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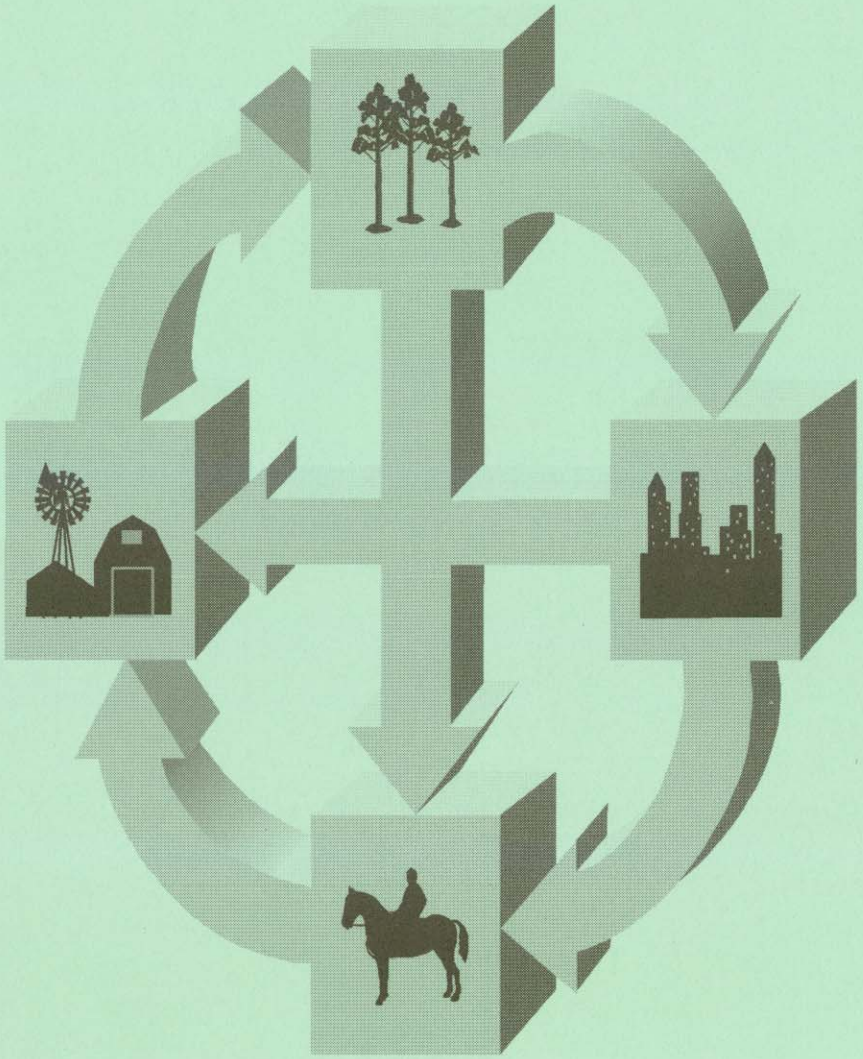
Institutional Barriers and Incentives for Ecosystem Management: A Problem Analysis

Hanna J. Cortner, Margaret A. Shannon, Mary G. Wallace,
Sabrina Burke, and Margaret A. Moote



Authors

HANNA J. CORTNER is a professor, School of Renewable Natural Resources, and director, Water Resources Research Center, University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721; MARGARET A. SHANNON is a Corkery Professor of Forest Resources and director, Institute for Resources in Society, University of Washington, Seattle, WA 98195; and MARY G. WALLACE is a senior research specialist, SABRINA BURKE is a former graduate research assistant, and MARGARET A. MOOTE is a research specialist, Water Resources Research Center, University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721. This research report fulfills cooperative agreement PNW-93-0392. It also is a Consortium for Social Values of Natural Resources document.

Abstract

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Ecosystem management is currently being proposed as a new resource management philosophy. This approach to resource management will require changes in how society approaches nature, science, and politics. Further, if efforts to implement ecosystem management are to succeed, institutional issues must be examined. This report identifies five problem areas where social science research can improve our understanding of how ecosystem management can best be implemented These include (1) the extent to which existing laws, policies, and programs may constrain or aid the implementation of ecosystem management; (2) institutional mechanisms for managing across jurisdictions; (3) internal organizational changes and new arrangements among resource agencies and the public, (4) theoretical principles underlying natural resource management, and (5) methodological approaches for researching institutional questions Strategies to begin researching these questions are also suggested

Keywords: Ecosystem management, research, institutions, policy

Summary

Scientists, managers, and members of the public are calling for new ways to manage the Nation's natural resources One proposed change is to shift to an ecosystem approach to resource management As a management philosophy, the ecosystem approach calls for changes in how we approach nature, science, and politics. It requires that we ask ourselves what kind of society and, correspondingly, what kind of relation with nature we want To answer these questions, and perhaps more importantly to put the answers into action, we need to examine our society's institutions

The purpose of this problem analysis is to outline a program of research and study addressing institutional barriers and incentives to ecosystem management. This document is a companion to *Social Aspects of New Perspectives in Forestry: A Problem Analysis* by George Stankey and Roger dark (1992) The Stankey and dark report focuses on the relation between social values and new approaches to land management. It identifies six general areas needing research, which include integrating social values, understanding public values for resources; public acceptability of management approaches, public participation mechanisms, structures, procedures, and values of natural resource organizations, and forums for debating issues

Social values and institutions are closely linked Values of the past created the institutions of the present, and changing social values will engender the institutions of the future We need to find out how our current institutions both encourage and resist change and, thus, how well they will accommodate ecosystem management Research is needed to build on our understanding of current social values and how these values can be integrated into management strategies.

Ecosystem management has been defined in different ways by different people. In general, however, researchers agree that its goals include maintaining healthy ecological conditions A literature review revealed five recurring principles of ecosystem management. (1) socially defined goals and management objectives; (2) integrated, holistic science; (3) broad spatial and temporal scales; (4) collaborative decision building; and (5) adaptable institutions Not all researchers embrace all these principles, however, and there is little consensus about the new terminology, conceptual categories, and classifications used to discuss ecosystem management. Because of this diversity, it is important that we look at all aspects of ecosystem management to determine the full range of its possibilities and limitations

The term "institution" has been defined in various ways, however, the broadest definitions include both formal institutions, such as Federal land management agencies, and informal institutions, such as customs and practices Recent trends indicate increasing dissatisfaction with many of society's institutions, including those that manage natural resources Our current institutions have evolved to serve purposes far different from those required under an ecosystem approach with its emphasis on maintaining viable and productive ecological systems An ecosystem approach suggests that institutions should be complex and adaptive rather than hierarchical and rigid.

We have identified five problem areas and associated rationales and objectives. These are areas where social science research can improve our understanding of how ecosystem management can best be implemented.

Problem one: The extent to which existing laws, policies, and regulations may constrain or aid the development and implementation of ecosystem management policies, programs, and practices is unknown The economic dimensions of ecosystem management also are unknown.

Problem two: Under an ecosystem approach, institutional mechanisms for managing across jurisdictions are mostly unknown and have uncertain effects.

Problem three: Adopting the ecosystem approach as a management philosophy may require both internal organizational change and the formation of new relations between resource management agencies and the public. The level of public support for ecosystem management is unknown, however.

Problem four: Ecosystem management requires examination of the theories guiding resource management.

Problem five: Current methodologies for researching institutional questions are insufficient to address the goals of ecosystem management.

Specific recommendations for how this institutional work could be approached include:

- a dissertation program
- electronic "brown bags"
- a new professional society to provide a forum for research dissemination
- a service learning program in which young people work with communities
- forums for discussion of critical issues

Any comprehensive research program is composed of different types of research, each with different goals and uses. Ultimately, the goal is to have a healthy mix of all types Priorities need to be set, however, which requires that we find a balance between research focused on short-term, practical problem solving and research focused on long-term, theoretical development. A good track record of applied short-term research will be necessary to build the support needed for long-term theoretical research We need to synthesize research developments to create a baseline inventory of information Finally, we need to create evaluation and monitoring criteria with the understanding that ecosystem management cannot be a blanket prescription, variations in biophysical, social, and economic characteristics of geographic areas must be respected At the same time ecosystem management also requires agreement about central principles and standards.

Contents

Introduction

Scientists, managers, and members of the public are calling for new ways to manage the Nation's natural resources One proposed change is to shift to an ecosystem approach to resource management (Agee and Johnson 1988, Society of American Foresters 1992, Thomas and others 1988) Eighteen Federal agencies recently reported to Congress on their ecosystem management policies and activities (Morrissey and others 1994) Five major resource management agencies—the USDA Forest Service, the National Park Service, the Bureau of Land Management, the Natural Resources Conservation Service (formerly the Soil Conservation Service), and the U S Fish and Wildlife Service—have officially adopted some form of ecosystem management (Morrissey and others 1994, Robertson 1992, U.S. Department of the Interior 1993) The Executive Office of the White House has also embraced the concept (Forest Ecosystem Management Assessment Team [FEMAT) 1993)

As a management philosophy, the ecosystem approach calls for changes in how we view nature, science, and politics. It requires that we ask ourselves what kind of society and, correspondingly, what kind of relationship with nature we want To answer these questions, and perhaps more importantly, to put the answers into action, we need to examine our society's institutions. These institutions are expressions of collective human experience. They are both formal, such as Federal land management agencies, and informal, such as customs and practices Institutions reflect the ways people interact with one another and the ways they interact with their environment. Further, they are the means people use to solve social problems.

Currently, we are undergoing a fundamental change in our vision of what forests, rangelands, riparian areas, and ecosystems are, and ought to be, as well as how people use them.

Recent trends in resource management, and in western society in general, indicate increasing dissatisfaction with many of society's institutions, including those managing natural resources Over the past 20 years, increasing numbers of administrative and judicial appeals of public land plans and management decisions have been filed. Similarly, hostile standoffs between the public and agencies indicate that the values some people place on natural resources are in conflict with the institutions that direct resource management Currently, we are undergoing a fundamental change in our vision of what forests, rangelands, riparian areas, and ecosystems are, and ought to be, as well as how people use them

An ecosystem approach, with its emphasis on maintaining viable and productive ecological systems, will require changes in institutions (Cortner 1994, Sirmon and others 1993) Although grounded in the ecological sciences, ecosystem management has a large social component, it is as much a social as it is a scientific endeavor (FEMAT 1993) And it is a very political process (Cortner and Moote 1992). Indeed, we may be facing "an institutional rather than a resource crisis in the years ahead" (Mitchell 1975) Accordingly, to address ecological issues, as well as broader social issues,

> We need to understand how much of our lives is lived in and through institutions and how better institutions are essential if we are to lead better lives. In surveying our present institutions we need to discern what is healthy in them and what needs to be altered, particularly where we have begun to destroy the non-renewable natural and nearly non-renewable human resources upon which all our institutions depend [Bellah and others 1991: 5]

We do not yet know, however, exactly how our institutions need to change to achieve the sustainability of natural resources under an ecosystem approach

In many cases the institutions that served us well in the past have outlived their intended missions, objectives, and in some cases, usefulness (Wilkinson 1992) The basic structure of many current institutions reflects a fundamentally different view of land, natural resources, and people than proposed under ecosystem management with its themes of holism, dynamism, complexity, and uncertainty (Kessler 1994) Organizations and laws that seemed sensible when resources were believed to be inexhaustible are now outmoded.

Indeed, our institutions for natural resource management, research, policy, and education may well be the most significant barriers to the adoption of an ecosystem approach (Grumbine 1994, Kessler 1992, 1994, Slocombe 1993) Fundamental change requiring the creation, reform, or even dismantling of institutions may be necessary (Caldwell 1970) In fact, the question is not really whether there is a need for change but what kind of change is needed and how it can be achieved The exact requirements for institutional change are unclear, however In part this is because of the subject's complexity, but it is also because we have failed to recognize the links in the ways people relate to nature and each other and the character of our institutions. For ecosystem management to succeed, we need a much better understanding of the relations between this change in resource management philosophy and society's institutions

In many cases the institutions that served us well in the past have outlived their intended missions, objectives, and in some cases, usefulness (Wilkinson 1992)

Project Goals

This problem analysis outlines a program of research and study that will examine how existing institutions may hinder or help the adoption of an ecosystem management approach It also analyzes the types of changes that may be needed in institutions and evaluations of them Specific research objectives—which range in focus from short-term, practical problem solving to long-term, theoretical development—are provided Finally, strategies to begin researching these questions are suggested. Our main purpose is to encourage a dialogue on this subject among resource managers, the public, researchers, and policymakers that will clarify the relations between ecosystem management and the institutions that influence natural resource policy.

Methods: Developing the Problem Analysis

This problem analysis is a companion to *Social Aspects of New Perspectives in Forestry: A Problem Analysis* by Stankey and dark (1992). They set forth a program of research, development, and application for exploring the relation between social values and resource management. They identify six general areas needing research integrating social values; understanding public values for resources, public acceptability of management approaches; public participation mechanisms, structure, procedures, and values of natural resource organization, and forums for debating issues.

Social values and institutions are closely linked. Values of the past created the institutions of the present, and changing social values will engender the institutions of the future. We need to find out how our current institutions both encourage and resist change and, thus, how well they will accommodate ecosystem management. Research is needed to build on our understanding of current social values and how these values can be integrated into management strategies.

Similar to the Stankey and dark report (1992), this problem analysis also intends to guide research but in the area of ecosystem management and institutions. To this end, we begin by defining the terms "ecosystem management" and "institutions." In the first section of this paper, principles of ecosystem management are presented to provide a broad outline of an ecosystem approach. The next section provides an overview of institutions and some points to consider when discussing them. This discussion is followed by the identification of five research problems, each with associated rationales and objectives. The five problem areas are as follows.

Problem one: The extent to which existing laws, policies, and regulations may constrain or aid the development and implementation of ecosystem management policies, programs, and practices is unknown. The economic dimensions of ecosystem management also are unknown

Problem two: Under an ecosystem approach, institutional mechanisms for managing across jurisdictions are mostly unknown and have uncertain effects

Problem three: Adopting the ecosystem approach as a management philosophy may require both internal organizational change and the formation of new relations between resource management agencies and the public. The level of public support for ecosystem management is unknown, however.

Problem four: Ecosystem management requires examination of the theories guiding resource management.

Problem five: Current methodologies for researching institutional questions are insufficient to address the goals of ecosystem management

These problems and objectives are not intended to be a comprehensive classification of the research issues, or to limit research to these specific areas, but are offered as an introduction to the nature of the problems and a guide to further research. In addition, the problems and objectives should not be viewed in isolation, but rather recognized as interdependent and cross-cutting. Finally, no priority is intended in the listing of problems or objectives

An initial draft of this problem analysis was prepared for discussion at a workshop held in October 1994 in Stevenson, Washington. Participants, based on their own expertise and experiences, prepared short papers responding to the draft version (for example, suggesting major revisions, identifying missing problems, or revising and expanding on problems identified in the draft). These papers are cited herein and are reflected in this document. Participants also were asked to begin developing a plan for a program of research, including prototype research projects. At the October 1994 workshop, participants gathered for *2 1/2* days to discuss the initial draft of the problem analysis, the papers written by participants, and the suggested research projects. Participants gave presentations on specific resource management sites to stimulate discussion and provide actual management situations to which ideas for needed research could be linked Based on these papers and the workshop discussion, we then made revisions and additions to the draft problem analysis.

Ecosystem Management: What Is It?

Ecosystem management has been defined in different ways by different people, but researchers generally agree that the goals of ecosystem management include maintaining healthy ecological conditions: "Ecosystem management focuses on the conditions of the [ecosystem], with goals of maintaining soil productivity, gene conservation, biodiversity, landscape patterns, and the array of ecological processes" (Society of American Foresters 1992. iv-v). A primary goal of ecosystem management is "sustaining healthy ecosystems. . .to ensure ecosystem viability indefinitely" (Iverson 1993: 2). It also requires the integration of social, economic, and ecological considerations at broad spatial and temporal scales (Moote and others 1994).

The integration of these elements occurs largely in a social context: "The best ecological approaches cannot sustain ecosystems unless they are integrated into a human context" (Pfister 1993. 231). Thus, ecosystem management is in large measure a political undertaking. "An ecosystem approach uses analyses of actors and institutions to recommend or facilitate more consensual, participatory processes" (Slocombe 1993" 620) "Care should be taken not to duplicate some of the large and expensive environmental monitoring programs, which typically overemphasize scientific and technical issues and under-represent managerial and political ones [Ecosystem management] calls for collaboration among ecologists, social scientists, and policy scientists" (dark and others 1991: 419)

A literature review conducted in 1993 revealed five recurring principles of ecosystem management (Moote and others 1994) These principles are not necessarily linked within the literature, in some cases, they are contradictory The literature search included writings in the areas of conservation biology, ecosystem management, integrated environmental management, adaptive management, and a miscellany of social science literature These principles are described below and listed in figure 1

"The best ecological approaches cannot sustain ecosystems unless they are integrated into a human context" (Pfister 1993: 231).

The first principle is that desired ecological conditions and the means of achieving them are socially defined. This reflects a recognition that many scientific concepts, including the definition of an ecosystem and criteria for a healthy ecosystem, are essentially value judgments (Norton 1992. 35) For example, successional theory, which dominated the field of ecology for years, places a bias on climax communities as being the optimal and best ecological condition, thus placing less value on systems in earlier stages (Westoby and others 1989). Further, our understanding of ecosystems comes largely through "negotiations with nature," and the gradual understanding built through interactions among humans and the surrounding environment (Bird 1987 259).

Ecosystem management is a management philosophy which focuses on desired conditions, rather than system outputs, and which recognizes the need to protect or restore critical ecological components, functions, and structures in order to sustain resources in perpetuity.

Socially Defined Goals and Management Objectives
Desired conditions and the means by which we choose to achieve these conditions are social values. Therefore ecosystem management, like all forms of management, is a socially defined process. Nevertheless, human society needs to adapt its activities to protect crucial ecological processes.

Integrated, Holistic Science
Ecosystem management uses a holistic approach, rather than focusing on specific system outputs. It attempts to conserve biodiversity from the genetic to the community level. Ecosystems are recognized as open, changing, complex systems. Ecosystem management focuses on the dynamic interrelations of systems components—including social, political, economic, biological, and physical features—and requires a better understanding of each of these components and their interrelations. Humans are recognized as a part of ecosystems.

Broad Spatial and Temporal Scales
Specific scales of management will be determined individually for each system, based on societal values and goals. In general, however, ecosystem management must work over larger spatial and longer temporal scales than has been the norm in resource management. It requires management across ecological, political, generational, and ownership boundaries.

Collaborative Decision Building
Successful planning for ecosystem management must be sensitive to the different mandates, objectives, and constituencies of agencies and landowners. Therefore, there is a need for cooperative, integrated data collection and planning, characterized by open communication among scientists, resource management agencies, and private interests. Participants should strive for joint organizational and community learning that acknowledges the values and expertise each participant brings to the planning process.

Adaptable Institutions
Institutions for ecosystem management must reflect its experimental nature. Organizations, laws, policies, and management practices need to be flexible, so that they may adapt to changes in social values, environmental conditions, political pressures, available data, and knowledge. Adaptable institutions treat management as a learning process in which decisions are continuously reviewed and revised, and therefore allow planning and decision-making to go forward in the face of uncertainty. At the same time, it is recognized that institutional decision-making is bounded by the currently defined legal limits of planning and management and by socio-political factors.

Figure 1—A literature search revealed five principles of ecosystem management (Source. Moote and others 1994)

Ecosystem boundaries themselves are social constructions (Lee 1993). The research necessary for the assessment of ecosystems, therefore, must be focused through social concerns: "The interests of scientists are usually quite narrow and reflect the particular history of a discipline. There is thus no guarantee that in a scientific study the appropriate variables or processes will be measured, or that information will be collected on the proper spatial and temporal scales to address management questions" (Holling 1978: 4) Further, cities, towns, villages, rural centers, and wilderness areas are viewed as nested within ecosystems, human activities are viewed as taking place within the context of maintaining healthy ecosystems Under this principle, the focus is on "adapting human activities to fit better with natural processes" (Francis 1993- 319)

The second principle includes a focus on understanding critical components, functions, and structures of ecosystems while viewing the system as a whole. In areas such as the Everglades, there is a growing recognition that ecological problems can no longer be approached piecemeal. Ecosystems need to be viewed in all aspects, from their overall function and structure to the viability of species. "The ecosystem approach. . .opposes the classical idea that the world can be analyzed as separate, independent parts" (Thomas and others 1988 41-42) Instead, "drawing heavily upon ecological and biological sciences, particularly the field of conservation biology, ecosystem management views the land and resource base in its entirety, as a holistic or integrated entity" (Keiter 1994a 295) Many researchers advocate applying a systems approach to ecosystem management, including social, political, economic, biological, and physical features

"The ecosystem approach . . opposes the classical idea that the world can be analyzed as separate, independent parts" (Thomas and others 1988 41-42).

The third principle states that ecosystem management needs to be carried out over larger spatial and longer temporal scales than has been customary in resource management "The goal of preserving diversity at all levels—genes, species, and ecosystems—requires a better understanding of how ecological processes operating on different spatial and temporal scales interact" (Lubchenco and others 1991. 389) This in turn will require "the development of integrated classification schemes, inventory methods, and data management systems for various levels of resolution and aggregation that allow data analysis and interpretation at landscape and bioregional levels" (Society of American Foresters 1992 120) Ultimately, "we must take special care . . . to avoid near term resource management decisions that may overly restrict or foreclose future management options" (Sample and others 1993 6)

The need for integrated data collection and planning implied by the third principle leads to the fourth, ecosystem management is characterized by open communication, collaborative decisionmaking, and coordination among agencies "The very nature of ecosystems dictates that broad, cooperative, and integrated approaches to ecosystem management have to be developed" (Gilbert 1988: 182) Yet, "the lack of commonly held policy and management goals among the agencies [remains] the single greatest impediment to sound ecosystem coordination. . . The crushing complexity of coordinating management activities between scores of separate political and administrative entities looms as the second most important challenge" (Varley 1988 220) Indeed, some claim that they "cannot conceive of any way in which an 'ecosystem' approach

could be implemented in jurisdictions with opposing attitudes, institutions, laws, and behaviors—except perhaps in an altruistic spirit of dedicated cooperation" (Vallentyne and Beeton 1988: 61). The need to integrate the knowledge and values of such a broad array of organizations and individuals implies a need to join organizational and community planning (Shannon 1992).

The fifth principle is that institutions need to be adaptable to reflect both the dynamic nature of ecosystems and the experimental nature of ecosystem management. "Given the complexities and uncertainties inherent in the biophysical and social systems that make up ecosystems, sustainable management can only be achieved if management institutions have strong learning capacities" (McLain 1993: Executive Summary). Instead of being wedded to traditional ways of doing things, institutions need the capacity to respond and adapt to new knowledge, changing public attitudes, and lessons learned from on-the-ground management experiences. Further, land management organizations must be able to operate in ways that account for the larger spatial and longer temporal scales required by ecosystem management. Current operating procedures may hinder these efforts. For instance, USDA Forest Service appropriations are directly tied to the amount of timber harvested; any decrease in harvesting levels means a decrease in funding, thus constraining agency action. Ecosystem management requires administrative flexibility: "No set of goals should be so firmly adopted that institutional adaptability is lost" (Agee and Johnson 1988: 229). "Rather than a set of well defined practices, [ecosystem management] is about *processes* for change" (Shands and others 1993: 4).

Not all researchers embrace all these principles, and there is little consensus on new terminology, conceptual categories, and classifications for use in discussing ecosystem management (Shannon and Anderson 1994) In fact, as noted above, contradictions occur within the ecosystem management literature itself. Calls for better use of ecosystem science in decisionmaking, for example, can generate criticisms of "biological imperialism," that is, the concern that basing decisions on ecological requirements in effect runs roughshod over the principle that humans and their wants and needs are also part of ecosystems. The need to address resource management on broader temporal and spatial scales and to integrate data collection and monitoring may conflict with the preference to center decisionmaking at the local or community level, closest to the land and the people. Finally, the ideal of flexible goals and objectives may conflict with the need to have clear and commonly understood goals when making practical applications on the ground.

Ecosystem management can thus be understood as a social movement designed to embrace a new philosophical basis for resource management. It calls for changes in how we approach nature, science, and politics and will require changes in behavior by institutions and individuals. It will affect values such as democracy, free enterprise, and the rights of citizens. Proponents of ecosystem management tie its principles to democratic concepts and governance models based on popular sovereignty, accountability, and diversity, but critics maintain that ecosystem management devalues individuals and individual freedoms in the name of the collective (Lee 1994). We need to look at all aspects of ecosystem management to determine the full range of its possibilities and limitations.

Institutions: What Are They?

Politics is the process through which we define the terms of our collective existence (Orr 1992). Institutions are expressions and mechanisms of collective experiences It is through institutions that humans search for the means to solve social problems. Yet institutions are difficult to conceptualize, let alone change. The term "institutions" has been defined in various ways, and Ostrom (1986) notes that little agreement has been reached on what the term means or how to undertake studies of institutions. Scholars have defined institutions as sets of rules, as standards of behavior, or in terms of political structure (Ostrom 1986). The broadest definitions include both formal and informal institutions and emphasize sociological elements. For Bellah and others (1991. 10), an institution is a "pattern of expected action of individuals or groups enforced by social sanctions, both positive and negative" and can range in scope from a handshake to a highly formal organization related to taxation (p. 10); institutions are the "normative patterns embedded in and enforced by laws and mores (informal customs and practices)" (p 11) As we will demonstrate, ecosystem management will require changes both in formal organizational structures and the informal customs and practices that are an integral part of organizations and of society. Because of the sweeping nature of these changes, we are adopting this broader definition of institutions

It is through institutions that humans search for the means to solve social problems

Our current institutions have evolved to serve purposes far different from those required under an ecosystem approach. Specific ideas about science and politics have shaped our existing institutions These ideas include a view of forests and rangelands as selected resource outputs, the assumption that humans can perpetually improve the yield performance of forests and rangelands through scientific management and technology, and a view that people exist apart from ecosystems—linked only by the flow of jobs, income, and products for human consumption (Kessler 1994). Our understanding of nature has undergone substantial changes, however, and it is time to assess whether formal and informal institutions are consistent with new circumstances and demands

Formal institutions, such as Federal land management agencies, have traditionally relied on scientific management, centralized planning, and governmental authority in managing the Nation's lands, authority has been centralized in arenas often closed to the full participation of citizens Resource institutions in particular have been characterized as insular, hierarchical, output oriented, and protective of turf. Further, most ecosystems cross Federal, tribal, state, and local jurisdictions as well as private ownerships. Yet, traditional land management "divides land and water along political boundaries and sections ecosystems into commodity resources" (Cortner and Moote 1994: 172). Finally, few existing institutions ascribe rights to nature, but ecosystem management may arguably require this.

Ecosystem management will also require changes in informal institutions These are the customs and practices, governed by norms of behavior, through which we approach natural resource management. These customs and practices are embedded in how we have been taught to think and speak of resources in categorical types, such as timber, wildlife, water, and minerals. This common conception of resources as separate and insular is reflected in the separation we find in research projects and

resource disciplines. Calls for an integrative approach to management and research will have to recognize the importance of informal institutions. Adherence to specific methodologies, heuristics, and cultural beliefs may lead us to the wrong lessons. For example, we often speak of property as either public or private, but the complexity of current property arrangements often blurs this distinction (Geisler and Kittel 1994).

Institutions have a key role in ecosystem management because they create mediation opportunities between citizens and larger issues. By providing a place for citizens to meet and discuss resource issues, agencies often can help communities examine larger social issues, such as high rates of unemployment and new avenues for economic development. This approach was adopted with some success in the Columbia River Gorge in communities such as Stevenson, Washington, and its surrounding area It is often through civic participation that people connect to larger social issues (Kettering Foundation 1993). As de Tocqueville notes, "Town meetings are to liberty what primary schools are to science; they bring it within the people's reach, they teach men how to use it and enjoy it. A nation may establish a free government, but without municipal institutions it cannot have the spirit of liberty" (de Tocqueville 1945 61) The formal institutions described by de Tocqueville, as well as informal institutions, can provide an opportunity for the public to shape its individual and initial reactions into more reflective and shared judgments (Kettering Foundation 1993 vn) We need to examine the potential of existing institutions to invigorate civic participation (Shannon and Anderson 1994).

Ecosystem management will require both increased deliberation on public issues and a process of social learning. Social learning occurs when people develop collective courses of action for managing resources. A goal of social learning is to direct conflict in constructive ways (Lee 1993). This kind of deliberation can lead to the discovery of public ideas—ideas about what is good for society (Reich 1988). Public deliberation is especially important when controversy and conflict are at the center of an issue (Lee 1993, Reich 1988) As Shannon (1993 244) notes, "The purpose of public deliberation is not to achieve sameness, but rather to recognize and value difference " The benefits of social learning for a society include that the problem and the solution(s) may be redefined, voluntary action may be generated, preferences may be legitimized, individuals may change through realizing what is good for society, and deeper conflicts may be discovered (Lee 1993, Reich 1988).

In addition to increased public deliberation and social learning, an ecosystem approach also suggests that changes will be needed in the internal organizational structure of institutions and in the way organizations relate to each other. Natural resource organizations largely reflect the "classical bureaucracy" described by Max Weber at the turn of this century (Weber 1893). This type of organization has characteristics such as a hierarchical structure, compartmentalized departments, a downward flow of policy and information, detailed rules, and clear lines between the organization and its environment (Meidinger 1994). In general, policy is set at the uppermost level of the organization An ecosystem approach suggests that institutions should be complex and adaptive rather than hierarchical and rigid. Policy and information should flow up the organization as well as down. For instance, in a flexible organization, information based on management experiences flows up the organization from field offices and helps to frame policy at higher levels.

Increased cooperation among agencies and across jurisdictions also will be an essential component of any efforts to implement ecosystem management (Keiter 1994a, Sample 1994b). Further, ecosystem management speaks of blurring the boundary between the agency and its environment, including the public Networks, interorganizational coordination, and the sharing of knowledge and authority are characteristics of institutions under an ecosystem approach Rather than compartmentalizing institutions (for example, public versus private, Federal versus local, USDA Forest Service versus Bureau of Land Management), integrated management is called for.

Changes in institutions mean changes in the location of control. Sharing decision-making with citizens may lessen the influence of technical experts; this raises concerns about loss of power, and is often viewed with alarm People fear that they will lose their jobs and prestige or even their ability to make decisions about things they made decisions on in the past (Yaffee 1994). Learning new things disrupts the comfort of standard operating procedures and requires significant investments of time and energy Further, changing institutional structures and behaviors involves risk taking. The threat of sanctions, either real or implied, can easily constrain the innovation and creativity of an organization's employees (Stankey 1994).

This suggests two emphases in approaching institutional change. (1) the attitudes, values, and perspectives of individuals within and outside of institutions, and (2) the properties of institutions themselves (Kessler 1994) At the first level, as individual norms change, the organization itself is gradually changed. Norms within organizations are central because they provide patterns for how people relate to each other and organize their work (Meidinger 1994) Cultural factors such as shared understandings and the capacity to create new understandings may be among the most important factors in changing institutional structures from hierarchical control toward more coordinated mechanisms (Sullivan 1982) At the second level, by changing properties of the institution as a whole, individuals change. We must examine both avenues of change for ecosystem management to be successfully implemented.

Changes in institutions mean changes in the location of control

Focusing on Institutions: Five Problem Areas

Defining and researching institutions is a complicated task, partly because institutional arrangements are difficult to categorize (Schlager and Ostrom 1992). Interrelations and interdependence exist among formal and informal institutions as well as among the multiple social levels on which they operate (Ostrom 1986). These formal and informal institutions often overlap and tend to reinforce each other. In fact, much of the increasing debate over ecosystem management is about the informal norms that underlie our formal institutions Meanwhile, new norms are slowly emerging as changes occur in the way we view the management of natural resources.

The following sections identify five problem areas where social science research can improve our understanding of what needs to happen so that ecosystem management can be implemented. As noted earlier, these problems and their corresponding research objectives do not represent the full array of research topics. They are intended to provide the basis for a program of institutional research and yield information for managers to consider in their efforts to implement ecosystem management on the ground.

Problem One

Problem one involves the extent to which existing laws, policies, and regulations may constrain or aid the development and implementation of ecosystem management policies, programs, and practices, which is unknown. The economic dimensions of ecosystem management also are unknown.

Rationale—We do not fully understand how the concepts of ecosystem management fit into the existing legal and political structure guiding resource management. Although existing laws may contain fragments of ecosystem management concepts, there are still significant barriers to be confronted (Keiter 1994a) For instance, laws dealing with natural resource management and environmental quality tend to divide ecosystems by arbitrary political boundaries bearing no relation to ecological structures or functions. Further, most laws divide management and production by resource categories, such as timber or endangered species. Federal laws such as the Clean Water Act, the National Forest Management Act, and the Endangered Species Act, and their accompanying regulations, have been criticized for being overly prescriptive and inflexible. The applicability of Federal law to private, state, and tribal lands is sometimes unclear, and this has important implications for cross-jurisdictional planning and management Antitrust and private property laws and the potential impact of the Federal Advisory Committee Act (FACA) must be considered when managing resources cooperatively and across jurisdictions. If ecosystem management is going to be more than "another layer of standards and guidelines" (American Forest and Paper Association 1993: 4), we need to assess more fully how these laws and regulations will apply to it

Similarly, Federal budgetary processes have been criticized for not giving local decisionmakers flexibility to tailor their resource allocation and land use decisions to site-specific and landscape conditions (Sample 1994a). Current budgetary allocations are also contingent on commodity outputs and do not provide long-term support for maintaining and monitoring ecosystem health. Concern over the national debt and general taxpayer sentiment in favor of cutting taxes and government spending could have important ramifications for funding the extensive research, data management, coordination, and long-term planning called for in ecosystem management literature.

The role of the judicial system in resource management also needs to be examined in the context of ecosystem management. Particularly since WWII, the courts have played an important role in defining and enforcing environmental standards and planning procedures. Adjudication has become a preeminent part of the natural resource planning and law enforcement processes. The law and regulatory systems are rigid and highly codified; law is about control, rather than coordination and information sharing.

We need a better understanding of how the movement to ecosystem management will evolve in economic terms The costs of managing the environment based on ecological prescriptions will be large (FEMAT 1993) and require significant investments in labor and capital Also, as traditional sources of capital diminish, such as taxes on commodity production, new capitalization strategies must be developed to fund resource management programs (Ewing 1994). The costs of both adopting and not adopting an ecosystem approach need to be defined, while recognizing that it is difficult to place economic values on ecosystem functions. An analysis of the role that economic institutions, specifically the market, play in promoting the ecosystem approach on both public and private lands is important (Ewing 1994). Markets often

are advocated as a more efficient means than government institutions to manage resource systems and protect public goods (Anderson 1992, Stroup and Baden 1983). However, many values associated with resource systems, such as ecological functions and spiritual renewal, are not exchanged within markets, more effective means of defining these values are needed (Stankey and others 1992). Finally, we need to clarify the relations between economic growth and ecosystem sustainability.

Researchers need to assess how the current legal, political, and economic frameworks facilitate or inhibit the use of alternative policies Natural resource policies developed under an ecosystem approach must be assessed. How can flexibility and accountability be balanced? Understanding current and future political trends and their implications for ecosystem management will be a key component in the discussion of alternative approaches.

Objectives—

- Review existing laws and regulations at all levels of government to identify barriers and opportunities for implementing the principles of ecosystem management.
- Develop alternative legislative and regulatory reform proposals for implementing ecosystem management (for example, model ecosystem management statutes and regulations).
- Examine how the public trust doctrine and antitrust legislation can affect efforts to cooperate.
- Assess the potential impact of the Federal Advisory Committee Act on efforts to manage cooperatively within and across boundaries
- Examine and assess legislation and institutional arrangements in other countries and cultures for possible application in the United States.
- Assess and evaluate the role of the judicial process in natural resource decisions.
- Assess and examine the constitutional limits of implementing ecosystem management on private property, including traditional concepts of property rights and their effects on cross-jurisdictional management
- Evaluate the kinds of changes in appropriations and budgetary processes needed to facilitate ecosystem management
- Conduct a macroeconomic analysis of the relation among levels of economic growth, rates of change in environmental quality, and long-term resource sustainability
- Assess the distribution of economic costs and benefits of ecosystem management and other management approaches.
- Evaluate the applicability of nonregulatory and nongovernmental models (for example, the market) for ecosystem management on both private and public lands.
- Identify and assess the costs and benefits of participating in cooperative ecosystem management arrangements for both large and small landowners
- Assess the impact of implementing ecosystem management in rural communities lacking local governance structures and budgets.
- Address the need to balance flexibility and accountability in terms of ecosystem management.

Problem Two

Problem two states that under an ecosystem approach, institutional mechanisms for managing across jurisdictions are mostly unknown and have uncertain effects.

Rationale—Ecosystems cross political and jurisdictional boundaries; it is rare to find an ecosystem wholly contained on land belonging to a single owner. An ecosystem is often a patchwork of Federal, state, tribal, corporate, municipal, private, and other types of land; moreover, responsibility for the management of Federal and state lands is divided among many agencies. These agencies often have overlapping Jurisdictions and differing mandates, which cause them to work at cross-purposes (Keiter 1989). Agency jurisdictions are further fragmented by resource type and geographic area These overlapping and sometimes competing jurisdictions may be a barrier to efforts to adopt ecosystem management. As dark and others (1991: 415) note, the "fragmentation of authority and overlapping agency authorities can result in cooperation or mutual obstruction " For efforts in implementing ecosystem management to succeed, resource managers will need to acknowledge mutual responsibility for ecosystem components and processes that transcend conventional boundaries (Keiter 1994b)

The multiple scales of ecosystem management require improved interorganizational coordination as well as cooperation among a broad range of interests (Sample 1994b); therefore, a significant challenge is to take existing tools for managing across mixed ownerships and match them to the appropriate management situation. Further, we need to design new tools that foster cooperative approaches to resource management. New institutional arrangements linking existing organizations in a network also may increase opportunities for coordination across boundaries. Institutions must be flexible to adapt and change, and they must have the ability to foster partnerships that include a diversity of interests. Although informal and formal methods of interagency and public-private coordination already exist, they have not resulted in interagency coordination on the scale called for in ecosystem management (Cortner 1994, Wondolleck and Yaffee 1994)

Federal agencies have an opportunity to demonstrate leadership and increase public trust by reducing "turf protection" and putting public service ahead of organizational survival (Force 1994) Research is needed, however, on how power and authority should be allocated across these interorganizational networks. Alternatives include establishing standards and rules, creating interagency coordination committees and regional entities, and developing basic procedural guidelines (Keiter 1994b).

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Most significant, however, is that efforts to implement ecosystem management will fail unless they include private landowners. Attempts to manage land uses divorced from ownership realities are ineffectual (Geisler and Kittel 1994). Clearly, the high cultural value that U.S. society places on private property rights requires research into how we can implement ecosystem management without infringing on those rights.

Research also must recognize that property tenure systems in society today are dynamic and diverse. Too often public debate, policy, and research focus on the dichotomy of private and public property and miss the complexity and richness of the hybrid forms of land ownership that already exist (Geisler and Kittel 1994). Increasingly, in areas such as the Columbia River Gorge and the Applegate area in southern Oregon, new institutional arrangements for managing property in mixed ownerships are beginning to evolve (Geisler and Kittel 1994).

The right to use and own property is an institutional process characterized by contingency and change. Property itself is a social construction that is undergoing continual modification through court rulings, new philosophical and ethical currents, and changing societal values toward labor and capital (Geisler and Kittel 1994) Changes in the institutions of property warrant deeper analysis as they relate to ecosystem management. Public-private cooperation and new categories of shared land ownership may require ownership changes for both private and public lands (Reidel and Richardson 1992) Managing across political boundaries also may imply opening public lands to more uses (Geisler 1992). Furthermore, preserve lands and other "single-use" designations may be inconsistent with ecosystem management goals.

We also need to identify the political and ecological impacts of local decisionmaking Questions include, What is the community of interests for any given ecosystem? What is the role of urbanites not living near public lands but who have an interest in their management? What voice do concerned citizens have for ecosystems on private lands? What incentives and resources will be required for private landowners to practice ecosystem management? Will local planning and decisionmaking lead to the "tyranny of local rule"? As Lee and Stankey (1992: 30) note, ecosystem management seems to present a "paradox of scale, small scale institutions are required to effectively regulate large-scale ecological processes." Research needs to address these and other issues associated with alternative forms of cross-boundary management and the possible effects of the alternatives.

Objectives—

- Assess existing policy tools for managing across mixed ownerships (for example, easements, land exchanges, tax incentives, regulation, partnership parks) and develop new tools and institutional arrangements for integrating and coordinating natural resource management
- Inventory land use and property rights systems in other countries that could aid in implementing ecosystem management in the United States.
- Compare decentralized and centralized approaches to land use and how they fit with ecosystem management principles.
- Assess and modify classifications of property types to reflect current institutional richness and diversity
- Identify and evaluate land-use classifications, such as adaptive management areas, wilderness areas, national conservation areas, and other special designations.
- Evaluate how alternative organizational arrangements for collaborative management, such as councils, ad hoc groups, and coordinating agencies, distribute power, authority, and responsibility, and accomplish ecosystem management goals.

- Develop working definitions of "coordination," "cooperation," and "collaboration" for ecosystem management
- Identify the impacts of partnerships on the implementation of ecosystem management in terms of community and economic stability and protection of private property rights.
- Compare the effectiveness of regulatory and incentive-based approaches for ensuring commitment to ecosystem management objectives.
- Examine the implications of emerging social movements (for example, the "wise use" movement) on efforts to implement ecosystem management.
- Evaluate the barriers and opportunities presented by existing hybrid property arrangements for achieving the social and ecological objectives of ecosystem management

Problem Three

Problem three states that adopting the ecosystem approach as a management philosophy may require both internal organizational change and the formation of new relations between resource management agencies and the public. The level of public support for ecosystem management is unknown, however.

Rationale—The importance of organizational change, especially in the relations between land management agencies and the public, is crucial in moving toward an ecosystem approach Because of the complexity and uncertainty involved in such a move, as well as the need for land management agencies to develop better relations with the public, institutions will have to become more flexible and open in decision-making and develop new models of leadership and coordination (Boyle and others 1994, Lee and Stankey 1992) Current norms and procedures found within natural resource agencies and other organizations such as interest groups, universities, and professional societies may produce both opportunities and barriers to implementing ecosystem management

Professional norms affect the identification of management goals and the formulation and adoption of the means for achieving those goals (Kennedy and Roper 1989, Kennedy and Thomas 1992). Agency culture may present a substantial barrier to ecosystem management: "the federal agencies may be incapable of looking beyond their own traditions, values, and management problems to translate . . . ecosystem management goals . . .into meaningful policies and practices" (dark and others 1991 418). For example, the current system of incentives and rewards within natural resource agencies is based primarily on commodity production (Boyle and others 1994) Efforts toward improving ecological conditions traditionally have not been rewarded, however, a more diverse workforce (by discipline, gender, and ethnicity) has brought new attitudes and perceptions into these agencies that may provide support for new approaches (Boyle and others 1994).

Innovation and new forms of leadership are impeded by hierarchical internal decision-making structures, the risk aversion found in upper levels of decisionmaking, and standards for organizational promotion (Boyle and others 1994). Centralized bureaucracies with rigid rules and regulations and a hierarchical chain of command may be barriers to innovation (Meidinger 1994, Osborne and Gaebler 1993); thus research is needed on the internal organizational structure of agencies Ecosystem management requires flexible and adaptable institutions that involve citizens rather than just serve them (Osborne and Gaebler 1993)

Under ecosystem management, the role of land manager may include educator, mediator, technician, conflict manager, public relations specialist, scientist, or some combination of these roles

The relation between the public and the agencies' roles in resource decisionmaking is another issue that will affect the adoption of ecosystem management. Presently, there is a lack of trust among resource agencies, other organizations, and the public. Although the rhetoric and research calling for increased public participation is voluminous, little has changed in the way agencies work with the public. In fact, public distrust of natural resource agencies and professionals has continually increased (Force 1994) Some have suggested that one way to restore trust between the public and governmental agencies is to shift away from linear step-by-step approaches to public participation to those that are flexible, open, and encourage a rich public discourse (Cortner and Shannon 1993, Orr 1992, Stanley 1983) Specifically, to meet the requirements for open communication and open decisionmaking, institutions must disperse authority and power to a wider array of participants (Blahna and Yonts-Shepard 1988, Kweit and Kweit 1987) Distributing responsibility and authority widely among citizens can encourage people to engage in critical thinking (Leiss 1974, Shannon 1993) and reach public Judgment, that is, an informed position on important issues, not simply public opinion (Yankelovich 1991).

Instead of primary reliance on technical experts, ecosystem management—when seen as a process whereby goals are socially defined—requires that decisions be made by a wide variety of people It follows that land management agencies have a key responsibility to provide forums where public deliberation can occur (Force and Williams 1989; Stanley 1983, 1990). In fact, we need a major restructuring in the nature of information and how it is communicated Rather than relying solely on the opinion of specialists, decisionmaking processes must be capable of accommodating new forms of knowledge and multiple sources of information (Stankey 1994) Thus, under ecosystem management, the role of land manager may include educator, mediator, technician, conflict manager, public relations specialist, scientist, or some combination of these roles

This type of decisionmaking can be contentious and seemingly disruptive as people work toward an understanding of goals they hold in common. Social discourse can become mired in conflict. Conflict is not necessarily a negative factor, however. It can sometimes serve important social functions, such as providing an incentive for agencies to search for innovative solutions (Lee 1993). The conflict surrounding old-growth forests in the Pacific Northwest, for example, has led to the creation of new institutional arrangements in the region, such as Adaptive Management Areas.

We need a better understanding of why and how new institutional arrangements arise among resource agencies and the public. Across the country, local community organizations are making efforts to improve the landscape. Grassroots in nature, and often composed of local residents, these groups are oriented toward action and show an ability to form networks with other groups and government entities. The rise of these groups raises serious questions about the role of locally empowered groups versus regional or national level authorities, and has led us to examine alternative methods of decisionmaking, concepts of leadership, and roles of the public and

agencies. These concepts are themselves related to broader questions of accountability and democracy. For example, we need to consider the implications of delayed administrative decisionmaking due to community discussions, coordinating agencies, and decisionmaking by consensus We also need to identify methods that balance accountability in light of increased public participation in agency decisions. Questions that need to be asked up front include, How do resource professionals become more politically responsive without becoming "politicized"? How should responsibility for defining and creating institutions and decisionmaking structures and processes be allocated? How can the interests of future generations be represented?

Ecosystem management will require widespread support among the general public. To succeed, it must not only be a political process but also a democratic one. The level of political support for an ecosystem approach is, however, unknown. The dominance of traditional constituencies over resource management agencies has eroded and new constituencies are emerging. Over the last 30 years, the general population has shown increasing concern for the environment, as evidenced by community recycling efforts, neighborhood cleanups, trail and riparian restoration efforts, and the number of grassroots groups dedicated to improving the landscape. Also growing, however, is an increasingly vocal portion of the public who believe that environmental regulation is excessive and that environmental protection is often at the expense of the Nation's economy The 1994 elections brought into office many more officials who hold these positions and promise changes in the internal organization of Congress and in how Federal and state governments relate to one another. How these changes may help or hinder the adoption of ecosystem management will need to be examined. Ultimately, though, in our democratic society, the public must decide what value to place on the issues surrounding an ecosystem approach.

We need to undertake a parallel process within academic institutions. Changing professional attitudes, norms, and working relations may require redefining concepts of expertise and professionalism Universities and professional societies have an important role in forming these norms and will have to undergo substantial changes. Currently, professional norms do not favor the interdisciplinary types of studies envisioned by ecosystem management Publication for tenure, academic jargon, and professional arrogance make it difficult to undertake studies across disciplines, especially those bridging social and natural sciences. Team teaching and team research, both valuable components of interdisciplinary projects, often are not rewarded under current tenure guidelines

Objectives—

- Improve our understanding of how the organizational structures of agencies, professional societies, and academic institutions impede or facilitate their capacity to adapt to change and to collaborate with other interests
- Examine the internal organizational culture, incentives, and rewards of agencies, professional societies, and universities to change behavior and disperse power.
- Explore the various meanings of collaboration and their implications for present and future institutional arrangements for natural resource management.
- Assess the role of risk-taking behavior in encouraging or resisting internal organizational change and the development of innovative leadership.

- Assess the negative and the positive effects of collaborative decisionmaking, such as the reinforcement of power relations on one hand, and building consensus on community goals on the other.
- Develop ways to integrate the technical knowledge of specialists with the personal knowledge of local residents.
- Assess alternative decisionmaking processes for ecosystem management, such as new forums for decisionmaking at the local level.
- Assess how and why new community groups arise and organize to address problems concerning natural resources.
- Examine how locally based planning efforts in other contexts, such as health, neighborhood planning, and education, have worked (or not) as models for potential application in natural resource management
- Examine the constituency for ecosystem management (for example, level of public support, shifting bases of power, effects of urbanization, and the role of the media).
- Assess the voting behavior of citizens and representatives to determine the role natural resource issues play in elections and congressional voting
- Examine the impact of organizational changes created by various political alignments in Congress.
- Determine the impacts of gender, professional training, length of tenure, and experience of interdisciplinary teams on the attitudes of professionals toward ecosystem management.

Problem Four

Problem four states that ecosystem management requires the examination of the theories guiding resource management

Rationale—To understand fully the implications of alternative resource policies such as ecosystem management, we must examine the theoretical principles underlying resource policies. Too often the link between theory and the development of policy is overlooked We have much to gain by a shift from examining policies to questioning theoretical principles Questions of political theory, whether implicit or explicit, underlie every policy (Sandel 1988, Stillman 1976) Reich calls the set of assumptions that underlie policy decisions "the philosophy of policy-making" (Reich 1988: 1) and notes that beneath the activities of elected officials, administrators, and the public exists a "set of first principles that suggest what good policy-making is all about" (p. 1) These principles reflect a certain view of human nature, such as whether people are motivated solely by self-interest or are capable of thinking about the community as a whole; what it means to be a citizen, including whether citizens are the ruler or the ruled, and what the appropriate role of government in society is, to coerce or to convince. Some argue that ecosystem management is calling for a new set of such principles (Stanley 1994b)

Examining the theoretical principles underlying our natural resource policies is a valuable exercise (Leiss 1974, Rodman 1980) From a theoretical perspective, questions to ask of resource policies include, What is the role of government in

the management of natural resources? What is the role of citizens in forming policy? What is the capacity of humans to participate in governing? At what point is participation representative? To what extent should the votes and opinions of elected officials override public sentiment as measured by other means? Should political representation reflect ecosystems rather than political districts? What is the view of our society toward nature? What is the relation between how we view nature as a society and our patterns of politics? We live our answers to these questions every day, and the growth and development of our political society depend on their constant reassessment. The answers to these questions form the theoretical principles that our resource policies are based on. Analyzing these principles can help us in developing benchmarks and alternative visions of the future, developing criteria to evaluate policies, and framing new theories and policy alternatives.

Examining the existing theoretical base can lead us to new ways of thinking about relations between humans and nature, people and government, and among humans themselves Ecosystem management may require profound, root transformations of "big picture" understandings that will appear revolutionary to some (Stanley 1994b) We need to ask key questions about the relations between humans and nature, the character of our political life, the relation among national, regional, and local interests; and the relation between ecosystem management and sustainable development. Policies developed under an ecosystem approach may require answers quite different from those that would derive from today's policies. We need to test theories about such relations if ecosystem management is adopted as a philosophy to guide resource management

For example, in the past, theoretical principles underlying natural resource management in the United States have emphasized the mastery of nature by humans (Wallace and others 1994, Worster 1992). Nature has been viewed historically as separate from humans, and traditional science has reflected this world view. Further, American political traditions and institutions emphasize the rights of the individual over the interests of the community (Christensen and Richardson 1994), and the sense of community, place, and belonging that has long been a tradition in western political thought is lacking in contemporary society (Stegner 1992). Policies in the past have been forged with little awareness of the larger community or of the actual landscape, however, by embedding human society in nature, ecosystem management implies a concern for both community and place.

Important theoretical questions about the appropriate roles of government also are implicit in an ecosystem approach. For example, some have argued that the threat to ecosystem health is so great that only more centralized government authority and power will be able to protect and manage ecosystems for the future (Ophuls 1976). Under this view, people must be constrained by a large central authority for society to achieve large-scale goals to address severe problems; the increasing scarcity of resources will therefore create "overwhelming pressures toward political systems that are frankly authoritarian" (Ophuls 1977: 163).

By embedding human society in nature, ecosystem management implies a concern for both community and place.

Others counter that a more decentralized approach to resource administration is needed so that management can be tailored to local ecosystem conditions (Behan 1988). Rodman (1980), for instance, advocates a decentralized and participatory society organized around local ecological conditions. Others call for building "ecologically rational" communities by eliminating social hierarchy in organizations (Dryzek 1987). Underlying this view is a belief that people have a capacity for self-governance that has been thwarted by the increasingly centralized nature of our society As Orr (1992- 71) notes, "the transfer of power, authority, resources, talent, and capital from the countryside, towns, neighborhoods, and communities to the city, corporations, and national government has undermined in varying degrees responsibility, care, thrift, and social cohesion—qualities essential to sustainability " We need to address these alternative ways of looking at the role of government under an ecosystem approach.

Similar shifts in thinking may be needed for science and how we approach knowledge In traditional resource management, shortcomings in knowledge are attributed to a lack of theoretical, methodological, or technical rigor, or to inadequate budgets (Stankey 1994). Under an ecosystem approach, knowledge is a much more fluid concept Knowledge is recognized as having a social character, science and knowledge are viewed as shaped by society as a whole (Bird 1987, Wheatley 1992) Using science to understand nature is very much a give and take process. Under an ecosystem approach, experts work in concert with society, not alone as is traditionally done, to understand social and ecological problems

Objectives—

- Assess the theoretical underpinnings of the different meanings of ecosystem management as framed by the general public, resource managers, different scientific disciplines, and others
- Examine the relation between ecosystem management and different theories of politics such as liberal democracy and civic republicanism
- Analyze traditional and alternative ways of thinking about the relation between humans and nature in the United States and other cultures
- Assess and compare how various political and social theories treat relations among individuals, groups, and communities in relation to natural resources
- Examine theories of representation, including the role of elected officials, locally appointed community representatives, and citizen groups, in relation to ecosystem management.
- Examine alternative theories of citizenship, including the role of the citizen in formulating natural resource policies
- Address federalism as a theory of governance as it relates to relations among levels of government, branches of government, and the public
- Compare and assess alternative theories of public participation and decisionmaking to understand how decisions are made.
- Assess how social and cultural values affect the development of new philosophies of natural resource management.

- Examine theories of place and community in Western political thought.
- Identify the theoretical underpinnings of on-the-ground natural resource projects that reflect ecosystem management concepts.
- Explore alternative theories of knowledge and the implications for scientific inquiry.

Problem Five

Problem five states that current methodologies for researching institutional questions are insufficient to address the goals of ecosystem management.

Rationale—Ecosystem management will require new methods of scientific inquiry, including different approaches to knowledge and research methods. Our research needs and understandings of the world are changing, and we simply cannot ask the same questions or use the same methods we have in the past, from either the bio-physical or the social science perspective. Uncertainty about the utility of existing institutions, or their alternatives, requires that we evaluate them from several perspectives Institutional studies for ecosystem management will require integrating traditionally distinct schools of thought, particularly the social and natural sciences.

Many methodological approaches to institutional research have potential to further the goals of ecosystem management, however, to date, few have been used in research on natural resource-based institutions. For example, Force (1994) suggests exploring and testing methodologies from the work of "new west" historians and environmental historians, inquiries by anthropologists and others into indigenous knowledge, feminist theories, systems research, methods based upon catastrophe and chaos theory, and recent contributions that strengthen the general field of qualitative research

Ecosystem management clearly calls for interdisciplinary research—research fully integrating the social and physical components. Separateness within the sciences is a barrier to interdisciplinary research and is contradictory to the idea of holism embedded in ecosystem management. The science of ecology has traditionally used reductionist research approaches that lead away from understanding the processes and functions of whole, complex ecosystems (Stankey 1994) Further, much of the data about ecosystems and the social consequences of an ecosystem approach are incomplete. Existing data sets were collected by different methods and often are not comparable (General Accounting Office 1994). Simply creating an integrated data-base, therefore, faces substantial barriers.

Attention by researchers and resource managers also must focus on questions of measuring policy successes and failures. Specifically, ecosystem management will require changes in the way success is measured and even conceptualized. The different components of success include impacts on land conditions, organizational environments, and people's behavior and perceptions In the past, methods used in policy analysis and evaluation have been narrow in scope, focusing on whether specified objectives have been met. Economic indicators have most often served as the predominant criteria used in evaluations (Wallace and others 1995). To monitor ecosystem management initiatives, we need to develop approaches able to recognize unintended consequences that may differ quite dramatically from stated goals or objectives

Research must recognize the complexity involved in evaluating resource policies Methods to identify various indicators of success or failure in policy design must be developed, many of the best lessons for resource managers lie in policies that are considered failures. A project deemed a failure from the standpoint of stated objectives may have yielded tangible benefits, such as a decrease in conflict, the establishment of communication, or lessons for application at another place or time This broader evaluation of success and failure, particularly if combined with a case study approach, can provide valuable lessons for guiding the development of future policies (Wondolleck and Yaffee 1994)

We also need better methods for integrating economic analysis into broad social and political research Under an ecosystem approach, there is an increasing range of values whose importance and worth are not captured by the economic marketplace (Stankey 1994), for example, a sense of community and place or the sublime experience of a wilderness area We need to understand how or even whether these values can be represented in a way that permits some form of economic measurement (Krutilla and Fisher 1985) Ecological economics, which seeks to incorporate the value of ecosystem functions into economic theory and analysis, may be a useful approach (Bradley 1991, Common and Pernngs 1992) Some economists argue, however, that not only is valuation of natural resources often impossible, but also unnecessary (Vatn and Bromley 1994)

We need to develop methods that can help us understand more fully the relation between scientific data and uncertainty Natural resource issues often are characterized by high levels of complexity and low levels of knowledge, leading to high levels of ambiguity in decisionmaking and disagreement about how problems are defined (Stankey 1994) To identify relevant research questions, agency personnel and scientists must develop better ways of communicating with the public Agency and scientific jargon have been a significant barrier to communities having a voice in decisionmaking Broad conceptual terms such as ecosystem management, sustainability, and forest health pose particular problems in communication, because people have very different views of what such terms mean (Chri stensen and Richardson 1994). Researchers and administrators have a responsibility to speak plainly and clearly so that resource managers and the public can understand them

Objectives—

- Develop methods to integrate knowledge derived from both physical and social sciences, including connections among science, ethics, and philosophy
- Develop new research methods that recognize the importance of context and incorporate qualitative as well as quantitative information
- Develop methods to integrate theoretical contributions and ideas with management practices
- Design research and implementation methods incorporating feedback mechanisms for learning about the uncertain effects of management actions.
- Explore how land management agencies might integrate ecological sciences and public values to achieve ecosystem management, alternatively, explore the relations between scientific data and public values in determining management priorities

- Develop ways to integrate understanding and analysis of social and natural processes, such as incorporating social data and analysis into Geographic Information Systems (GIS)-based analyses.
- Develop new approaches to policy evaluation so that on-the-ground accomplishments of ecosystem management experiments can be measured.
- Design research and implementation methods capable of addressing different temporal and spatial scales of management.
- Design and test new methodologies for transferring the results of scientific research to potential users
- Design methodological approaches for analyzing and evaluating nonroutine and nonincremental shifts in policy
- Develop case study approaches that allow information sharing among sites with similar features
- Examine methods of ecosystem valuation to determine their applicability in ecosystem management.

Strategies For Research: Where Do We Start?

The companion document to this problem analysis (Stankey and dark 1992) concludes that a number of approaches will be necessary to deal with the issues and research objectives discussed in their report. These approaches include

- synthesis, interpretation, and integration of existing knowledge
- development of new concepts, frameworks, and tools
- baseline and descriptive studies
- analytical and experimental studies
- demonstration projects
- forums
- continuing education

In addition to emphasizing the importance of these approaches, participants at the October 1994 workshop suggested specific activities in each of these categories, including several that cut across different categories. Examples of specific suggestions included'

- A program in which research objectives from this problem analysis are used by a clearinghouse to generate dissertation topics. This program would be overseen by a separate interdisciplinary committee. The goal over 5 years would be three to five dissertations a year resulting in publishable book-length manuscripts.
- Electronic "brown bags" for sharing research ideas and results among interdisciplinary networks of researchers and managers.
- A new professional society to bridge the insularity of the separate disciplines engaged in ecosystem research and to provide a forum for research dissemination.

- Service learning in which young people (K-12 as well as higher education) work with citizens and community agencies on community-defined ecosystem management concerns and engage in systematic reflection about their experiences
- Forums focusing on the results of experimental educational methods, including multimedia techniques and computer-based learning technologies.

Participants also discussed ways to prioritize and classify research Any comprehensive research problem is composed of different types of research, each with different goals and uses (Alston 1994) A simple schematic in figure 2 divides research along two continua—by time scale from short-term to long-term and by orientation from theory to practice Ultimately, the goal is to have a healthy mix of all types of research; but because funds are limited, priorities need to be set, which will create a number of dilemmas.

Perhaps the most perplexing dilemma is finding the balance between research focused on short-term, practical problem solving, and research focused on long-term, theoretical development As noted earlier, we are entering new frontiers where "we do not know what an institution or institutions for carrying out ecosystem management on a landscape or ecosystem scale should look like" (Shannon and Anderson 1994' 160) At this time, resource managers are carrying the responsibility for implementing the concepts of ecosystem management and for experimenting with new institutional designs and forms It is therefore important that research focusing on these issues address the practical questions that managers face in a timely and an understandable manner The types of research projects initiated and their presentation need to be extremely sensitive to managerial needs and concerns

There are, however, practical, and ultimately ethical, dilemmas of how far social science research should go to be responsive to the particular political and policy agendas of current decisionmakers and managers Research solely defined by the short-term needs and concerns of managers is biased, by its very nature, toward the status quo; in the extreme, it entrenches the power of existing institutions With this focus it becomes too easy to ignore the theoretical questions underlying the reasons why problems emerge or solutions fail to remedy problems Questioning and evaluating institutions in this macro sense is, however, at the core of citizenship and the democratic process.

Although it is urgent that we work at a practical level, theoretical and philosophical questions must nonetheless be addressed Such investigations go to the underpinnings of democratic theory, allowing us to take off our glasses, try on the glasses of others—including those of other cultures—and in the process, grind new lenses (Alston 1994). We should recognize that our sense of the appropriate level of scientific involvement in policy and problem solving is itself influenced by democratic precepts that place boundaries between theoretical science and management Indeed, disciplines such as political science have long been divided between those who believe their first priority is to promote research that advances theory and strengthens the discipline, and those who believe their fundamental obligation is to direct research toward policy issues and applied problem solving (Lowi 1992, Ripley 1991)

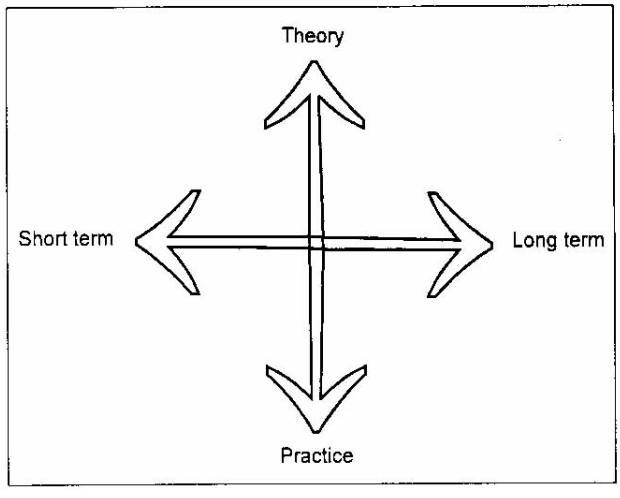

Figure 2—Research can be divided along continua short term, long term, theory, and practice

There will always be tension between the need for research that is responsive to immediate managerial issues and research that addresses classical and fundamental questions. If research centered on long-term, theoretical questions gets too far ahead of short-term goals by giving too little attention to the issues and institutions that presently create peoples' reality, there will be little common dialogue among researchers, management, and the public In that case, it would be difficult to build the necessary political and financial support for social science research.

Social science research in natural resources has never been a high priority. Its funding has always been limited—a lament at most gatherings of natural resource social scientists This occurs, in part, because managers often believe that social science research simply verifies conventional wisdom, and that experience is the best teacher about the social and political environment in which they operate. The language of social science is full of jargon and seems incomprehensible to managers who want researchers of all disciplines to speak in plain language.

We need a good track record of applied research addressed to the short-term problems encountered in moving ecosystem management theory to operational, on-the-ground applications. This would go a long way in building support for social scientists to address critical theoretical and methodological questions and to transfer the results of these fundamental investigations in a meaningful way. For example, research on the question of managing across ownership boundaries (problem two) is at the core of our ability to move forward with ecosystem management. Such research certainly addresses issues that are "hot" politically. Alternatively, studies examining whether the theoretical bases of ecosystem management are consistent with the political theories currently underlying most existing institutions in our society (problem four) are critical in the long term Realistically, many of the studies in this problem area are unlikely to attract major funding support at this time, particularly from government agencies Support for such studies more likely depends on the ability of social scientists to first demonstrate—more convincingly than they have in the past—their ability to effectively address short-term applied problems.

We also must remember that neither the public nor resource managers may find relevance in academically intriguing studies if there is no baseline information to ground their understanding Ideas are a cumulative social process; we need to review and synthesize developments and not "reinvent the wheel" (Stanley 1994a). Consequently, we urgently need synthesis studies on institutions and institutional approaches to natural resource management, public participation, decisionmaking, and education A diverse range of research on these topics has emerged, but access to the results often is limited The reductionist nature of most research spawns numerous studies focusing on ever narrower and narrower topics, and there are few rewards for "bringing it all together" in an accessible, useful form to problem solvers Thus, even though the importance of such synthesis studies is often recognized, in actuality few get undertaken in any comprehensive manner A "clearing-house" effort in this area could be a significant contribution Such an effort could focus on the issues in this problem analysis and result in a series of synthesis monographs or a book-length manuscript that tackles both the applied and theoretical lessons of social science research as applied to natural resource management

Along with this clearing-house activity, we would need to build relations to promote more effective information transfer of social science research Several concrete proposals in this regard emerged at the October 1994 workshop They included ideas such as the electronic brown-bag seminars mentioned above, as well as renewed efforts at building relations with other scientists through participation in cross-disciplinary sessions at national and international meetings More frequent dialogues among social scientists, biophysical scientists, and managers were also deemed essential and could be accomplished, for example, by informal, agency-sponsored briefings

Another critical need is the creation of evaluation and monitoring criteria We need to begin to answer the questions of how to evaluate lessons learned, and how to apply these criteria on the ground The practical experience gained by early efforts to organize ecosystem management will tell us a lot We also need to create sets of indicators that can help to identify when adaptation is necessary One key element is to create open flows of information among researchers, the public, managers, and policymakers at all levels to discuss lessons and ideas learned through implementing alternative institutional arrangements and developing new institutions

Finally, we need to recognize the unique, particular, and contingent characteristics of ground level management as a critical element of problem solving Ecosystem management as a practice cannot be a blanket prescription levied only from the top down or the bottom up Variations in biophysical, social, and economic characteristics of geographic areas must be respected Each unique region must be allowed to develop research problems and experiments reflecting its own concerns and conditions. At the same time, ecosystem management also requires agreement about central principles and standards underlying this management philosophy, such as recognizing the importance of ecological functions and valuing ecosystem health

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Ecosystem *management as a practice cannot be a blanket prescription levied only from the top down or the bottom up.*

Conclusions

Ecosystem management suggests alternative organizational structures, cooperation across institutional and land boundaries, large scales and broad focuses for management and research, and the need to learn while acting. Barriers to this approach may be found in our current laws, in the organizational relations among levels and branches of government and between private and public interests, in the theories underlying resource management, and in scientific methods. Incentives and avenues for change also are present. Instead of "recipes" from manuals, textbooks, current policies, status quo, and traditions, management actions may be viewed as an "improvisory art" where "we combine familiar and unfamiliar components in response to new situations" (Bateson 1989: 3). Such an approach contrasts with the goal-centered, rational, linear approach of most of current natural resource-related institutions in the United States (Force 1994).

Ecosystem management thus provides a framework for reassessment of natural resource management and institutions in society (Stanley 1994a). It is "an opportunity to invite professionals and citizens alike backstage behind community and social institutions, so that they may discover the ropes and pulleys, scripts, and stage directions which generate the social dramas of institutional life" (Stanley 1994b) How society is organized and what kind of institutions we have, both formal and informal, matter a great deal. Because ecosystem management calls for fundamental alterations in the institutional structures and processes that govern resource management, it is bound to engender controversy. Managers will need the ability to recognize both the intended and the unintended consequences of implementing ecosystem management. Action will be needed to resolve the inevitable institutional issues. A research program on the institutional barriers and incentives for ecosystem management is an opportunity for managers, scientists, and the public to collaboratively explore, from many perspectives, what matters institutionally.

Acknowledgments

Workshop participants included:

Dick Alston
Department of Economics, Weber State University, Ogden, Utah

Harriet "Chris" Christensen
USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon

Roger Clark
USDA Forest Service, Pacific Northwest Research Station, Seattle, Washington

Robert Ewing
Department of Forestry and Fire Protection, State of California, Sacramento, California

Jo Ellen Force
Department of Forest Resources, University of Idaho, Moscow, Idaho

Chuck Geisler
College of Agriculture and Life Sciences, Cornell University, Ithaca, New York

Robert B. Keiter
College of Law, University of Utah, Salt Lake City, Utah

Winifred B. Kessler
Forestry Programme, University of Northern British Columbia, Prince George, British Columbia

Errol Meidinger
School of Law, State University of New York at Buffalo, New York

George Stankey
Department of Forest Resources, Oregon State University, Corvallis, Oregon

Manfred Stanley
Maxwell School of Citizenship and Public Affairs, Syracuse University, New York

Mary Stanley
Maxwell School of Citizenship and Public Affairs, Syracuse University, New York

Workshop Presenters:

Art Carroll and Jurgen Hess
Columbia Gorge National Scenic Area

Catherine Elliot
Department of Natural Resources, State of Washington

Rebecca McLain
College of Forest Resources, University of Washington

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Scientists, managers, and members of the public are calling for new ways to manage the Nation's natural resources. One proposed change is to shift to an ecosystem approach to resource management. As a management philospophy, the ecosystem approach calls for changes in how we approach nature, science, and politics. It requires that we ask ourselves what kind of society and, correspondingly, what kind of relation with nature we want. To answer these questions, and perhaps more importantly, to put the answers into action, we need to examine our society's institutions.

Keywords: Ecosystem, management, research, institutions.

Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, Oregon 97208-3890

U.S. Department of Agriculture
Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, Oregon 97208-3890