

THE ECOSYSTEM APPROACH:
Healthy Ecosystems *and* Sustainable Economies
Volume I Overview

REPORT OF THE
INTERAGENCY ECOSYSTEM MANAGEMENT TASK FORCE
June 1995

Copies of this report may be purchased from the National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. Volume I: PB95-265583; Volume II: PB95-265591; Volume III: PB95-265609; the three volume set: PB95-265575. The sales desk phone number is (703)487-4650. 24-hour FAX order number is (703)321-8547. Rush service number (overnight) is 1-800-553-NTIS. Internet order address is orders@ntis.fedworld.gov.

INTERAGENCY ECOSYSTEM MANAGEMENT TASK FORCE

Chair

Council on Environmental Quality: Katie McGinty, Chair

Members

Department of Agriculture: James R. Lyons, Under Secretary for Natural Resources and Environment

Department of the Army: John Zirschky, Assistant Secretary for Civil Works

Department of Commerce: Kate Kimball, Deputy Assistant Secretary for Oceans and Atmosphere

Department of Defense: Sherri W. Goodman, Deputy Under Secretary for Environmental Security

Department of Energy: Susan Tierney, Assistant Secretary for Policy, Planning and Program Evaluation

Department of Housing and Urban Development: Andrew M. Cuomo, Assistant Secretary for Community Planning and Development

Department of the Interior: Bonnie Cohen, Assistant Secretary for Policy, Management and Budget

Department of Justice: Lois Schiffer, Assistant Attorney General for Environment and Natural Resources

Department of Labor: Joseph A. Dear, Assistant Secretary for Occupational Safety and Health

Department of State: Elinor G. Constable, Assistant Secretary for Oceans and International Environmental and Scientific Affairs

Department of Transportation: Frank Kruesi, Assistant Secretary for Transportation Policy

Environmental Protection Agency: David Gardiner, Assistant Administrator for Policy, Planning and Evaluation

Office of Management and Budget: T.J. Glauthier, Associate Director for Natural Resources, Energy, and Science

Office of Science and Technology Policy: Jack Gibbons, Director

INTERAGENCY ECOSYSTEM MANAGEMENT WORKING GROUP

Co-Chairs

Department of the Interior: James Pipkin, Counselor to the Secretary of the Interior

Department of Agriculture: Dr. Diane Gelburd, Regional Conservationist for the East, Natural Resources Conservation Service

TABLE OF CONTENTS

PREFACE

EXECUTIVE SUMMARY AND RECOMMENDATIONS

THE ECOSYSTEM APPROACH

Definitions

Characteristics of the Ecosystem Approach

Principles of the Ecosystem Approach

Benefits of the Ecosystem Approach

Achieving Balance

Misunderstandings About the Ecosystem Approach

MAJOR IMPLEMENTATION ISSUES

Issue 1: Federal Agency Coordination

Issue 2: Shared Vision of Ecosystem Conditions and Goals

Issue 3: Partnerships with Nonfederal Stakeholders

Issue 4: Communication Between Federal Agencies and the Public

Issue 5: Resource Allocation and Management

Issue 6: Knowledge Base and the Role of Science

Issue 7: Information and Data Management

Issue 8: Flexibility for Adaptive Management

FRAMEWORK FOR AN ECOSYSTEM APPROACH

INTERAGENCY ECOSYSTEM MANAGEMENT WORKING GROUP

PREFACE

Vice President Gore's National Performance Review called for the agencies of the federal government to adopt a proactive approach to ensuring a sustainable economy and a sustainable environment through ecosystem management. The Interagency Ecosystem Management Task Force was established in August of 1993 to carry out this mandate. The member agencies of the Task Force are working to increase our understanding of the cooperative framework known as *the ecosystem approach*.

The Task Force formed a working group to assist in its efforts. The working group conducted case studies to learn about ecosystem efforts to date, to identify barriers to implementing the ecosystem approach, and to identify ways the federal government could assist in overcoming those barriers. Seven areas were selected as case studies:

Anacostia River watershed, Coastal Louisiana, Great Lakes basin, Pacific Northwest forests, Prince William Sound, South Florida, and Southern Appalachians.

The working group also examined major issue areas that influence the effectiveness of the ecosystem approach, categorizing problems into the following issue areas: budget issues, institutional issues, public participation, science and information, and legal authorities.

The report of the Task Force is focused on the activities of the federal agencies and what they can and should be doing to implement the ecosystem approach. It is presented in three volumes:

Volume I Summary and Overview. The overview volume describes the ecosystem approach and identifies key crosscutting issues relevant to implementation. It is aimed at those who wish to obtain a general understanding of what the ecosystem approach is, what its benefits are, difficulties in implementing it, and things that have been done or could be done to make it more effective.

Volume II Implementation Issues. The collective findings and recommendations of the five interagency issue groups are contained in Volume II. This volume is aimed particularly at those who wish to focus on a specific issue area such as science and information or legal authorities.

Volume III Case Studies. The findings and recommendations of each of the seven survey teams are contained in Volume III. Each survey team report contains a detailed description of the nature of the ecosystem, its history, current activities, and summaries of what the survey team learned from interviews with many participating parties. This volume is aimed particularly at those who wish to know a great deal about one or more specific ecosystems and the partnership efforts to manage the resources in those ecosystems.

[Return to Table of Contents](#)

EXECUTIVE SUMMARY AND RECOMMENDATIONS

An ecosystem is an interconnected community of living things, including humans, and the physical environment within which they interact.

The ecosystem approach is 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 conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

The goal of the ecosystem approach is to restore and sustain the health, productivity, and biological diversity of ecosystems and the overall quality of life through a natural resource management approach that is fully integrated with social and economic goals. This is essential to maintain the air we breathe, the water we drink, the food we eat, and to sustain natural resources for future populations.

My definition of ecosystem management is really to be able to work across the fences with neighbors and partners. My family has been here prior to statehood. Ecosystem management gives us a plan of land tenure where we can work through problems that in the past created animosity, and more importantly, thwarted our ability to do what's right for the land.

**Bill Miller, Rancher and Board Member, Malpai Borderlands Group
Arizona and New Mexico**

The ecosystem approach recognizes the interrelationship between natural systems and healthy, sustainable economies. It is a common sense way for public and private managers to carry out their mandates with greater efficiency. The approach emphasizes:

- Ensuring that all relevant and identifiable ecological and economic consequences (long term as well as short term) are considered.
- Improving coordination among federal agencies.
- Forming partnerships between federal, state, and local governments, Indian tribes, landowners, and other stakeholders.
- Improving communication with the general public.
- Carrying out federal responsibilities more efficiently and cost-effectively.
- Using the best science.
- Improving information and data management.
- Adjusting management direction as new information becomes available.

In many cases, the ecosystem approach developed spontaneously as landowners and other interested parties attempted to deal with local resource issues. For example, on the Henry's Fork of the Snake River in Idaho, ranchers sat down with fishermen and environmentalists and determined how their apparently conflicting needs could be resolved and still achieve the goals that are most important to all of them. In the Anacostia River watershed in the Washington, D.C. area, a group of state and local governments established a six-point action plan for watershed restoration. In southern Arizona and New Mexico, a ranching community, with assistance from federal agencies, established the Malpai Borderlands Group to work across political boundaries to improve the land. Many grass-roots efforts such as these are taking place. Federal agencies must do what they can to facilitate these emerging efforts and participate in them.

Everybody has to work together, but we cannot take people's livelihoods away and we cannot wreck the

environment as people say we're doing. The plans and the things the Bureau of Land Management has done, and the [Trout Creek Mountain] working group has done, in a lot of ways [are] better for the cattle operation.

Nick Wilkinson, Rancher, Oregon

The ecosystem approach has developed in response to a number of changes. Perhaps the greatest change is population growth and its associated demands on natural resources. Since 1950, the world population has increased by almost 50 percent; the population of the United States has increased by nearly 60 percent. The impact of this change is an increasingly precarious balance with the natural resources upon which we depend for food, shelter, fuel, and quality of life.

Human history is replete with examples of communities and civilizations that have fallen with the loss of a natural resource base. One example is the Hohokam people of Arizona, who built a vibrant agricultural civilization and watered the land with an advanced system of aqueducts only to disappear a half millennium ago because they irrigated incorrectly and poisoned the land with salt buildup. The Hohokam people did what people have done throughout history when local environments failed them or were destroyed by abuse and overuse. They moved on. The name Hohokam means those who have gone.

Our generation faces a new difficulty. There are virtually no more places to go. There is no more frontier with the promise of new pastures to graze, new fields to till, and new forests to harvest. Unbridled competition and conflict over natural resources must give way to cooperation, sharing, and maintaining reasonable and sustained uses of natural resources.

The emergence of the ecosystem approach is by no means a sudden event. In the United States, the role of the federal government changed over the years from disposer of land to holder of land. There has been a gradual evolution in our view of natural resources that increasingly emphasizes stewardship: from single use to multiple use; from extraction to reclamation; from disposal to recycling, reuse, and environmental protection.

What we need now is a mechanism for coordinating the implementation of the many laws, programs, policies, and regulations that affect natural resources. We also need a mechanism for resolving conflicts that protects our national economy and the resources on which it is based. The ecosystem approach can help to bring about better coordination and to resolve conflicts in constructive ways.

In many instances, landowners and others interested in local resources have had the foresight and vision to establish such mechanisms for coordinating and for resolving conflicts, simply because they make sense. Their application of the ecosystem approach

helps protect and maintain for future generations a desired economic strength, a natural resource base, and a satisfying life style.

We have lived, worked and raised a family on our ranch over the past 32 years. Our great-grandparents arrived in the last century, shortly after the Civil War. Working in partnership with local agencies toward a goal of Ecosystem Management has enabled us as a community to begin to get the tools we need to restore and protect our wide open lands and our way of life.

**Wendy Glenn, Rancher and Board Member,
Malpai Borderlands Group Arizona and New Mexico**

Healthy regional economies and attractive, healthy natural settings go hand in hand. Both benefit from the ecosystem approach. The approach also helps build local and regional consensus, so that conflicts can be resolved before they become crises and so that the expense and delay associated with litigation can be avoided or reduced. The ecosystem approach has the potential to provide local landowners and businesses with a measure of certainty about what to expect from federal agencies. And it can improve the efficiency and cost-effectiveness of federal agency programs.

The ecosystem approach is paying dividends and promises to be a more efficient approach to natural resource management. In the long, pitched battle in the Pacific Northwest forests between the timber industry and conservationists, symbolized by the northern spotted owl, the Clinton administration developed its Forest Plan using an ecosystem approach. Although much remains to be done and some communities are still struggling, they at least now have hope for a better future. What was billed as an agonizing choice of jobs versus owls has proved not to be a dilemma at all.

Owls versus jobs was just plain false. What we've got here is quality of life. And as long as we don't screw that up, we'll always be able to attract people and business.

**Bill Morrisette, Mayor of Springfield, Oregon
New York Times, October 11, 1994**

The ecosystem approach is intended to address both environmental and economic concerns, to increase the opportunity for state, tribal, and local cooperation, and to enhance involvement by other stakeholders and the public in agency decisions. The approach responds to requests by many in both the public and private sectors for government that works better.

Because of their varying statutory responsibilities, the ecosystem approach applies to different federal agencies in different ways. For example, land and natural resource management agencies may utilize the ecosystem approach directly in the management

of their lands and in collaborating with other landowners. Agencies providing technical or financial assistance may emphasize the ecosystem approach in establishing priorities, program guidelines, or planning requirements, or may assist local entities in implementing grass-roots efforts. Infrastructure agencies may use the ecosystem approach to gain a greater sensitivity to regional ecological and economic needs as they implement their programs.

The survey teams and issue groups identified several recurring barriers that agencies face in implementing the ecosystem approach.

1. **Federal agency coordination.** A coordinated and comprehensive framework is essential to implement the ecosystem approach. Federal resource management has traditionally been characterized by specific missions, rigidly stratified and specialized organizational structures, and the subdivision of problems into narrowly defined tasks.
2. **Partnerships with nonfederal stakeholders.** The ecosystem approach requires active partnerships and collaboration with nonfederal parties, particularly state, local, and tribal governments, neighboring landowners, nongovernmental organizations, and universities. Although partnerships between the federal government and nonfederal entities are not uncommon, agencies need to strengthen their own outreach programs and improve the ability of nonfederal entities to participate. Together, they must also project and articulate a desired ecosystem outcome with a shared vision for the future. The Federal Advisory Committee Act (FACA) imposes procedural requirements on federal agencies with respect to the receipt of advice from persons outside the federal government. The Act makes it more difficult for agencies to establish partnerships with stakeholders and involve the public in ecosystem activities.
3. **Communication between federal agencies and the public.** Current outreach activities must be strengthened. Coordination with the public is generally perceived to be *secondary* to normal work of the agencies. Regional offices typically lack specialized staff with experience in working with the public. Most federal employees who should be interacting with the public are not trained in the skills needed for public participation aspects of the ecosystem approach educating the public, motivating people to become involved, facilitating public discussions, building consensus, and resolving conflict.

The most essential element of ecosystem management is community buy-in. Without this, local knowledge, talent, and political support [are] not available. In this age of hostility toward large government, many federal government ideas (some excellent) die due to public apathy. If the community believes the idea its own, then marvelous things occur.

Bill Coates, Board of Supervisors, Plumas County, California

4. **Resource allocation and management.** Agency coordination in ecosystem efforts can be improved by recognizing the interdependency of agency budgets. The ability of each agency to take an ecosystem approach is affected by its ability to budget for long-term goals, organize around and fund interdisciplinary activities, and quickly modify programs in response to new information. Agency budget priorities and structures, however, often reflect narrow, program-specific perspectives, are driven by immediate concerns, and are sometimes linked primarily to the production of tangible outputs such

as commodities. Furthermore, Congress makes funding decisions on an agency by agency basis, making it difficult to coordinate the funding of interagency programs.

5. **Knowledge base and the role of science.** The existing *information* base what we know about what exists in a place and the existing *knowledge* base how well we understand how ecological and economic components function are both inadequate for many system-wide ecosystem analyses. The linkage between scientists and managers, and between natural resource agencies and other agencies and entities, is essential in establishing a shared vision of desired ecosystem conditions, for specifying how the vision can be achieved, and for monitoring and measuring progress toward goals.
6. **Information and data management.** No single entity has the resources or mandate to develop all relevant information on any ecosystem, or even the capability for locating and accessing information pertinent to an ecosystem that is available from other sources. Some agencies are sources for ecological data, others for social and economic data. Managers must have coherent and complete information from all of the sources in order to make reasonable decisions on their actions that affect the ecosystem.
7. **Flexibility for adaptive management.** Adaptive management requires a willingness to undertake prudent experimentation, consistent with sound scientific and economic principles, and to accept occasional failures. This contrasts with the strongly risk-averse nature of most agencies and managers. Agencies are hampered in their efforts to adapt management practices in accordance with new circumstances. As a result, innovation is discouraged, new knowledge is applied too slowly, and inefficiencies persist to the detriment of both resources and communities.

Recommendations

As a matter of policy, the federal government should provide leadership in and cooperate with activities that foster the ecosystem approach to natural resource management, regulation, and assistance. Federal agencies should ensure that they utilize their authorities in a way that facilitates, and does not pose barriers to, the ecosystem approach. In administering their programs, federal agencies should be sensitive to the needs and rights of landowners, local communities, and the public, and should work with them toward common goals.

Listed below are specific recommendations derived from the ecosystem surveys and the efforts of the issue groups. In addition, the Interagency Ecosystem Management Task Force recommends that member agency representatives sign a memorandum of understanding affirming their intent to implement the recommendations of this report. Such a memorandum of understanding might call on agencies to review, and revise as appropriate, their internal authorities, policies, and procedures. It might also encourage agencies to participate in ecosystem efforts initiated by other federal agencies, state, local, or tribal governments, or that began as a result of local grass-roots efforts.

The Task Force further recommends that member agencies adopt the following management strategies.

- *First, agencies should attempt to focus their activities on the issues faced by particular ecosystems, the people who live in them, and the economies founded upon the ecosystem resources.* This will require agency programs that respond to the needs of specific geographic areas, not simply to statutory mandates.
- *Second, agencies should make every effort to engage in coordinated, integrated action.* The ecosystem approach involves not only natural resource and land management agencies, but also the efforts of agencies whose missions are environmental, technical assistance, research, commerce, trade, or economic development. Ecological problems are almost always beyond the purview of any one agency, program or organization.
- *Third, agencies should strive toward open information flow.* While respecting private property rights, agencies should improve and integrate the information they gather, make it broadly accessible, and forge strong links between the scientific community, the information technology community, and the information user community.

RECOMMENDATIONS TO IMPROVE FEDERAL AGENCY COORDINATION

1. **Regional interagency collaboration.** Regional directors or comparable executives of the federal agencies in the various regions should have regular and systematic exchanges of information about plans, priorities, and problems. The purpose of regular and continuing dialogue among regional federal executives would be to eliminate inefficiencies and duplication of effort, because executives would be more informed about federal government activities outside of their agencies. Such coordination could help clarify the respective contributions to ecosystem activities of federal agencies with varying missions, such as land management, resource management, regulatory, research, infrastructure, technical assistance, and funding. It would also strengthen executive-level support for the interagency activities of field personnel.
2. **Joint planning and decision-making structures.** Where appropriate, agencies should be encouraged to establish task forces, common offices, or joint staffing arrangements for addressing ecosystem issues. The choice among many available structures depends upon the nature of the problem to be solved.
3. **Management commitment.** Managers should be encouraged to put the ecosystem approach at least on a par with other approaches to implementing their agency programs. Mixed signals and inconsistencies in viewpoints among managers discourage innovation and cooperation. Agencies should also ensure that those selected for participation on interagency working groups are fully committed to new ways of operating. In addition, agencies should establish personnel appraisal systems that reward interagency cooperation.
4. **Decentralization of management.** When an interagency coordination structure is created, it should focus on providing guidance and resources needed to sustain on-the-ground efforts, rather than on imposing a new hierarchy to oversee each and every work item. Many of the most innovative coordination efforts originate at the field level; these should be encouraged. Interagency management structures, like agencies, should avoid excessive vertical layers or horizontal divisions.
5. **Administrative boundaries.** The configurations of land management agency boundaries should be reexamined to determine opportunities for adjustments, land exchanges, and reciprocal management agreements that eliminate inefficiencies and inconsistencies. To the extent that changes are not feasible, agencies should consider coordination mechanisms or procedures to ensure that an ecosystem approach can be effectively

applied across administrative boundaries.

RECOMMENDATIONS TO IMPROVE PARTNERSHIPS WITH NONFEDERAL STAKEHOLDERS

1. **Shared vision.** Active partnerships between federal agencies and state, tribal, and local governments, and private stakeholders should be a component of most attempts to articulate a shared vision of desired ecosystem conditions. Federal agencies should seek to play the role of facilitator and assistant in the development of a vision; they should avoid imposition of a solely *federal* vision upon local communities. While some cases may demand implementation of a top-down federal vision, they should be the exceptions.
2. **Federal Advisory Committee Act (FACA) procedures.** An attempt should be made to create flexibility in Federal Advisory Committee Act procedures that, while still achieving the goals of the Act, encourages collaboration between federal, local, regional, state, and tribal governments, and other stakeholders. Collaboration between federal agencies and other nonfederal governmental entities is essential and should not be subject to the same restrictions that apply to most advisory committees. In this regard, we welcome the provision in section 204 of the Unfunded Mandates Reform Act of 1995 that exempts from Federal Advisory Committee Act requirements meetings with state, local, and tribal officials for the purpose of exchanging views, information, or advice relating to shared responsibilities. Agencies should also train employees involved in ecosystem activities on sensitivity to Federal Advisory Committee Act-related issues, and on the content and requirements of the Act, to make them aware of the situations under which contacts are appropriate, and of methods for conducting the contacts consistent with the Act. This would help remedy the isolation from public contact that seems to be an unfortunate unintended consequence of the Federal Advisory Committee Act.
3. **Advisory committees under the Federal Advisory Committee Act (FACA).** Agencies should consider more extensive use of advisory committees chartered under the Federal Advisory Committee Act when seeking to collaborate closely with nonfederal stakeholders on a regular and systematic basis. In accordance with Executive Order 12838 (Termination and Limitation of Federal Advisory Committees, February 10, 1993) it is Administration policy to minimize the number of advisory committees. Nevertheless, in implementing the ecosystem approach, a chartered advisory committee may be the most effective way to obtain broad public participation in the process. Because the process of chartering committees under the Federal Advisory Committee Act can be cumbersome, chartered committees may be cost effective only in large ecosystems with complex and long-term problems.
4. **Private landowners.** Federal agencies should offer technical assistance, consistent with agency programs, to private landowners involved in ecosystem efforts. In addition, federal agencies should identify mechanisms for improving the services provided to private landowners, with particular regard to regulatory programs affecting natural resources. One possible mechanism would be interagency cooperative efforts that result in a form of Aone stop shopping@ or combined regulatory processes that would allow a person to initiate a combined permit request from a single location, instead of making separate requests from different agencies, as currently required.
5. **Support for existing grass-roots efforts.** The ecosystem approach is hardly the exclusive domain of federal agencies. There are many locally-driven, grass-roots efforts

underway across the country. Federal agencies with interests in common with these efforts should be encouraged to join as partners.

RECOMMENDATIONS TO IMPROVE COMMUNICATION WITH THE PUBLIC

1. **Public access to information.** Agencies should systematically increase access to biological, social, and economic information and data associated with ecosystems. All interagency ecosystem efforts should include the development of a communication plan. Agencies should explore alternative methods of public outreach, such as special-issue newsletters, community potluck dinners, radio broadcasts, non-English-language publications, church group meetings, or information on Internet. Agencies should develop educational materials and programs about the linkage between a sustainable economy and a sustainable environment, and inform people how to become involved. Agencies should make special efforts to translate technical information into a format easily readable by laypersons. Agencies might contract with local organizations to provide public information. For example, the Environmental Protection Agency provides technical assistance grants to community groups near Superfund sites.
2. **Training in community relations.** Agencies should provide training in public involvement techniques for federal employees involved in ecosystem activities. Agencies should also employ specialists in community relations for ecosystem projects. These specialists should take a proactive approach, and not just inform people after problems have occurred. Agencies should recruit specialists from diverse backgrounds and with cultural skills consistent with community structure and composition. Training could also be provided for the public aimed at increasing public awareness of the value of maintaining ecological integrity and sustainable economies.
3. **Interagency teams.** In their regional ecosystem efforts, federal agencies should establish interagency teams to develop an integrated and comprehensive communications strategy for the ecosystem. This could decrease duplication and increase the mix of skills available. All public information materials for an ecosystem effort should be available from all participating agencies. Availability of such materials should be publicly advertised. Agencies should consider establishing a circuit rider to go directly to the communities on a scheduled basis to increase exchange of information and data. Where possible, agencies should consider use of volunteers for public participation activities.
4. **Regional planning under the National Environmental Policy Act (NEPA) process.** Agencies should develop regional ecosystem plans to coordinate their review activities under the National Environmental Policy Act. These ecosystem plans can provide a framework for evaluating the environmental status quo and the combined cumulative impacts of individual projects. The overall goal of regional ecosystem plans would also include identifying appropriate opportunities to maintain sustainable ecosystems in a cost-effective and coordinated manner. Such an approach is consistent with 1993 recommendations from the Council on Environmental Quality aimed at saving time and financial resources in preparing National Environmental Policy Act documents while at the same time increasing consideration of biodiversity. The ecosystem approach is particularly amenable to broad-scale assessments. With the use of the National Environmental Policy Act's scoping process, the public and other federal agencies may participate systematically and continuously.
5. **Public involvement programs.** Agencies should assess the successes and shortcomings of their public involvement efforts. Based on such evaluations, agencies should develop mechanisms to strengthen their programs. Representatives of the public should be

involved in the evaluation process.

RECOMMENDATIONS TO IMPROVE RESOURCE ALLOCATION AND MANAGEMENT

1. **Coordinated ecosystem budgets.** Agencies should consider the need for coordinating their ecosystem budgets to parallel their cooperative program activities in an ecosystem. Agencies would coordinate their budget proposals at the local level; each would request funds for work needed to achieve its portion of the shared vision. Some mechanism would be needed to ensure that budgets initiated at the local level be cross referenced to each other through successive budget review processes. In some cases, it would be desirable to have fully integrated budgets. This would require full support of the highest levels of the agencies and the Office of Management and Budget.
2. **Budget structures.** Natural resource management and regulatory agencies should work with the Office of Management and Budget and Congress to revise their budget structures and organizations, where needed, to facilitate the ecosystem approach. Key revisions include reductions in the numbers of line items, increased reprogramming authority, greater flexibility to respond to ecosystem needs, and a corresponding increase in accountability by local managers. Agencies may also wish to promote joint congressional appropriation hearings to allow for review of multiple agency contributions to ecosystem approaches.
3. **Budget planning procedures.** Federal agencies should assess their budget planning procedures and identify mechanisms to: (1) increase participation by field-level managers in the budget process; (2) ensure that budgets reflect long-term ecosystem needs; and (3) ensure that budget procedures reflect the ecosystem approach as a new way of meeting existing responsibilities, rather than as a new set of program responsibilities.
4. **Exchange of human and financial resources.** Federal agencies should encourage the use of short-term personnel exchanges as a way of increasing flexibility for dealing with new problems, obtaining needed skills as ecosystem requirements change, and as a way of infusing new ideas into traditional organizations.
5. **Fund-pooling arrangements.** In large, complex ecosystem efforts that require an interagency organization for coordination, the Administration should consider seeking legislative authority (as permitted under section 613 of P.L. 103-329, the Treasury, Postal Service, and General Government Appropriations Act) for the pooling of resources where such pooling is cost effective.

RECOMMENDATIONS TO SUPPORT THE ROLE OF SCIENCE

1. **Regional science planning bodies.** Agencies should establish or support regional science planning bodies to: assess the current state of knowledge regarding a region or ecosystem; identify major gaps in understanding; and allocate responsibilities consistent with agency expertise, resources, and mandates. In many instances, existing regional planning organizations may be in a position to undertake such a role. Regional science planning should incorporate a wide range of natural scientists and social scientists, address both ecological and socioeconomic issues, and incorporate an explicit goal of fostering integration among disciplines.
2. **Translating science into everyday language.** Research organizations should commit

themselves to ensuring that ecosystem research results are produced in a form that can be understood and used by managers and the public. It takes time and patience to translate technical theory, data, and information into language that all the members of an ecosystem team can understand and use in developing complex decisions or recommendations. Managers should participate in recommending research priorities, evaluating proposals, identifying study sites, preparing dissemination plans, and reviewing research results. Managers should review research results for usability and relevance on a track parallel to the peer review for scientific credibility. Science agencies need to develop performance evaluation procedures that reward federal scientists for superior technology transfer. Management and resource agencies might even take the initiative by establishing information specialist or scientific translator positions with responsibility for providing a bridge between scientists, managers, and the public. They may also have public affairs specialists work hand-in-hand with scientists during the research and reporting phases.

3. **Standards for ecosystem studies.** Agencies should develop standards for ecosystem studies, emphasizing: studies applicable on several scales; interactions among species, groups of species, and habitat, and the impact of human activities; socioeconomic priorities and needs; monitoring as a science priority; protocols establishing ecological indicators for monitoring ecosystem sustainability; determining the range of natural variability; techniques for restoring damaged systems; and models to link management activities with changes in selected ecological indicators.
4. **Exempting peer review from the Federal Advisory Committee Act (FACA).** Consideration should be given to whether the Federal Advisory Committee Act should be amended or clarified to provide specific exemptions for scientific panels used by agencies to obtain advice and recommendations.
5. **Monitoring of all ecosystem efforts.** Agencies should require a monitoring component as an integral part of all ecosystem efforts. Monitoring provides the essential information to agencies about how closely actual conditions approach the desired ecosystem conditions. This information is a crucial element in adaptive management. Agencies should develop consensus regarding selection and interpretation of factors (commonly known as indicators that indicate progress or deviation from an expected or preferred path. Each ecosystem monitoring program should include: a description of the desired outcomes of the policy or management change; identification of indicators used to track progress toward those outcomes; and a description of monitoring strategies that will be employed to determine progress. Initially, monitoring could increase information costs; in the long run, it would allow more rapid and flexible response to changing conditions.
6. **Federal research budgets.** Federal research budgets should be designed to deal with changing circumstances. They should be described in terms of major thrusts rather than specific projects at specific research centers. Budget decision makers should adopt such funding criteria as: relevance to ecosystem goals; reliance on peer review; and resource agency feedback regarding utility, timeliness, and relevance. Federal agencies should explore ways to increase flexibility in research budgets.

RECOMMENDATIONS TO IMPROVE INFORMATION AND DATA MANAGEMENT

1. **Data ownership.** Agencies should provide training to their employees regarding communication and information sharing, and on the nature, handling, and limitations of combining data from multiple sources. Increased data sharing means that individuals and

agencies will be handling data they did not generate, and they need to recognize the limitations as well as the benefits of such data. Executive Order 12906 requires all federal agencies to plan for providing public access to geospatial data, to utilize an electronic clearinghouse authorized by the Order, and to determine whether data exists elsewhere, prior to initiating new data collection activities. Federal agencies should go beyond the letter of the Order and make data sharing part of their culture.

2. **Collaborative regional data management efforts.** Federal agencies at the regional level should be encouraged to collaborate on regional data management activities, including: sharing data in electronic format; developing data-sharing systems; obtaining and entering the necessary data and information into the systems; and developing standards and protocols for data collection, management, and transfer, and the protection of private property rights. Major, centralized databases usually are not necessary. Current technology allows entities most familiar with certain resources to collect, update, and maintain data on those resources. Data sharing and transfer is accomplished electronically.

RECOMMENDATIONS TO INCREASE FLEXIBILITY FOR ADAPTIVE MANAGEMENT

1. **Common monitoring and evaluation standards.** Agencies should develop common monitoring and evaluation standards. Agencies should also develop guidance for designing programs and assessing their effectiveness over time. Agencies should support the efforts of the Interagency Task Force on Monitoring to initiate development of monitoring standards.
2. **Management structures.** Agencies should assess their current statutes, regulations, and management structures to determine whether they provide sufficient incentives, authority, and responsibility to undertake adaptive management.
3. **Long-term funding for monitoring and research.** Policy makers should commit adequate resources, as part of ecosystem efforts, to secure the necessary long-term monitoring and research programs necessary for adaptive management. To provide a credible basis for management change, efforts must be supported over a sufficient period of time. Funding and personnel instability, even for a short time, can undermine a well-designed effort. Monitoring is needed to determine whether management actions have placed an ecosystem on the proper trajectory towards agreed-upon desired future conditions. Monitoring also provides regular feedback on changing research needs to support the ecosystem effort.

[Return to Table of Contents](#)

THE ECOSYSTEM APPROACH

Definitions

An ecosystem is an interconnected community of living things, including humans, and the physical environment within which they interact.

The ecosystem approach is 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 conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

The goal of the ecosystem approach is to restore and sustain the health, productivity, and biological diversity of ecosystems and the overall quality of life through a natural resource management approach that is fully integrated with social and economic goals.

Characteristics of the Ecosystem Approach

The ecosystem approach is a comprehensive regional approach to protecting, restoring, and sustaining our ecological resources and the communities and economies that they support. Past efforts have been fragmented, and have produced mixed results. Evidence of the stress that has been placed upon ecological resources can be seen in the decline of the salmon populations in the Pacific Northwest and the oyster stock in the Chesapeake Bay, the decline in migratory bird populations, and degraded coral reef systems. The causes of these problems are as varied as human activity itself: the way we farm, work, travel, and spend our leisure hours.

The ecosystem approach integrates ecological protection and restoration with human needs to strengthen the essential connection between economic prosperity and environmental well being. The ecosystem approach provides the framework that draws together federal, state, local, and tribal governments, and the public, to achieve the ultimate goal of healthy, sustainable ecosystems that provide us with food, shelter, clean air and water, and a multitude of other goods and services.

The ecosystem approach is a logical way for federal agencies, state and local governments, tribes, and the private sector to carry out their responsibilities for protecting and managing resources. It requires federal agencies to be sensitive to the needs and rights of landowners, particularly those whose lands are adjacent to federal property boundaries, and to work with them toward common goals. Agencies must also be sensitive to the needs of affected communities, and must actively seek public involvement in agency decision making.

The approach recognizes the fundamental connection between human communities and the environment. Agencies must consider the broad-scale, long-term ecological consequences of their actions. Agencies need to use the best scientific information available and modify their actions in light of new information.

Many in the public have felt powerless to influence federal actions that affect them. To remedy the situation, individuals in the private sector and in government have advocated more public-private partnerships, more intergovernmental cooperation, more

integrated planning, and a broader and longer-term perspective in making decisions affecting natural resources. These are all key elements of the ecosystem approach.

The ecosystem approach is an idea whose time has come for other reasons as well. First, there is wide public support for maintaining clean water, clean air, and biodiversity, as well as for economic growth. Second, statutes increasingly favor multiple uses of the federal lands. Third, protracted conflict is not getting us closer to solving resource problems. Finally, advances in computer technologies make it possible to consider numerous variables over large geographic areas and long time frames.

In a December 21, 1994, order regarding the Administration's Forest Plan for the Pacific Northwest, U.S. District Judge William L. Dwyer noted the imperative of the ecosystem approach:

The agencies for years had operated independently and sometimes in conflict. In the current plan they cooperated and have analyzed not just individual species but ecosystems. . . . Given the current condition of the forests, there is no way the agencies could comply with the environmental laws without planning on an ecosystem basis.⁶

The ecosystem approach is a significant step in the evolution of natural resource management. It constitutes both a different way of conducting business and a different way of viewing the world. The following characterizations are somewhat simplified and possibly overstated to illustrate differences. The ecosystem approach builds upon existing resource management capabilities, modifying or discontinuing aspects that are no longer appropriate.

More partnerships and greater collaboration. Traditional resource management tends to use public involvement sparingly, often too late to allow the public to make a difference. Under the ecosystem approach, public collaboration on a regular and sustained basis is key. Bottom-up, grass-roots generation of ideas gives local communities more ownership of goals and solutions. Agencies as well as communities contribute toward achievement of shared goals.

Broader program perspective. Traditional natural resource management tends to be characterized by actions taken on behalf of narrow programs and specific jurisdictional boundaries, without respect to impacts on other programs or land areas. Conflicts between resource uses are not uncommon, and cumulative long-term impacts are sometimes overlooked. Under the ecosystem approach, resource management plans are based on a collaborative vision for the ecosystem, considering the mandates, needs, interests, and goals of all stakeholders. Actions involve other programs and resource managers in order to avoid costly duplication of effort and conflict.

Broader resource perspective. Traditional resource management tends to be oriented toward one or a few resources, such as timber, minerals, single wildlife species, or

water, with passing attention paid to other resources. Under the ecosystem approach, management is oriented toward interacting systems, and addresses ecological, economic, and social concerns. The explicit goal of the ecosystem approach is the concurrent achievement of sustaining ecological systems, human communities, and economic infrastructure.

Broader geographic and temporal perspective. Traditional resource management tends to be site specific, with little consideration of how a proposed action fits into the context of the broader ecosystem or landscape. Under the ecosystem approach, the frame of reference is much broader. Although site-specific actions are necessary, they will be conducted in the broader ecosystem context, and evaluated over a longer time frame.

More dynamic planning processes. Traditional resource management plans tend to be relatively static and are revised only periodically or on fixed time schedules, such as five or ten years. Under the ecosystem approach, resource management is more dynamic. Management plans and actions are modified as necessary, based upon changes in our knowledge of the ecosystem, new information, availability of new methods and approaches, and assessments of progress toward goals.

More proactive. Traditional resource management tends to be reactive and crisis driven. Under the ecosystem approach, resource management is more proactive, aimed at achieving long-term ecosystem conditions, not simply at accommodating short-term demands.

Principles of the Ecosystem Approach

Federal agencies should adopt a set of common principles to guide them in implementing and participating in ecosystem efforts. The principles below are intended to provide such guidance. Because there are so many types of agencies with such varying missions, agencies will need to tailor these principles to their own mandates and circumstances.

- Develop a shared vision of the desired ecosystem condition that takes into account existing social and economic conditions in the ecosystem, and identify ways in which all parties can contribute to, and benefit from, achieving ecosystem goals.
- Develop coordinated approaches among federal agencies to accomplish ecosystem objectives, collaborating on a continuous basis with state, local, and tribal governments, and other stakeholders to address mutual concerns.
- Use ecological approaches that restore or maintain the biological diversity and sustainability of the ecosystem.
- Support actions that incorporate sustained economic, sociocultural, and community goals.
- Respect and ensure private property rights and work cooperatively with private

landowners to accomplish shared goals.

- Recognize that ecosystems and institutions are complex, dynamic, characteristically heterogeneous over space and time, and constantly changing.
- Use an adaptive approach to management to achieve both desired goals and a new understanding of ecosystems.
- Integrate the best science available into the decision-making process, while continuing scientific research to improve the knowledge base.
- Establish baseline conditions for ecosystem functioning and sustainability against which change can be measured; monitor and evaluate actions to determine if goals and objectives are being achieved.

Benefits of the Ecosystem Approach

The goal of the ecosystem approach is to restore and maintain the health of ecological resources together with the communities and economies that they support. The inclusion of people and their economic needs is a fundamental part of the approach. Resource problems are, in a sense, not environmental problems but human problems created under a variety of political, social, and economic conditions. The ecosystem approach should highlight potential conflicts between human activity and a sustainable environment early enough to resolve them when there are still options available, and to prevent them from becoming crises.

The ecosystem approach can provide clear economic and social benefits to the nation by protecting, restoring, and sustaining ecosystems that are critical to the local economies of many regions of the country. The fishing industry is one of the most significant examples of the economic importance of the long-term sustainable management of ecological resources. The fishing industry contributes more than \$100 billion annually to the nation's economy and one and a half million jobs. Yet nearly 80 percent of the nation's commercial species are overfished or being harvested at a level that cannot be sustained. Regional fisheries management councils have imposed strict regulations to increase dwindling stocks of salmon in the Pacific Northwest and groundfish such as cod, flounder, and haddock in New England.

The Gulf of Mexico is another example where sustainable management of ecological resources could prevent declines in commercial fisheries and provide significant economic benefits. The Gulf's one-billion-dollar-a-year fishing industry, the largest in the country, is directly dependent on the health of coastal ecosystems because 90 percent of the commercial fish species in the Gulf require estuarine wetland habitat during some phase of their life cycles. Louisiana has lost over 1,000 square miles of coastal wetlands since the 1950s, and continues to lose about 30 square miles annually. Continued loss of wetlands in the Mississippi Delta region may have substantial economic and social costs.

The following discussion outlines some of the most important benefits that may be

realized by individuals and interest groups in the private sector, and by units of government.

Consensus-building. Under the ecosystem approach, governmental decision-making processes are more open to the public, and the public is involved early in the process. Interested parties are encouraged to help establish goals and identify ways to achieve them. The consensus-based orientation of the ecosystem approach benefits the public because people are more likely to get what they want with regard to ecological and economic goals.

Federal agencies can learn from the experience and desires of other stakeholders and the public. The ecosystem approach builds consensus among the people most affected by actions in an ecosystem. The lack of such consensus often triggers conflicts that lead to costly and time-consuming litigation. Avoidance of litigation is a major benefit of the ecosystem approach. Even if total consensus is not achieved on every issue, collaboration and negotiation help resolve conflicts and clarify issues and concerns.

The Weyerhaeuser Corporation is developing a long-term habitat management plan for its own holdings. According to Weyerhaeuser's Executive Vice President:

Watershed analysis is a cooperative effort among landowners, government and public groups that analyzes the cumulative impact of human activities on a stream or river and implements changes on a site-specific basis. We want to show how private forestland owners can complement public land management efforts to address threatened and endangered species while providing the wood society needs.

Weyerhaeuser *NEWSFAX*, February 16, 1994(7)

Prompt action. The ecosystem approach identifies and addresses ecological problems before they become critical, and allows for early consideration of management options that later may be foreclosed. Continuous monitoring of ecosystem conditions and progress toward goals allow parties with a vested interest in an ecosystem to respond promptly when issues arise. Long-term deferral of problems imposes major costs on communities, economic structures, and public agencies. A timely approach is far less disruptive to economic activity, and less wasteful of public funds.

Certainty. Uncertainty about government programs, goals, and compliance requirements imposes a high cost on individuals and businesses. Uncertainty that continues into the latter stages of a project heightens conflict and polarization. To the extent that the ecosystem approach enables ecosystem issues to be addressed simultaneously or comprehensively, it offers major economic benefits to the private sector. Such future possibilities as one-stop shopping for multiple-permit requirements by agencies that coordinate their actions on an ecosystem basis could achieve consistency in information requirements or otherwise reduce red tape.

The Secretary of the Interior has embraced the ecosystem approach in protecting the federally-listed California gnatcatcher and numerous other sensitive species dependent upon the coastal sage scrub ecosystem of southern California. The southern California program brings together federal, state, and local governments, private landowners, environmental groups, and community organizations to collaborate on the development of comprehensive plans to preserve biodiversity based on the needs of the ecosystem, rather than on individual species. The shift in focus away from species-by-species management promises to enhance species protection efforts, accommodate economic growth and development, and minimize conflict.

To facilitate an ecosystem approach to species conservation, the Secretary of the Interior recently issued a no surprises policy designed to provide long-term certainty to landowners who develop habitat conservation plans pursuant to the Endangered Species Act. Under the policy, landowners who complete and adhere to such plans are released from future demands for financial or land contributions even if the needs of any species covered by the plan changes over time. The policy creates an incentive for landowners to plan for a range of species, not just those listed under the Endangered Species Act, so that maximum assurances can be obtained up front.

Consideration of all interests. Collaboration on common problems in an ecosystem context should ensure that all important interests are represented and that all key factors social, economic, and ecological are considered. Agencies too often consider only those factors of immediate concern to their mission, and then implement decisions with the same narrow vision. The ecosystem approach allows for more local input and assures that decisions will address the concerns of local communities.

Investment in economic equity. Investing in and protecting our environment will ensure long-term sustainability of our natural resources, and thereby balance and sustain the economies that rely upon the natural resource base.

Managerial and budgetary efficiency. The ecosystem approach promotes cooperation among stakeholders in a manner than can achieve greater efficiency and reduce duplication. To the extent that sustainable ecosystems result, the ecosystem approach may also reduce costs associated with restoring degraded habitats and their associated species populations. Stakeholders may realize savings from economies of scale in the long run as a result of collaborative activities. The ecosystem approach may enable agencies to combine administrative support functions that typically are duplicated in their many narrowly focused programs and budgets.

Reduction of burden on small landowners. The ecosystem approach benefits smaller landowners and businesses because it allows problems to be addressed comprehensively at a scale large enough to reduce the burden on smaller entities. For example, in areas in which there are large blocks of public lands and large landholdings, these can be used for conservation purposes where there is flexibility to do so, instead of imposing heavy

conservation burdens on small landowners who often have few options.

Reduction of disruptive changes. With its emphasis on long-term goals and on ecological and economic sustainability, the ecosystem approach reduces the probability of harsh boom-and-bust cycles that adversely affect individuals and communities. The adoption of the ecosystem approach can lead to greater economic diversification, while retaining the amenities that induce new businesses to invest in communities. In western Oregon, for example, increased conservation has helped to attract new high-technology investments and jobs that have counterbalanced the economic losses due to reduced logging. Although some communities continue to struggle, the Administration's Forest Plan offers retraining assistance that has assisted workers in making the transition to a new economy. Simultaneously, mills are adopting innovative practices that enable greater utilization of smaller logs.

Achieving Balance

Natural resource conflicts have been assumed to pit environmental concerns against economic development. We now recognize that it is wrong to think in terms of either/or, that is, framing issues around the false choice of *either* environmental protection *or* economic development. Long-term economic prosperity depends on sustaining ecosystem functions.

Natural resource development, if carried to an extreme, can have devastating effects on ecosystems. Economic development depends upon stable natural resources. Economic development done wisely, with due regard for sustaining its resource base before major components are depleted, can be sustained through a variety of options. Economic development without consideration of sustainable levels of resource use can bring about the demise of both the natural resource and the economic activities based upon the resources, or result in having to choose from among a limited set of options, none of which are optimal.

In the Pacific Northwest forests and in southern Florida, resource conflicts have pitted development against environmental protection. The issues are now framed more in the context of balancing human activities and environmental conservation. Reduction in resource consumption does not necessarily translate into economic losses.

We have learned to our cost that development which destroys the environment eventually destroys development itself. And we have learned to our benefit that development that conserves the environment conserves also the fruits of development. There is, thus, no fundamental dichotomy between conservation and growth.

Rajiv Gandhi

Address to the United Nations General Assembly, October 19, 1987

The Pacific Northwest has attracted many people to live and work, in part because of the natural resource amenities, such as the ocean, the forests, and the rivers. In the opposite corner of the country, Floridians are coming to the same conclusions that a sustainable ecosystem is *essential* to a thriving Florida economy. Floridians are realizing that the Everglades, once dismissed as a bug-ridden swamp suited only to draining, is a pillar of southern Florida's economy. The prospects of its demise as a healthy, functioning system threaten not just the alligators, wading birds, and fish, but also the tourist economy of Florida Bay, the fishing industry, and the water supply of millions of people.

In the greater Yellowstone ecosystem, the growth in the service sectors of the economy . . . has brought a measure of stability to a region historically subject to the boom-and-bust cycles of extractive industries. From 1969 to 1989, the total number of jobs in the region grew by almost 66,000, an increase of 68 percent, and total personal income grew by nearly \$2.2 billion, an increase of 99 percent. Ninety-six percent of the new jobs and 89 percent of the growth in labor income occurred in sectors other than agriculture and the extractive industries. Although extractive industries are still important to the region, the true wealth of the region stems from its natural amenities and opportunities for desirable lifestyles.

Many people and entities have a strong interest in natural and ecological resources. Some industries use the resources directly, for example, for timber harvest, commercial fishing, or production of pharmaceuticals. Some commercial interests use the resources indirectly, such as for scenic tours. Some people choose to live in areas because high natural values improve the quality of life. Some people use the resources for relaxation and recreation. Some place a value on healthy ecosystems simply because they are there. But no one has a right to use the resources to the exclusion of all others, or to use the resources to such a degree that their ecological values and utility are destroyed.

The ecosystem approach provides a mechanism for bringing these resource users together in public discussion to identify their objectives, develop a common vision, and share in the implementation of activities that move them toward fulfillment of that vision. Such partnerships among users offer our best opportunity for healthy and sustainable economies and communities, as well as healthy and sustainable ecosystems.

Misunderstandings About the Ecosystem Approach

The Administration has sought to bring an ecosystem perspective to natural resource management. As with any new way of conducting business, there are those who are skeptical about its intent and its effects. There remain common misunderstandings or suspicions about what the ecosystem approach is and what it is not. The nature of the approach and its benefits are not well understood.

The consequences of such misunderstandings are serious. They can polarize interested

parties. They can result in congressional actions that limit or frustrate collaborative efforts for resolving common problems. They can result in reticence on the part of federal managers to try the ecosystem approach. The issues that most commonly involve misunderstandings about the ecosystem approach are discussed below:

The private lands issue. Some believe that the ecosystem approach is a thinly veiled attempt by the federal government to take over the management of private lands.

Many people are hesitant about ecosystem management because they are afraid of losing private property rights. I have been involved in ecosystem management for some time, and even though the government has a hand in it, you don't lose property rights. Some of the benefits I have received are saving my rangeland from soil erosion with the technical help of the Natural Resources Conservation Service and the cost share assistance from the Farm Services Agency. It is next to impossible for landowners to invest in their important resources by themselves. The technical assistance and cost-share programs make a big difference.

Bob Farnworth, President, Feather River Resource Conservation District, and Private Range and Forest Owner, Quincy, California(9)

The ecosystem approach arises out of the recognition that federal agencies' actions in the past have had significant effects on the private sector, often without adequate opportunity for private sector or public involvement in agency decision making. The ecosystem approach involves private landowners and other stakeholders in setting, implementing, and evaluating goals. Such involvement could actually *increase* the influence of private landowners over some agency resource decisions and allow both government and private entities to draw upon an improved information base when managing their respective lands.

Difficulty of defining ecosystems. Some skeptics note that ecosystem means different things to different people. They say that it is impossible to define ecosystems precisely enough to place them on a map. As a result, they argue that an ecosystem approach is meaningless.

Certainly, geographic boundaries appropriate for addressing one issue may not work for another. However, for most ecosystem efforts, a practical definition can be determined that is satisfactory to all participants. The ecosystem approach does not rely on prior definition of precise, scientifically valid delineations of ecosystems that apply to all situations. The boundaries of a particular ecosystem effort are determined by the partners based upon what they are trying to accomplish, or the problem they are trying to solve. Ecosystems need to be characterized and studied at scales appropriate to the issues at hand. There should be some ecological basis for the boundaries, of course. Boundaries should also reflect the capability of the partners. Partners should define the ecosystem broadly enough to encompass the factors necessary to solve their problems, but not so broadly that the effort loses focus and vitality.

The ecosystem approach is a *process*, not a mapping convention. It encourages people to take a broader view, to consider their neighbors when making decisions. It shifts the federal government's traditional focus from individual agency jurisdiction to the actions of multiple agencies within larger ecosystems. It finds ways to increase voluntary collaboration with state, tribal, and local governments, and to involve other landowners, stakeholders, interested organizations, and the public.

Expansion of authority. Some believe that the ecosystem approach is an attempt by federal agencies to expand their authorities and to usurp state and local land use planning or growth management authorities.

The ecosystem approach gives no additional authority to federal agencies. Agencies are encouraged to use their existing authorities more efficiently and effectively by cooperating with other agencies and nonfederal partners, rather than competing with them or ignoring them. For example, in its proposed special rule under section 4(d) of the Endangered Species Act for the conservation of the northern spotted owl on nonfederal lands, the U.S. Fish and Wildlife Service adapted the rule to accommodate different owl conservation efforts in the states of Oregon, Washington, and California.

Top-down imposition. Some believe that, under the ecosystem approach, federal agencies decide what ecological problems exist and impose solutions on local communities.

The ecosystem approach promotes cooperation among all interested stakeholders. Some of the best examples of the ecosystem approach involve a grass-roots initiative. The ecosystem approach encourages the community of federal agencies, state and local governments, and the private sector to develop a shared vision for the ecosystem. Each entity then uses its own capabilities and authorities to accomplish a portion of the larger goal. Realistically, a top-down approach is neither feasible nor desirable.

Reduced environmental protection. Some believe that the ecosystem approach is a sophisticated cover for resource managers to make tradeoffs and compromises instead of enforcing existing environmental laws.

No one should mistake the ecosystem approach as a buzz word for finding loopholes in the law. The ecosystem approach neither adds to, nor detracts from, federal agency authorities. Rigid administration of some environmental laws without regard to human communities has in some instances resulted in community antagonism toward the environmental objectives contained in these laws. The ecosystem approach allows communities to become part of the solution to environmental problems. Federal agencies must and will implement environmental laws, but in a climate of cooperation rather than conflict.

Ecological myopia. Some believe that the ecosystem approach focuses solely on

environmental protection, and not on human needs or on existing human uses of the land.

The Administration's definition of the ecosystem approach emphasizes a collaboratively developed vision of desired future ecosystem conditions *that integrates ecological, economic, and social factors affecting a management unit*. The ecosystem approach necessarily involves a recognition of the interrelationship between a sustainable economy *and* a sustainable environment, and fosters *both*.

The Georgia-Pacific Corporation and The Nature Conservancy have agreed to share management of 32 square miles of Georgia-Pacific land in North Carolina. A key stopping place for migratory birds, this tract is one of the last great places, according to The Nature Conservancy. A team of company and Conservancy personnel will manage the property, and share scientific expertise. Timber harvesting will be prohibited in some areas and carefully managed in others to minimize long-term ecological disruption. Public land ownership is not essential to the ecosystem approach.(10)

Cure-all. Some believe that the ecosystem approach is the solution to the difficulties of managing natural resources because the approach magically resolves all conflicts.

Natural resource management under any circumstances is a complex and difficult job. Competition for natural resources is intense, and growing more so as population pressures mount. The ecosystem approach is simply a way of bringing competing interests together on matters of mutual concern. It should reduce conflict, increase understanding, and help accommodate many goals simultaneously through cooperation. This is a difficult job, and may not be successful in every instance. Conflict may still have to be resolved in the courts. But the ecosystem approach can help identify and resolve many conflicts before they become crises.

[Return to Table of Contents](#)

MAJOR IMPLEMENTATION ISSUES

The survey teams and issue groups identified several recurring barriers that agencies face in implementing the ecosystem approach. Their findings and recommendations are presented in detail in Volumes II and III of the Task Force report. The most significant of these barriers that cut across all case studies and all issues are discussed below. Recommendations for actions that should be undertaken with regard to each of these categories of barriers are on pages eight through fifteen, above.

Although many barriers exist, a significant finding of the survey teams was that the ecosystem approach can and does work to bring together a variety of stakeholders as partners on issues that previously had divided them. This is the real strength of the

ecosystem approach.

Issue 1: Federal Agency Coordination

Nature of the Problem and its Consequences

A recent General Accounting Office report noted that Awhile ecosystem management will require unparalleled coordination among federal agencies, disparate missions and planning requirements . . . hamper such efforts.

The ecosystem approach challenges some of the most basic organizational principles of federal agencies. Existing practices are generally characterized by specific missions, rigidly stratified and overly specialized organizational structures, and the subdivision of problems into narrowly defined tasks. Coordination among federal agencies is hampered by procedural requirements, budget structures, data inconsistencies, traditional agency cultures, and political alliances. A coordinated and comprehensive approach is essential to implement the ecosystem approach.

Agency planning requirements, which should support interagency coordination, often frustrate coordination. For example, planning by the Department of the Interior's Bureau of Land Management and the Department of Agriculture's Forest Service focuses on jurisdictional boundaries, on scales unrelated to ecosystems. In addition, planning in different units within the same agency often proceeds under separate schedules and procedures.

Barriers to coordination can be overcome, at least in part. Currently, agencies are participating in a variety of efforts to improve communication and coordination through working groups, memoranda of understanding, partnership arrangements, information sharing, and data management. This trend needs to be encouraged.

Examples of What Works and What Does Not

Regional task forces. The South Florida Ecosystem Restoration Task Force, convened by the Department of the Interior, and subsequently formalized in a memorandum of understanding, includes representatives of several federal agencies. A task force comprised of high-ranking agency officials was a preferred option in southern Florida because of the potential economic issues and the necessary high-level interactions with the Governor's office and the private sector. This task force is responsible for developing federal objectives for restoring the ecosystem, designing an ecosystem-based science program, supporting the development of multispecies recovery plans, and coordinating specific restoration projects. A field-level working group provides implementation assistance, project monitoring, and oversight. The task force's experience indicates that coordination problems associated with individual agency mandates can be overcome, but it sometimes takes a strong top-down intervention to get

things started.

Interagency office. An alternative or supplement to the task force approach involves the creation of an interagency office, separate from but responsible to the agencies involved in a coordinated management effort. In the Pacific Northwest, two regional offices were established.

To coordinate the natural resources management part of the Administration's Forest Plan, agencies sponsored the creation of a Regional Ecosystem Office (REO) with a small, full-time staff. A separate office was considered appropriate in the Pacific Northwest because of the large size of the management area and the broad scope of resource issues. The Regional Ecosystem Office provides staff support to a Regional Interagency Executive Committee that is charged with implementing the Administration's Forest Plan. It also coordinates the work of specialized committees, such as research and monitoring, and database development and management, thereby helping to integrate the concerns of management and the scientific community. The Regional Ecosystem Office will also help coordinate the activities of the Aprovince teams that will be established to provide the basis for subregional management and planning activities.

The United States Office of Forestry and Economic Development (OFED) was established in December, 1993 at the request of the White House to help coordinate and implement the Administration's Forest Plan. The two-year mission of the Office is to help oversee the 14 agencies who are responsible for the three major components of the Forest Plan: natural resources management, economic revitalization and assistance, and interagency coordination. The Office of Forestry and Economic Development is located in Portland, Oregon, which is strategically located in the center of the Forest Plan region consisting of western Washington, western Oregon, and northern California.

Regional executive organizations. An organization of federal agency regional directors was established in the Pacific Northwest, known as the Regional Interagency Executive Committee. A major benefit of this organization has been the frequent communication among these executives on *a variety of issues*, not just ecosystem issues. Getting regional agency heads together on a regular basis can help prevent, or at least anticipate, the kinds of intractable problems that might otherwise occur. This kind of organization provides a level of support and legitimacy to interagency coordination at the field and scientific level that is often lacking. Without such a definitive management commitment, even the best intended coordination mechanisms are likely to fail.

Management teams. Each situation requires a tailored response with varying levels of resource commitment. Ongoing policy-level involvement, while critical in some cases, may not be required in others. For example, in anticipation of the California Desert Protection Act, a joint National Park Service/Bureau of Land Management team composed of career employees developed a contingency management plan for transition

of lands between agencies, and for joint visitor services and law enforcement.

Efforts to promote coordination need not be tied to a specific location. For example, a joint Fish and Wildlife Service/National Marine Fisheries Service working group developed administrative policy changes for multispecies listing and recovery planning under the authority of the Endangered Species Act.

Reducing barriers within agencies. When it comes to coordination, agencies are sometimes their own worst enemies. Agencies that are internally integrated and coordinated often make the best partners in interagency efforts. In part to improve internal coordination, the Bureau of Land Management's Idaho State Office reorganized itself, creating a team structure around ecosystems.

Personnel exchange programs. Coordination can be promoted through personnel exchanges under the Intergovernmental Personnel Act and other mechanisms. The Regional Ecosystem Office in the Pacific Northwest, for example, has used personnel exchanges with states in order to obtain needed skills and gain a better state perspective. In an era of tight budgets, a vigorous exchange program can help agencies adapt to changing needs and reduce duplication of effort.

Issue 2: Shared Vision of Ecosystem Conditions and Goals

Nature of the Problem and its Consequences

Agencies are accustomed to establishing goals for activities, such as timber sales and completed plans. They routinely measure success in terms of completion of activities, such as board feet of timber or number of species listed. However, agencies are *not* accustomed to establishing goals for desired ecosystem conditions. They normally do not account for successes in terms of the extent to which ecosystem conditions have been moved in the direction of the desired conditions.

Federal agencies are driven by their authorizing legislation. Most existing federal statutes were not written with interagency coordination in mind. Instead, they focus on narrow jurisdiction over specific lands, resources, Amedia such as air or water, species, or projects. Agencies tend initially to view desired ecosystem conditions narrowly within the context of these mandates.

Yet the ecosystem approach demands a vision of desired conditions for an ecosystem. The ecosystem approach requires a holistic view of ecological and socioeconomic aspects of an entire landscape. Most federal agencies, acting independently of all others, do not have the expertise for such analysis. Ecosystem sustainability is much more difficult to visualize, measure, and document than traditional performance measures.

Thinking in terms of ecosystem sustainability requires a link between management and

science. Good science can help managers and stakeholders to understand the elements of ecosystem diversity and functions, and the current, historical, and desired ecosystem conditions.

Examples of What Works and What Does Not

In reviewing the case studies, we found a great deal of variation in terms of how a vision of desired ecosystem conditions was developed and how it was characterized. In most cases, some form of plan or written document establishing objectives has been developed to guide collective actions toward a common vision. Most of the visions for ecosystems examined in the case studies are rather general. This is to be expected because we are in the early stages of the ecosystem approach, and much more learning and experimentation will be needed.

Pacific Northwest Forest Plan a federal vision. The vision for the Northwest forests was based on five principles articulated by the President: (1) protecting the long-term sustainability of forests, wildlife, and waterways; (2) never forgetting the human and economic dimensions of the problems; (3) making efforts that are scientifically sound, ecologically credible, and legally responsible; (4) producing a predictable and sustainable level of timber sales and non-timber resources that will not degrade or destroy the environment; and (5) making the federal government work together with and for the people. An interagency team used these principles as the basis for more detailed instructions. The Forest Ecosystem Management Assessment Team prepared an assessment of options for future management of federal forests in the region.

The Forest Plan represents an entirely new way of doing business. It includes: (1) an ecosystem-based management plan for 25 million acres of federal land in the region; (2) an economic assistance plan; (3) and a blueprint for improved agency coordination. Such a top-down approach to establishing a vision was probably the *only* viable alternative for breaking the impasse caused by years of competition and conflict in the region. Prior to the Forest Plan, there were many narrow and conflicting visions for the forests. Any effort to make simplistic choices among these competing visions was bound to fail, since each vision ignored key components of the regional ecosystem. Thus, in this instance, a single, strong voice was needed to end the crisis and facilitate movement toward a common goal.

Anacostia River watershed-a local vision. Anacostia's Watershed Restoration Committee established a six point action plan for restoration in the Anacostia River watershed in the greater Washington, D.C., area. The plan identifies agencies involved in the restoration effort, describes proposed and completed projects, and describes problems, strategies, and challenges associated with achieving the goals. Facilitated through the Metropolitan Washington Council of Governments, the action plan was developed by the Anacostia Watershed Restoration Committee. The Committee is comprised of the District of Columbia, two counties, and one state. The U.S. Army

Corps of Engineers represents federal agencies.

Of the seven case studies, the Anacostia River watershed most represents the vision of local and state governments. Federal agencies were perceived as facilitators and implementors of local goals through design and funding of projects and through technical assistance. However, some federal activities in the basin were viewed as not supportive of the goals. Because federal agencies did not participate in vision setting, they may not have modified their priorities in accordance with the vision. Some interviewees said the plan does not provide a *comprehensive* vision for restoring the watershed, but they agreed that it *does* provide an effective beginning to focus action. Indeed, the key role of any vision may be to provide a general guide for moving diverse entities in a common direction.

Prince William Sound-a legislative vision. As a result of settlement of litigation following the *Exxon Valdez* oil spill in Alaska, the state and federal trustee agencies established an interagency trustee council to oversee restoration of the spill-injured area. The goal to restore the resources affected by the spill is required by law, and settlement funds are to be used to achieve that goal. Among other things, the plan calls for workshops in which interested parties can participate in developing ecosystem and restoration objectives.

Southern Appalachian Man and the Biosphere program-an intergovernmental vision. The Southern Appalachian Man and the Biosphere program was started through an interagency cooperative agreement. Although federal agencies are in a position to work collaboratively on developing a vision for the ecosystem, local people said that such a vision must be developed with full public participation. The organization facilitates cooperation among federal, state, and local agencies. The vision for the region is stated in general terms, the achievement of a sustainable balance between the conservation of biological diversity, compatible economic uses, and cultural values across the southern Appalachians. The Southern Appalachian Man and the Biosphere Cooperative, an interagency organization, intends to achieve this balance by collaborating with stakeholders through information gathering and sharing, integrated assessments, and demonstration projects aimed at solving critical regional issues.

Northeast coastal wetlands and estuaries restoration-an opportune vision.

Sometimes a vision can be based on circumstance and timing. Long ago, the rail line between New York and Boston bisected Connecticut coastal wetlands that were considered undesirable at the time. The railway constricted the tidal flushing of these wetlands, and over time the wetlands on the inland side of the tracks lost much of their value to finfish and shellfish. The rebuilding of the railway corridor for future needs has provided an opportunity for the Coastal America partnership of federal agencies and states simultaneously to reintroduce tidal flow to the degraded wetlands and thereby to progress toward the vision of restoring coastal wetland habitats.

Similar restorative efforts are underway in Northeast estuaries. In Waquoit Bay on Cape Cod, land use patterns in the watershed have changed over time, from two percent residential in 1950 to 20 percent in 1990. Human population has increased in the area 15- fold in 50 years, leading to increasing stress on the watershed. Collaborative efforts of federal, state, tribal, and local governments, as well as environmental groups and the general public, have led to ongoing water quality monitoring by volunteers and scientists, the acquisition of a no-discharge order for the bay, and discussion of creating a 2,500-acre refuge.

Issue 3: Partnerships with Nonfederal Stakeholders

Nature of the Problem and its Consequences

The ecosystem approach requires active partnerships and collaboration with nonfederal parties. Partnerships with some of these entities, particularly state, local, and tribal governments, neighboring landowners, and nongovernmental organizations, require a level of interaction comparable in many respects to interaction with other federal agencies. Yet agencies are often less equipped for these partnerships than they are for interagency cooperation.

Partnerships with nonfederal stakeholders. One of the most frequently cited barriers to the ecosystem approach is the Federal Advisory Committee Act, commonly referred to as FACA. The Act imposes procedural requirements on federal agencies with respect to the receipt of advice from committees established or controlled by the federal government. The Act also makes it more difficult for agencies to establish partnerships with stakeholders and to involve the public in ecosystem activities. Because of recent court decisions, many federal agency personnel believe that the Act restricts virtually all contacts with nonfederal entities, and are fearful that any such contacts will subject them to legal action. Many managers believe the procedural requirements of the Federal Advisory Committee Act are too inflexible. In some cases, working groups with combined federal and nonfederal membership have ceased to function. In others, such as the Applegate Partnership, federal agencies felt they had to withdraw from participation.

Government-to-government relationships. Consultation between the federal government and state or tribal governments, when the state or tribal representatives are acting in a sovereign capacity, represents a special case for several reasons: (1) federal environmental and natural resource laws often require close coordination or consultation with states and tribes; (2) federal and state governments have concurrent jurisdiction over certain resources; (3) some federal statutes, such as the Clean Water Act, allow the federal government to delegate regulatory responsibility to states; and (4) the federal government has trust responsibilities to Indian tribes. Thus, the federal government has a different relationship with states and Indian tribes than with the

general public. Yet the Federal Advisory Committee Act does not expressly exempt from its coverage contacts between federal officials, on the one hand, and states and treaty Indian tribes, on the other.

Sensitivity to local needs. There were concerns expressed in virtually every ecosystem survey about the appropriate federal role in the ecosystem approach. Many of these concerns derived from a perceived imbalance of power. Federal agencies must be sensitive to local needs and perceptions as they develop, facilitate, or participate in partnerships. It is easy for federal agencies to overwhelm their nonfederal partners. The ecosystem approach requires that federal agencies and their partners achieve a balance that allows each to participate in common decisions without any party gaining or losing its legal authority.

The appropriate federal role differs from ecosystem to ecosystem. In grass-roots efforts initiated by local landowners, such as the Malpai Borderlands Group in Arizona and New Mexico, providing technical assistance is an appropriate federal role. Where federal agencies take the lead, such as in southern Florida, the challenge is to provide for *meaningful* nonfederal participation in agency decisions. In the Anacostia River watershed, which is dominated by state and local governments, the federal roles are project funding, regulations, management of federal resources and facilities, and technical assistance.

Examples of What Works and What Does Not

Southern Florida. In southern Florida, where both federal and state organizations are limited by the Federal Advisory Committee Act in the formal contacts they can have with each other, an informal connection has emerged between the Governor's Commission for a Sustainable South Florida and the federal South Florida Ecosystem Restoration Task Force. Some of the federal agencies on the Task Force also sit on the Governor's Commission, and recent meetings of the two groups were scheduled on consecutive days in the same location.

Old Woman Creek and Lake Erie. As part of a national water quality initiative, the Old Woman Creek watershed was chosen as a demonstration project for application of best management practices to solve nonpoint source water pollution. Because of strong community involvement in planning and implementation, a majority of local farmers continued to use best management practices after the project was completed.

Applegate Partnership. The Applegate Partnership in western Oregon offers many lessons about the formation and maintenance of partnerships between the federal government and nonfederal parties. One participant noted several factors contributing to its success. Particularly helpful were technical support by federal agencies, especially for geographic information systems, and agency representatives who were risk takers with the ability to listen and to admit past mistakes of their agencies. Other factors of

success included: people who could leave their baggage behind and focus on the common good; involvement of industry representatives who were creative, bright, good communicators, and visionary; forest issues that posed a threat to the entire community and thus provided an issue of common concern; an initial lack of polarization; a commitment and sense of shared responsibility that enabled development of a shared vision; and a voluntary relationship not spurred by crisis or litigation.

Only two years old, the Malpai Borderlands planning project has garnered national attention from public and private resource managers. The region straddles sixty miles along the U.S./Mexican border, encompassing parts of Arizona and New Mexico. Co-existing with this land for a century has been a ranching community of less than 100 families. Early overgrazing and 80 years of fire suppression contributed to the encroachment of woody shrubs into the native grasslands. Today, sustainable ranching provides the best hope for the restoration of the grassland ecosystems.

The type of Ecosystem Management that we're undertaking has proved to be a wonderful tool to bring all the players together and get all of us to stay on the same course and communicate with one another and work together on specific projects and plans and reach consensus on overall goals on this million acre project area. The support and help and leadership that we've had from the Natural Resources Conservation Service and the Forest Service have been crucial to this undertaking

Bill McDonald, Rancher and President, Malpai Borderlands Group

Little River Adaptive Management Plan. The Little River Adaptive Management Plan in Oregon is an example of what can go wrong in forming partnerships to increase public involvement. This plan tried to replicate the Applegate Partnership; meetings were organized to form a partnership. However, local community members were not interested in participating, because they perceived this as an attempt by federal agencies to increase control over private lands. This shows the importance of communicating a clear and non-threatening message up front in order to avoid alienating key stakeholders. It also suggests the value of grass-roots efforts that begin out of local perception of a common problem, and later seek federal participation as partners.

Southern Appalachian Man and the Biosphere Foundation. The Southern Appalachian Man and the Biosphere Foundation was formed as a nonprofit entity. It can complement the ecosystem effort by involving private industry, universities, and other special interest groups in ways that individual federal agencies cannot. The Foundation also directly supports the work of agencies through public involvement, education, and the solicitation of support for agency projects and priorities.

Pacific Northwest Forest Plan. Under the Administration's Forest Plan for the Pacific Northwest, advisory committees are being chartered under the Federal Advisory Committee Act to enable federal agencies to obtain information and advice from state, tribal, and local governments at the regional level, and from a broader array of stakeholders, including private interests, at the province level. However, this approach still has its limits. Under the Federal Advisory Committee Act, nonfederal

governmental entities and other stakeholders are treated as *advisors* to federal agencies. Under the ecosystem approach they are considered *full partners*, particularly where considerations affect more than just federal land.

Federal technical assistance. Technical assistance programs provide a mechanism for federal agencies to contribute to improved management of private lands in a relatively unobtrusive way. For example, the critical technical assistance and network of local services of the Department of Agriculture's Natural Resources Conservation Service, formerly Soil Conservation Service, provides ways of reaching large numbers of local stakeholders, particularly through assistance to private landowners. The Anacostia River watershed and Coastal Louisiana efforts illustrate how cost sharing, easements, and matching grant programs allow local and state governments to influence federal priorities by selecting projects they wish to cofund.

Issue 4: Communication Between Federal Agencies and the Public

Nature of the Problem and Its Consequences

The importance of public education and public participation in decision making was a central issue in many of the case studies. Public involvement at all stages of the process was seen as a key element to the successful management of ecosystems. The public must be involved in the development and implementation of an ecosystem vision and strategy. Public participation can include the design and implementation of a process to seek public review and comment on proposed agency actions. It can also include efforts to explain agency proposals to the general public, interest groups, and the media. There was general agreement among interviewees that current outreach activities are inadequate.

Outreach considered secondary. Public affairs work is generally perceived to be a *secondary* assignment for natural resource management staff. As a result, public involvement is often limited to one or two standard products, such as brochures, videos, or newsletters, presented only in English. Many stakeholders in communities are being missed by these standard efforts. Employees for whom public involvement is a secondary task may not plan public meetings sufficiently, and may provide inadequate notification to the various publics. Many regional offices lack staff with expertise in public involvement techniques, such as facilitating public discussions, building consensus, and resolving conflict. The complex and diverse issues that are raised in the ecosystem approach demand these skills. Without staff with backgrounds in journalism, community relations, communications, foreign languages, and cultural diversity, federal agencies will be limited at best in their efforts at public involvement.

Interagency coordination in public outreach. Agencies often conduct their public involvement activities independently. Within the government, this can result in duplication of effort and inefficient use of resources. In an ecosystem effort where many

agencies are involved, this can also overwhelm and confuse the public. The distinction between agencies is not as clear to the public as it is within the government. Public input into the process will be diluted by multiple public meetings on the same topic. Agencies need to collaborate to give the public a concise, comprehensive picture of the issues facing ecosystems.

Frustration with the process. People inside and outside the government expressed frustration with public involvement processes. There are several reasons: agencies often do not communicate the results of public involvement; unending series of meetings fail to produce tangible progress; and agencies sometimes seek public input only after important decisions have been made. Current efforts were considered too focused on technical information, which is important to agencies. There is not enough focus on how information affects peoples' lives, such as how pollution in the Great Lakes affects local drinking water. Public participation involves active involvement in decisions. Agency presentations about planned or ongoing activities are *not* sufficient.

Lack of access to information and data. Some interviewees expressed frustration over lack of public access to research results. In the unusual case of Prince William Sound, scientists were advised not to share information with nongovernment scientists because of litigation. But the typical complaint involved insufficient access to information on federal activities, rulemakings, and opportunities for involvement. Lack of a central point of contact for interagency ecosystem projects was identified as a critical barrier to access.

Examples of What Works and What Does Not

Interagency Communications Group. In the Pacific Northwest forests, the Interagency Communications Group was formed to devise a communications plan. The group is focusing on increasing employee understanding, public understanding, public involvement, and multiagency, multilevel coordination. To address these issues, the group held employee briefings, facilitated media outreach at the field level, arranged for senior managers to conduct a series of editorial board meetings for newspapers, and conducted various public outreach activities. The group has continued to hold conference calls each week to address emerging issues.

Southern Appalachian Man and the Biosphere community relations. The Southern Appalachian Man and the Biosphere program has an extensive public education and outreach program that uses different media to reach diverse publics. Several videos were produced, including an Emmy award-winning video entitled *Front Runner*, which deals with the reintroduction of the red wolf in Great Smoky Mountain National Park. The Southern Appalachian Man and the Biosphere program prepared a teacher's guide and a highly popular poster to accompany the video. The organization also develops publications to be used at public meetings and holds conferences and workshops designed to share information and build consensus around issues. Because of its

nonpartisan reputation, the Southern Appalachian Man and the Biosphere program can bring to the table groups that had not participated previously.

Alaska state agencies. Because traditional public hearing processes do not reach the rural communities of Alaska, state agencies initiated a bottom-up process in which communities are encouraged to define goals for their areas and thereby to influence agency decision making. The state agencies meet to discuss and coordinate plans for each community, and then meet several times with each community to develop a vision. This process appears to be successful because all interested stakeholders participate from the beginning.

Prince William Sound Science Center. The Prince William Sound Science Center was established by the people of Cordova, Alaska, after the *Exxon Valdez* Oil Spill. The center developed a cooperative education program with state and local agencies and the local school district. It is developing a program for sharing research and geographical information system information with the local community. The Center gives people access, in one location, to a wide array of information on the ecosystem. In addition, the *Exxon Valdez* Oil Spill Trustee Council is putting all information online for public access via personal computers.

National Environmental Policy Act. The National Environmental Policy Act contains provisions that enable an ecosystem frame of reference. Although environmental impact statements often involve specific projects, they need not be so narrow. The Corps of Engineers, for example, used a programmatic environmental impact statement for the Coastal Louisiana restoration plan to provide for early public comment on an ecosystemwide plan. This is but one example. Other environmental legislation that enables broader approaches includes the Endangered Species Act, the Fish and Wildlife Coordination Act, and the Marine Research, Protection, and Sanctuaries Act.

Issue 5: Resource Allocation and Management

Nature of the Problem and its Consequences

Decisions about the allocation and management of resources, money, people, time, and even equipment provide a useful measure of agency identity. Managers tend to allocate their funds in areas closest to the central missions of the agency. Whereas interagency coordination in an ecosystem requires some degree of budget coordination, managers may perceive ecosystem efforts to be draining resources away from traditional activities of their agencies, or they may view budget coordination as loss of control.

Managers should *not* be asking how to fund ecosystem activities *in addition to* traditional activities. Instead, they should ask questions that help them implement their mandated activities using the ecosystem approach: (1) which traditional activities can be incorporated into ecosystem efforts; (2) which activities are no longer a priority; (3)

whether the ecosystem effort requires additional activities not currently funded; and (4) how all priority activities can be carried out under current funding levels.

There are several institutional factors that limit the ability of federal agencies to coordinate their budgets. First, agency budget structures tend to reflect narrow, program-specific perspectives that differ from agency to agency. They are based more upon funding histories than upon emerging needs. Second, agency budgets are often linked to the production of tangible outputs or commodities (timber or minerals) or to permits and enforcement requirements, rather than to ecosystems. Third, no single appropriations committee has jurisdiction over the budgets of all federal agencies cooperating in any particular ecosystem. Fourth, loss of control, whether real or imagined, may be an issue for some managers who view interagency budget coordination as a dilution of their own authority. Fifth, most agency personnel have not yet acquired the skills, knowledge, or support required for budget coordination. Several managers were concerned that integrated ecosystem-based budgets proposed at the local level may not retain their ecosystem identity if the budget requests are combined with other requests at successive review levels of the appropriations process. Finally, some agencies are prohibited from expending funds outside of their jurisdictional boundaries.

There are legislative restrictions as well. For example, a governmentwide funding prohibition is currently included in the Treasury, Postal Service, and General Government Appropriations Act, P.L. 103-329, which states that *no part of any appropriation contained in this or any other Act shall be available for interagency financing of boards, commissions, councils, committees, or similar groups (whether or not they are interagency entities) that do not have a prior and specific statutory approval to receive financial support from more than one agency or instrumentality.* In some ecosystems, interagency financing would be a useful tool, but agencies have tended to focus on the restrictive elements of P.L. 103-329 rather than on its permissive elements.

Examples of What Works and What Does Not

Cost savings: the Idaho experience. The Bureau of Land Management in Idaho recognized that its jurisdictional boundaries in Idaho were not correlated with ecological systems. The Bureau reorganized into teams structured around ecosystems, significantly reducing personnel in the state office headquarters and putting more personnel into the field. As a result, the Bureau estimates a 30-percent increase in efficiency and productivity for its Idaho operations.

Budget integration. None of the seven case studies have integrated budgets. All are experimenting with ways to share budget responsibility for common goals, including: interagency agreements that specify the responsibilities of each agency; budget crosscuts that show how much each agency is contributing; exchange of personnel through details and Intergovernmental Personnel Act arrangements; and lead-agency

arrangements, whereby one agency conducts work on behalf of other agencies under reimbursement agreements.

Reevaluating budget priorities. Some agencies are reprioritizing budgets by revising their strategic plans and linking them more closely to budgets. For example, the Forest Service's 1995 strategic plan focuses agency priorities on restoring and protecting ecosystems and ensuring that the organization operates in an effective and efficient manner. The Environmental Protection Agency reorganized its five-year strategic plan around a new set of environmental goals that are intended to drive future budget decisions. The case studies indicate the need for agencies to place greater emphasis in their budgets on such priorities as scientific information, stakeholder involvement, and interagency coordination.

Budget modification and restructuring. The Forest Service has modified its budget structure to facilitate the ecosystem approach. Line item consolidation reduced the number of line items within the Forest Service budget categories most associated with resource management. The National Forest System appropriation contains a new \$150-million line item for ecosystem planning, inventory, and monitoring. An expanded reprogramming authority allows for greater flexibility in shifting funds between line items within each appropriation.

The Bureau of Land Management has a new, more flexible budget structure that better supports the agency's overall mission to maintain ecological diversity across the landscape, rather than rigidly allocating funds to separate programs. The new structure facilitates the ecosystem approach and is estimated to save \$4 million annually. The new budget collapses by half the number of accounts for management of land resources. The Bureau has increased flexibility by moving fund control from the subactivity account to the activity level, and can operate with no-year appropriations.

The Fish and Wildlife Service has adopted an ecosystem team approach to decision making as the foundation of its budget formulation process. Each of the 52 ecosystem teams will establish priorities and develop three-year ecosystem action plans. These plans will provide a field-level ecosystem basis for budget formulation.

Issue 6: Knowledge Base and the Role of Science

Nature of the Problem and its Consequences

Science is particularly crucial in the ecosystem approach for describing the structure and functions of the ecosystem, assessing vulnerability to stress, identifying ecosystem processes needed to achieve the vision, establishing restoration techniques, and monitoring ecosystem changes. However, information about ecosystems of interest, and levels of understanding about ecosystem functions, are often inadequate for ecosystem analyses. Several barriers must be overcome.

Inadequate integration of science disciplines. Most ecosystem-related science comes from traditional science disciplines. The ecosystem approach requires scientific understanding and information concerning the interaction of physical, chemical, biological, and geological components of the ecosystem, as well as of social and economic aspects of the system. A host of economic and sociological questions need to be raised: how people interact with natural resources; how peoples' plans and aspirations relate to natural systems; and how people think resources should be managed. Implementation of the ecosystem approach requires full integration of social and economic concerns into any analysis of the ecosystem.

Narrowly focused science. The ecosystem approach requires broad knowledge of ecological structure and process, resource requirements for sustainable economies, resource availability and quality, potential responses to resource utilization, vulnerability, and response to stress, and potential for recovery, all at multiple scales in space and time. Most ecological research in the past has focused on relatively narrow fields of inquiry, such as small geographical areas, short time frames, or individual species. Agency scientists also tend to view problems, research needs, and solutions from the perspective of their own agencies' missions.

Unidisciplinary science. The ecosystem approach requires multidisciplinary and interdisciplinary research. Scientists need to identify and communicate across disciplines and to look to multidisciplinary professional associations for exchange of ideas and outlets for publication. Agencies tend to hire scientists whose disciplines most closely match agency missions. Because agency scientists are career employees, it is difficult for agencies to move quickly into new disciplinary areas as needs change.

Restrictive budget cycles. Research and monitoring by their very nature are long term and do not produce immediate results. However, annual funding cycles in federal agencies, and one-year availability of funds, are often too restrictive for research activities. Scientists must identify specific projects, locations, objectives, and strategies up to two years in advance. Funding is often not available to address new and emerging issues.

Problems of communication. Scientific findings are often poorly communicated to managers and the public, if communicated at all. Scientists are reluctant to translate their findings for public consumption. Studies are often so narrowly focused that managers have difficulty using them to inform and guide decision making. Scientists strive for precision, while managers must often make do with available information. Scientists often focus on the *lack* of information as a basis for new studies, whereas managers focus on *available* information as a basis for decision making. Finally, scientists are rewarded for publication in peer-reviewed literature, not for publication in lay literature.

Examples of What Works and What Does Not

Independent science agencies. For resource decisions, independent science agencies, such as the National Biological Service and the U.S. Geological Survey, can be viewed as objective sources of information, particularly in ecosystems with contentious issues. Increased trust and impartiality can result when science agencies have no regulatory or resource management responsibilities, and hence no preferred decision outcomes.

Coordination of federal research. The Clinton administration established the National Science and Technology Council for the purpose of coordinating all federally-funded research and development activities. One of nine committees established under the Council, the Committee for Environment and Natural Resources has developed research and development strategies for various issue areas, including biodiversity and ecosystem dynamics, resource use and management, water quality, and global change. These strategies are designed to move federal agencies toward a coordinated, multiagency, interdisciplinary approach to program and budget planning that brings together natural and social scientists, economists, engineers, and policy makers. The Committee has also developed a national research agenda that would help agencies to understand, predict, and manage ecological systems in a sustainable way.

Linking science and management concerns. It is desirable to have formal mechanisms to maintain a science focus in a region and to facilitate regional science/policy coordination. In southern Florida, for example, there are separate but linked regional interagency groups. One group involves scientists, the other involves managers. This provides a two-way forum for managers to explain their issues and information needs, and for scientists to explain the results of their work.

Separating science from management bias. The Southern Appalachian Man and the Biosphere Cooperative, although containing federal agency partners, has developed an identity separate from the agencies. This gives the Cooperative a unique ability to forge cooperation in all aspects of science and information dissemination. Many interviewees viewed the Cooperative as a resource and facilitator. Individual management agencies might, by contrast, be perceived as a threat. The Southern Appalachian Man and the Biosphere Cooperative has become accepted as a translator of technology. It facilitates science by increasing awareness among agencies of other agencies' missions and functions. It also helps eliminate duplication of effort in research activities, and it encourages software compatibility for data sharing.

Problem-controlled research. Many of the researchers in Prince William Sound in Alaska were concerned that research needs were driven by the narrow requirements of litigation and natural resource damage assessments. Consequently, research was focused more on assessing current populations of selected species than on the dynamics and interactions of species and communities. Many scientists maintained that the studies, therefore, did not support broader ecosystem decisions.

Nature of the Problem and Its Consequences

Access to accurate, up-to-date, comprehensive information is essential for effective decision making at an ecosystem or regional level and to assess changes in ecosystem conditions. Common access to the same information provides a level playing field on which federal, state, local, and private interests can meet. No single entity has the resources or the mandate to collect or maintain all relevant information on any ecosystem. An information-rich, ecosystem-wide picture requires the combined effort of many agencies and institutions.

Unfortunately, the ideal in data management and data access is rarely met. There are significant difficulties in locating and synthesizing available information. Access to information and analytical tools is not uniform among regional stakeholders. Without a coherent and complete picture of the resources affected by their decisions, managers may unwittingly bring harm to the ecosystem and to neighboring jurisdictions. Duplication of effort is likely when managers independently obtain similar information.

Modern computer technology allows the solution of many technical problems associated with data management and sharing, but there are still a number of institutional problems. Information must be: focused on key indicators of ecosystem functions; integrated for common use by many disciplines; standardized in terms of terminology, definitions, procedures, and geographical referents; appropriate to how the data will be used; and subjected to quality controls.

Available data may not always be widely *accessible*, for a number of other reasons: (1) individual scientists are often reluctant to share data before they have been able to use it for publication; (2) scientists and agencies often prefer limited data systems for their own use; (3) the private sector often views data as proprietary; (4) agencies may fear that information on location of rare, sensitive, or culturally valuable resources will encourage vandalism; and (5) litigation may result in restricting availability of information.

Examples of What Works and What Does Not

Access to information technology resources. An increasing variety of data bases and electronic networks and related tools are available through the Internet, such as Mosaic, World-Wide Web, and Gopher. Many agencies have home pages on Internet. Some agencies do not take advantage of these resources. For example, agencies developing a regional data-sharing network for the Pacific Northwest forests noted that the Forest Service's lack of access to Internet was a major constraint. Participants in the Anacostia River watershed planning process said they lacked information on available geographic information systems.

Regional data synthesis. Ecosystem approaches examined in the case studies have reached different levels of regional data synthesis. One of the most exciting developments is the common geographic information system work underway in the Pacific Northwest forests by the Interagency Resource Information Coordinating Council. A group of scientists is creating an integrated geographic information system that seems certain to result in efficiencies for participating agencies. The Great Lakes Information Network links data, information, and individuals in the region using the Internet. Many federal, state, and university entities are providers to this data-sharing system.

Neutral facilitation of data sharing. Participants in the Southern Appalachian Man and the Biosphere program pointed to the fact that the organization, by its very nature, was not owned by any regional interest. This clearly contributed to its ability to serve a regional information coordinating role without being suspected of bringing an agency mission to the task. A sense of joint ownership is important. Too often, perfectly good data is viewed as suspect because of its source. The southern Florida science group was successful in bringing together information in part because its broad membership extended to all interested parties, including the agriculture community and others. The missions of the National Biological Service and the U.S. Geological Survey place them in positions of more neutrality than management or regulatory agencies. The National Biological Service co-chairs the southern Florida science subgroup.

Data standards and common data sets. Efforts such as the National Spatial Data Infrastructure, the National Biological Information Infrastructure, the Interagency Taxonomic Information System, and others are making important progress in resolving many compatibility, comparability, and transferability issues at a national level. Executive Order 12906 (April 13, 1994), which established the National Spatial Data Infrastructure, also requires federal agencies, in cooperation with state and local governments and the private sector, to document all new geospatial data they collect according to standards adopted by the Federal Geographic Data Committee, and to make that standardized documentation available through an electronic clearinghouse.

Nationwide strategies to improve monitoring and data management. The Intergovernmental Task Force on Monitoring Water Quality designed a model for providing integrated information for water quality monitoring. The task force recommends a data-sharing strategy that provides water and associated information at all geographic scales from nationwide to local, and that includes environmental goals and indicators, comparable methods, data descriptors, and data management techniques.

Issue 8: Flexibility for Adaptive Management

Nature of the Problem and its Consequences

Adaptive management requires that agencies periodically review progress toward

ecosystem goals, and adjust their management activities affecting the ecosystem as necessary. Adaptive management implies a rigorous process, well grounded in its understanding of ecological, social, and economic factors, and the interactions among them. It requires ongoing testing and evaluation of the impacts of management decisions. Such testing must be based on systematic program design, research, monitoring, and evaluation. An effective program requires an across-the-board organizational commitment over an extended period of time, and an ability to deal with the setbacks and frustrations that are unavoidable consequences of experimentation.

Adaptive management has few successful precedents. Various substantive and procedural barriers hamper agency efforts to adapt management practices in accordance with new circumstances. First, agencies are often unwilling or unable to make the long-term investments of personnel and resources for the level of monitoring that is required. Monitoring and research do not offer instant gratification, and therefore have trouble competing for funding. This is even more difficult in a period of budgetary uncertainty.

Second, there are no standards for determining when ecosystem changes are sufficiently great to require changes to agency plans and programs. Without such standards and associated guidance, there is no basis for reconciling the varied perspectives of scientists, managers, and policy makers. With respect to some problems in ecosystems, such as toxic exposure, risk assessment methodologies are sufficiently refined to allow quantitative measurements. But for most ecosystem analyses, scientists and nonscientists often differ considerably on risk-related questions such as probable survivability of species under different scenarios. Third, there are no national standards for monitoring. Consequently, it is not clear what level of rigor is required. This makes it difficult to come to agreement on what constitutes enough information on which to base management choices.

In addition, the level of scientific understanding needed for adaptive management may not be available. One interviewee noted that adaptive management is, by definition, information dependent, but that in many cases the information is not there or the means for its development are lacking. For example, although general causes of land loss and salinity intrusion in Coastal Louisiana are reasonably well known, the factors that lead to subsidence lack rigorous documentation. Without well-defined programs to verify causes and consequences, and to test potential options for addressing them, there is an insufficient basis for altering current management.

Examples of What Works and What Does Not

Adaptive management units. The Forest Ecosystem Management Assessment Team report on the Pacific Northwest forests proposed the designation of adaptive management units to allow experimentation with approaches that combine scientific, economic, and social objectives. The units are located throughout the region so that adverse management results in a particular unit do not threaten the attainment of

regional management objectives. As noted in the report, these localized, idiosyncratic approaches . . . rely on the experience and ingenuity of resource managers. Accordingly, the units provide an opportunity to consider untested yet potentially beneficial options that might otherwise be infeasible.

Experimenting with watersheds. The Corps of Engineers is using its section 404 authority to implement watershed-based approaches, including the use of programmatic general permits for classes of activities. The Natural Resources Conservation Service is focusing its small watersheds program on community and ecological concerns using adaptive management. The Environmental Protection Agency is also experimenting with watershed management in over 100 watersheds across the country.

[Return to Table of Contents](#)

FRAMEWORK FOR AN ECOSYSTEM APPROACH

As agencies gain experience with the ecosystem approach, they will find creative ways to work together. Methods of interaction that are now experimental will become standard practice. In the meantime, the typical steps in the ecosystem approach are provided below as guidance to agencies and entities that wish to begin new ecosystem efforts. The order in which these steps are taken may vary. Not all steps need to be taken for every ecosystem initiative. As the approach matures and agencies gain experience, it is expected that this outline can be greatly expanded.

A. Define the Area of Concern/Interest

The area boundaries may be influenced by a number of issues: economic, social, cultural, and ecological. The initial interests may be to maintain a viable economy, ensure pristine ecological conditions, or address such resource problems as drinking water pollution or poor air quality. The issues that give rise to the ecosystem efforts in the first place might be very specific. But they should be viewed in the broader ecosystem context. How the issue is framed will determine in part which stakeholders will become involved. The issues that initially precipitate the ecosystem approach may give way to other issues as time passes, requiring changes in stakeholder representation.

Based on the issues, the ecosystem boundaries can be tentatively defined. The size of the area should allow effective actions by the participants, it should be neither too small to be meaningful nor too large to be focused.

B. Involve Stakeholders

Involving all stakeholders is an important component of the ecosystem approach. The level and nature of involvement will likely vary from one ecosystem to another, depending upon a number of factors, including the degree of stakeholder interest,

pressure on the ecosystem's resources, financial resources available to support involvement, and organizational structures and processes used.

C. Develop a Shared Vision of the Ecosystem's Desired Future Condition

A vision statement is a clear conceptual picture of the desired future state the ideal state towards which efforts are directed. It is long term in nature and defines the principal benefits to stakeholders. The vision should be consistent with the overarching goal of sustaining biological diversity of the ecosystem while also sustaining communities and economies. Vision statements tend to be broad and general, but should be precise enough to provide a realistic target toward which specific implementation actions can be directed.

D. Characterize the Historical Ecosystem and the Present Economic, Environmental, and Social Conditions and Trends for the Ecosystem

This step involves describing how the ecosystem and its components look now, and how they looked historically. The historical description is the baseline against which restoration efforts are measured. Characterization of the current situation helps clarify the factors that must be considered in developing action plans. The current ecosystem condition provides a baseline for measuring how much has been accomplished. Much of the needed information is already available from federal agencies.

The ecosystem can be characterized by such variables as composition, structure, function, and natural range of variability for key ecosystem characteristics, and by ecological stresses such as toxic pollution. The social environment can be described in terms of such factors as the location and distribution of communities, the human uses of resources, and the political and economic issues related to resource use. The economic environment can be characterized by such variables as local employment patterns, work force availability and skills, and the location and distribution of important economic centers. Typically, this stage will require extensive involvement of the research community, both inside and outside of government.

E. Establish Ecosystem Goals

Goals are results that can be achieved and against which one can measure progress and eventual success. Ecological goals should consider what values to protect, the threshold levels of human-induced stress, and the spatial scale to address. Goals should be quantifiable, verifiable, and flexible. Mechanisms should be provided for resolving inevitable conflicts associated with establishing priorities, selecting ecosystem goals, and choosing the means to reach goals.

F. Develop and Implement an Action Plan for Achieving the Goals

An action plan specifies detailed steps for achieving goals. Actions range from administrative activities, such as proposal writing, public participation, budgeting, or market analyses, to on-the-ground efforts such as replanting, monitoring, or controlled burning. Any budgeting requirements should be included in the action plan. The plan should also provide for coordination of the various interests, and for obtaining public comment from groups and individuals in the community at large.

G. Monitor Conditions and Evaluate Results

Monitoring serves the following purposes: to determine whether standards and guidelines are being followed (implementation monitoring); to verify achievement of desired results (effectiveness monitoring); and to determine soundness of underlying assumptions (validation monitoring). Monitoring is crucial when new, unproven techniques are being applied, when there is high risk and uncertainty, and when it is necessary to determine whether management or restoration measures are working as planned. Monitoring should: detect changes in ecological, social, cultural, and economic systems; provide a basis for natural resource and other policy decisions; provide standardized data; identify present and future conditions; track status and trends; compile information systematically; link overall information strategies for consistent implementation; and ensure prompt analysis and application of data in the adaptive management process.

H. Adapt Management According to New Information

Adaptive management is a process of adjusting management actions and directions in light of new information about the ecosystem and about progress toward ecosystem goals. When new information becomes available, a decision is made whether and how to adjust the strategy and actions. Management decisions are thus viewed as experiments subject to modification, rather than as fixed and final rulings. As we increase our understanding of ecosystem structure and function, and their relationship to management actions, we need also to adjust our actions accordingly. Adaptive management recognizes the limits of knowledge and experience, and helps us move toward goals in the face of uncertainty.

Adaptive management provides feedback regarding progress toward goals (see figure). In essence, adaptive management works as follows: restoration or management measures are implemented; monitoring is conducted; feedback is provided based on new insights gained; and adjustments are made. There is a need to constantly review and revise environmental and other restoration and management approaches because of the dynamic nature of ecosystems.

[Return to Table of Contents](#)

INTERAGENCY ECOSYSTEM MANAGEMENT WORKING GROUP**Co-Chairs**

James Pipkin, Counselor to the Secretary of the Interior

Diane Gelburd, Regional Conservationist for the East, Natural Resources Conservation Service, Department of Agriculture

Members

Peter Boice
Joseph Canny
Ray Clark
Terry D'Addio
Michael Davis
Harvey Doerksen
Richard Hayes

Gary Larson
Maurice LeFranc
Bruce Long
Louise Milkman
Mary O'Lone
Morgan Rees

Mark Schaefer
Michael Sweeney
Robert Szaro
John VanDerwalker
Donna Wieting
Brooks Yeager
Susan Huke, Coordinator

Issue Group Members**Science and Information**

Robert Szaro, Chair
Jeri Berc
Scott Cameron

Steve Cordle
Mike Crosby
Lynn Martin

Doug Norton
Robin O'Malley
Greg Ruark

Public Participation

Val Chambers, Co-Chair
Jim Serfis, Co-Chair
Richard Alexander
Elisabeth Blaug

Bill Breed
Paul Jones
Sari Kiraly
Carol Sanders

Bruce Umminger
Rich Whitley
Mary Anne Young
Steve Young

Legal Authorities

Louise Milkman, Chair
Reid Alsop
Elisabeth Blaug
Ted Boling
David Dickman

David Gehlert
Roger Griffis
Jane Hannuksela
Jim Havard

Joanne Jones
Sam Kalen
Tom Marshall
Ron Mulach

Policy Issues

Roger Griffis, Chair
Thomas Gunther

Ann Hooker
James Omans

Peter Smith
Molly Whitworth

Institutional Issues

Ann Bartuska, Chair
Richard Alexander
Ted Boling

Bill Breed
Roger Griffis
Kniffy Hamilton

Douglas Lawrence
Rob Mangold
Steve Young

Budget Process Issues

Bruce Long, Co-Chair
 Susan Huke, Co-Chair
 Bill Breed
 Scott Cameron
 Harvey Doerksen

Owen Lee
 Darrell McElhaney
 Jane McNeil
 Pete Nessen
 Roger Normand

Alan Perrin
 Al Sherk
 Claudia Tornblom
 Richard Ullrich
 Chris Wood

Survey Team Members

Anacostia River watershed

Lynn Martin, Chair
 Rosina Bierbaum
 Ann Hooker

Joanne Jones
 Ron Lauster
 Rom Mangold

Mary O'Lone
 Robert Reichardt

Coastal Louisiana

(Maurice LeFranc, Coordinator; Roger Zimmerman and Russel Rhodes, Local Coordinators)

Roger Griffis, Co-Chair
 Molly Whitworth, Co-Chair
 Jeri Berc

Val Chambers
 Joanne Jones

Doug Norton
 Al Sherk

Great Lakes basin

(Maurice LeFranc, Coordinator; Christopher Grundler, Romy Myszka and Al Beeton, local coordinators)

Steve Cordle, Chair
 Sam Kalen

Rob Mangold
 Andrea Ray

Larry Shannon
 Charles Terrell

Pacific Northwest forests

James Pipkin, Co-Chair
 Robert Szaro, Co-Chair
 Harvey Doerksen

Diane Gelburd
 Susan Huke

Don Knowles
 Louise Milkman

Prince William Sound

(Steve Pennoyer, Local Coordinator)

Roger Griffis, Chair
 Sean Furniss
 Diane Gelburd

Susan Huke
 Louise Milkman

James Pipkin
 Andrea Ray

South Florida

(Colonel Terrence Salt and Richard Ring, Local Coordinators)

James Pipkin, Chair
 Diane Gelburd

Roger Griffis
 Susan Huke

Louise Milkman
 Mike Sweeney

Southern Appalachians

Susan Huke, Co-Chair
 Bill Sexton, Co-Chair

Ted Boling
 Ray Clark

John Dennis
 Terry West

[Return to Table of Contents](#)
