number of field offices will reduce opportunities for transferring technical information to private landowners in the region.
- Great Smoky Mountains National Park has exotic tree species that threaten survival of native species. Despite the danger, the park does not have a large interpretive program on threats to native tree species.
- Several agencies are planning large regional assessments. Due to differences in purpose among them, they are not exactly comparable, although agencies are expected to cooperate on data bases and analytical tools used for these assessments. There is no current proposal for total assessment of the entire Southern Appalachian ecosystem to determine what system of protected lands is needed to sustain ecosystem values and functions.
- Private landowners vary in their willingness to permit inventory and monitoring activities on their lands. Many fear that information about their property could become public against their will, and that remote sensing could be used to survey their lands without their knowledge or consent. Lack of information about private lands could hamper cumulative effects analyses that are important for effective decision making under the ecosystem approach.

Interviewee Suggestions

Many interviewees offered suggestions on how to make their research and information transfer efforts more productive, including:

- Use SAMAB to facilitate broader planning. Where agency management plans for individual units do not relate to the larger landscape, SAMAB could help broaden the focus by encouraging data sharing and interagency cooperation that would lead to broader planning.
- Integrate research with policymaking. One key lesson of the Southern Appalachian Mountains Initiative is that policy making and research are interdependent: each must contribute to the other to be successful. Researchers must learn from policymakers what information is needed, how certain it must be, and when it is required. If they know what is needed, many researchers are willing to work on policy-oriented studies. By the same token, policymakers must learn from researchers what information is already available, where gaps exist, how soon these gaps can be filled, and how much the effort is likely to cost. For both parties, working together builds common vocabularies, trust, and ability to compromise, all necessary to communication and achieving consensus.
- Foster interagency cooperation in research. Cooperation in research programs is best developed when program partners identify mutual questions derived from similar scientific interests. Interagency cooperation means identifying common interests, establishing agency liaison personnel (possibly through personnel exchanges), and making enough time and staff available to move beyond day-to-day concerns to foster cooperation.
- Establish a regional preserve. Partners in the Southern Appalachians should consider establishing a regional genetic preservation area with interagency support. The preserve would shelter endangered and threatened native species until threats in their native habitats can be neutralized or eliminated.
- Seek special designation for the region. Partners in the Southern Appalachians should seek designated-area legislation to permit interagency cooperation. In this way, the individual missions of federal agencies in the region would not hinder effective cooperation.
- Develop regional indicators of environmental change. The scientific community should develop systems to identify when environmental changes significantly exceed what is accepted as normal variability. Developing these systems would require interagency and interdisciplinary workshops, literature and data review, model building, peer review, and model testing. It would include examining what little is known about declines and extinctions of such regional species as the passenger pigeon, American chestnut, Fraser fir, snail darter and other fish, and freshwater mussels.
- Develop commodity activities. Science has a role in the design of commodity activities to mimic natural processes. Use of commodity activities as a resource management tool increases their potential contributions to both environmental and economic sustainability.
- Educate the public on the relationship between air quality and land use. People in the SAMAB area generally do not understand the connection between air quality deterioration and land use, so it is necessary to demonstrate the effects of land uses on air quality throughout the region. Educating residents about this relationship will help them to understand how changing land use and its regulation by state or local government can determine the quality of the regions air.
- Share data with all users. Information on common environmental baseline data, human dimensions data, syntheses, gap analyses, and assessments should be equally available to public and private users.
- Encourage sustainable development. SAMAB should broaden its focus to include projects involving sustainable development and economic issues.

Outlook for the Future

The wealth of research, information transfer, and awareness of common management problems that has developed in the Southern Appalachians has generated a climate of interagency coordination that was influential in the formation of SAMAB and continues to make it effective. The longstanding cooperative spirit among agencies was partly stimulated by the TVA and the Oak Ridge National Laboratories. The system-oriented awareness of TVA in particular, with its interdisciplinary watershed focus, helped pave the way for SAMAB. Because TVA is a single agency with multiple responsibilities over a single watershed and a mission focused on the interrelationship of people with their environment, it has played an important role in creating the climate of cooperation and information sharing that makes SAMAB so effective.

Although SAMAB was created through the Man and the Biosphere program, the regional characteristics that contributed to its development may exist in other regions as well, whether or not they have a connections with the Man and the Biosphere program. Several regional characteristics helped to stimulate formation of SAMAB, including: a strong, diverse research base; common resource management problems shared by several land management organizations; widespread mechanisms to share research information; a recognition that voluntary cooperation can achieve greater results; and individuals in several agencies who promote cooperation.

Public and private organizations in Southern Appalachia that conduct research and monitoring, take inventory, and transfer information have generated a great deal of data. Still, the region is so large such activities currently do not meet all identified needs. Planned ecosystem assessments and data administration systems will improve the management of existing data and their utility for public information, and will guide decisions on where additional research, monitoring, baseline data collection, and information transfer are needed.

RECOMMENDATIONS

After conducting the complete series of surveys and interviews, the team has developed the following recommendations, based on themes that recurred throughout the region.

1. Compile and maintain an ecosystem data base. Developing and providing baseline information that is useful to everyone active in and around the ecosystem appears to be critical to any coordinated effort to implement the ecosystem approach. An interagency data base would facilitate agency evaluations of ecosystem impacts (including evaluations required by the National Environmental Policy Act and other statutes) and coordination of various agency programs. An integrated ecosystem data base would require each agency to provide data in a format usable by all, to broaden collection to include data needed by others, and to help provide funding to maintain the data base.
2. Encourage ongoing public involvement. To be effective, agencies must take public perceptions of ecosystem health and the effects of agency programs into account. In turn, agencies should educate the public about environmental problems and about agency efforts to address them. Trust and voluntary cooperation by citizens, particularly private landowners, is essential to comprehensive protection of ecosystem values. Existing authorities for public involvement in ecosystem assessments should be exploited. If necessary, informal agency efforts to exchange information with members of the public, nonfederal governmental bodies, and groups of scientists should be exempted from Federal Advisory Committee Act requirements.
3. Coordinate with federal, state, and local regulatory authorities. Agency regulatory efforts should be formally separate from the programs of any interagency ecosystem coordinator or facilitator, and should be employed judiciously to avoid undermining coordinated ecosystem programs that depend on public involvement and support. Federal regulatory agencies should also recognize that they can only address particular aspects of ecosystem impacts unless their regulatory programs are coordinated between agencies and with state and local counterparts. Greater coordination could better focus agency resources on critical ecosystem impacts so that they complement other regulatory or nonregulatory programs.
4. Build and execute budgets around ecosystem needs. Interagency plans for the ecosystem approach must be accompanied by coordinated budget planning and execution. Agencies should, at a minimum, compare budgets and adjust them based on their respective plans (to avoid duplication of efforts and to decrease the likelihood of no funding in needed areas). Ideally, agencies would go much further, appointing an interagency budget team to formulate a budget based on a strategic plan for the ecosystem. Such a budget would be developed in tandem with jointly organized meetings with key congressional committees and subcommittees to garner their support.
5. Because transferring funds is a key constraint to cooperation for some agencies, an interagency study should be conducted at the national level to identify legal and administrative barriers to interagency transfers of funds and to develop ways to overcome them.
6. Establish a federal regional coordinating council. The coordination of federal activities within ecosystems is essential. A regional coordinating council should be established to facilitate and focus federal actions on advancing the ecosystem approach. Such a council would act as a coordinator, not a regulator, and would promote communication among agencies, seek public input, and keep the public apprised of all federal activity within the ecosystem. The council would ensure that appropriate environmental baseline data is developed and shared, and that it is not duplicated. The council would annually assess ecosystem needs and make them known to agencies during budget development. It would advance cooperation and partnerships between agencies and state, local, community, and private

organizations. If the recommendation for removing barriers to interagency transfer of funds is accepted, the council would develop internal control mechanisms to ensure accountability of resources. The council would host federal agency meetings to coordinate future federal proposals so that analysts could address the cumulative environmental effects of such proposals in all NEPA analyses prepared within the region.

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