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Integrating Social Science and Ecosystem Management: A National Challenge

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Integrating Social Science and Ecosystem Management: A National Challenge

Proceedings of the Conference on Integrating Social Sciences and Ecosystem Management

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Foreword

These proceedings contain the contributed papers and panel presentations, as well as a paper presented at the National Workshop, of the Conference on Integrating Social Sciences and Ecosystem Management, which was held at Unicoi Lodge and Conference Center, Helen, GA, December 12-14, 1995. The overall purpose of this Conference was to improve understanding, integration, and research applications of the human dimension of ecosystem management. Specifically, the goals of the Conference and Workshop were to: (a) discuss the state of knowledge of social sciences relevant to ecosystem management, (b) discuss how to integrate this knowledge with ecosystem management (along with the physical and biological sciences), (c) develop a strategy to effectively integrate social sciences with ecosystem management, and (d) identify a research agenda to further knowledge in the area. Thus, the format of the Conference went from invited paper presentations to a combination of panel discussions, discussions with speakers, and finally, an action-oriented workshop.

The enthusiasm and commitment surrounding the intersection of social sciences and ecosystem management quickly became evident when we began organizing the conference. Initially it was to be a regional workshop, but interest was so high across the United States that it rapidly grew to a full-fledged National Conference. In fact, people from British Columbia, Canada and Puerto Rico were in attendance. Additionally, we received a number of other international inquiries, including, for example, interest from the Netherlands and Egypt. Fortunately, along with the growth of the scope of the Conference, many agencies and individuals helped make it successful. This interest and the healthy number of conference participants speak to the importance of integrating the social sciences with ecosystem management. We hope the momentum and enthusiasm generated at this Conference continues.

Opening presentations by invited speakers (see the list of presenters under Acknowledgments) are not contained in these proceedings, rather they are being published in a book entitled "Integrating Social Science and Ecosystem Management." After the invited speakers, panel presentations highlighting successful integration efforts were presented. These, too, are being included in the book. These sessions were followed by contributed research papers. The organizing committee attempted to group conceptually similar papers into one session. The diversity and complexity of the contributed papers, however, allowed this goal to be met only partially. Thus, papers were presented under loosely fitting categories, and that is how they are organized in the Proceedings. These proceedings are organized around the following topic areas: Social Decisions and Desired Future Conditions; Institutional Challenges and Cross-Disciplinary Integration; Deep Meaning and Sense of Place; Values, Attitudes, Perceptions, and Behaviors; Spatial Scale, Mixed Ownership, and Urban Forests; Rural Development; and Cultural Resources. Finally, a paper representing the National Workshop is included.

Acknowledgments

Many contributed to this Conference and National Workshop on Integrating Social Sciences and Ecosystem Management. The cosponsors were: the Sustainable Management of Southern Appalachian Ecosystems Program, coordinated at Bent Creek, NC, and research units of the Southern Research Station at Athens, GA, and Research Triangle Park, NC, USDA Forest Service; USDA Forest Service, Washington Office; University of Georgia, Department of Recreation and Leisure Studies; USDA Natural Resources Conservation Service; and the National Task Group on the Human Dimension in Ecosystem Management, USDA Forest Service, Washington, DC. The Southern Research Station and the Natural Resources Conservation Service are to be particularly thanked for providing most of the funding and other support for the Conference, and for publishing the proceedings. Most of the funding was provided through David Loftis, Coordinator of the Sustainable Management of Southern Appalachian Ecosystems Program—Thanks David!

Conferences don't just happen. There are many to be thanked who helped in various ways with this one. In particular, Ken Cordell, Southern Research Station, Athens, GA, and Fred Cubbage, then of Southern Research Station, Research Triangle Park, NC, provided the initial conceptualization for the Conference, as well as the support of staff. Tom Holmes assumed Fred's place when Fred moved to The North Carolina State University. Linda Caldwell, then of the University of Georgia, now at Pennsylvania State University, organized and guided development of the conference as its overall coordinator. Members of the steering committee included: Linda Caldwell, Deborah Carr, Frank Clearfield, Ken Cordell, Linda Donoghue, Tom Holmes, Anne Hoover, William Hughes, Gary Jann, David Meriwether, and Greg Super. The following people contributed in special ways: Tom Holmes and Morgan Grove reviewed the contributed papers; Anne Hoover and Greg Super organized and facilitated the National Workshop; Gerald Wicker and David Meriwether facilitated the National Workshop working group sessions; John Peine and Dan Williams organized and facilitated the Hard to Answer Policy Questions Session; Greg Super organized and facilitated the Fluid Session; and Ingrid Schneider, Deborah Carr, Burt Lewis, Anne Hoover, and Tom Holmes were moderators for the Contributed Papers and Panel presentations.

Adela Backiel, Jerry Sesco, Elizabeth Estill, and Pete Roussopoulos are to be thanked for providing provocative opening remarks to the Conference and for setting the stage for fertile discussion. Further stimulation was provided by the invited speakers, each representing one social science discipline's past, present, and future contributions to ecosystem management. These individuals included, in order of their presentation: Susan Giannenttino, USFS, Region 4; Dan Williams, University of Illinois; John Bergstrom, University of Georgia; John Loomis, Colorado State University; Fred Cubbage, North Carolina State University; Ruthann Knudson, Archeological Assistance Division, National Park Service; and J. Kathy Parker, Social Ecologist, The Oriskany Institute.

Shela Mou and Sharon Malley, who assisted with the often thankless, nitty-gritty chores, deserve special thanks for keeping things organized and running smoothly. Shela Mou is especially to be thanked for being the technical producer of these Proceedings. Finally, Lisa O'Daly deserves special mention because she volunteered to coordinate transportation from the Atlanta Airport to the Conference center.

We are especially appreciative of all the people who contributed papers, presentations, and panel discussions to the Conference, as well as those committed and enthusiastic professionals who attended and participated.

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John L. Heywood

Abstract

Human effects on natural environments have traditionally been considered in terms of time and geographic scale dimensions. This paper recommends that a social scale also be considered. The social scale is considered from a macro, societal perspective, and micro, social perspective. Problems for managing ecosystems may arise because solutions developed at the societal scale are not compatible with solutions developed at the social scale. Community-based decisionmaking can alleviate such problems when resource managers assume the role of social facilitators who establish processes rather than encourage effective communication and cooperation.

Introduction

Throughout human history decisions about the uses or nonuses of natural environments have often resulted in disputes and interpersonal conflicts. Controversies about natural environments continue today concerning such things as old growth forest management, grazing of western rangelands, hard rock mining, and species reintroductions. Such controversies are characterized by disagreements between resource scientists, resource managers, and interested publics about the appropriateness of human actions and behaviors toward the natural environment.

The basis for understanding the human dimension of ecosystem management is that human interactions affect natural environments. Human interactions may involve conflict, cooperation, or coordination, and can affect natural environments whether they take place within the natural environment or some distance from it. The actions of players involved in conflict, cooperation, or coordination help define the values of natural environments and the appropriateness of behaviors within or toward the natural environment of interest.

Time and Scale as Human Dimensions

The effects of human-interaction processes on natural environments are determined by time and scale considerations (Field and Burch 1988). The effects of time are usually considered in terms of deriving short-term or long-term benefits from the use or protection of the natural environment (Kaufman and others 1994). Sustaining long-term benefits from the management of natural environments has been a hallmark of the conservation and environmental movements for most of the 20th century (Worrell 1970, Dana and Fairfax 1980, Clawson 1983). This was the essence of Pinchot's dictum of the greatest good, for the greatest number in the long term, and eventually found its legal basis in the forest (1960) and public lands (1964) multiple-use and sustained-yield acts. The legal emphasis on long-term, sustained-yield management of forest resources continued with the passage of the Resources Planning Act of 1974 and the National Forest Management Act of 1976. Responding to public concerns that these legal mandates were not being adequately implemented, the Chief of the Forest Service instituted a new management philosophy of ecosystem management (1992).

Scale considerations traditionally have been viewed from a geographic perspective. Natural environments or ecosystems are dichotomized as being relatively large or small. While the concept of an ecosystem was derived from considerations of relatively small, self-contained units, such as a pond, ecosystem management has generally considered much larger landscape units, e.g., northwest old-growth forests, greater Yellowstone, and the Everglades. In general, it can be argued that emphasizing ecosystem management can shift geographic scale considerations to larger areas that then take on national significance.

Scale can also be considered from a social perspective. The social scale can be dichotomized as being *macro*, e.g., societal aggregations at the State, regional, national levels, or *micro*, e.g., social associations at the local, community levels. Because of the likelihood that managing an ecosystem will become a nationally significant issue, solving disputes about how ecosystems should be managed will be more likely to be made at a macro-societal scale. The actual use of the ecosystem, whether for development and extraction of resources or for enhancement and preservation of resources, takes place at a more localized, social level. That is, the implementation of policy, whether about logging old-growth trees, reintroducing wolves to Yellowstone, or ensuring adequate water flows through the Everglades, is carried out at a micro-social scale.

The Social Scale of Human Dimensions

An important reason for considering the human dimensions of ecosystem management is to give greater recognition to

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the role of resolving disputes and conflicts in resource decisionmaking. Disputes and conflicts arise because people have different expectations and preferences about the appropriateness of actions and behaviors toward and within the environment. This raises an important question: "How does society determine appropriate actions and behaviors?" Unfortunately, answering this question may not seem as straight forward as the more traditional scientific or technical approaches commonly applied in resource management decisionmaking. While the social processes for determining appropriate actions and behaviors are messier than the scientific and technical processes for managing and/or developing natural resources, the contexts within which the social processes operate can be more simply understood by approaching the question from the two perspectives introduced above: (1) a macro-perspective at the societal level, and (2) a micro-perspective at the social level. From the macro-perspective, institutions (such as the Forest Service) have developed planning and public involvement strategies as "objective" processes for resolving disputes, and thus defining appropriate actions and behaviors. These institutional processes attempt to foster **cooperation** among the interested parties, and usually take place in more formal settings some distance from the resource or area under consideration. From the micro-perspective, individuals are seen to interact with one another and the variety of "subjective" processes involved in the interaction can result in **coordination** or conflict. These micro-processes usually take place on site or in closer proximity to the resource under consideration.

Societal level-cooperation–Problems often develop at the societal level because the parties involved in a dispute are likely to perceive only zero sum outcomes and typically establish negotiating positions not conducive to finding optimal solutions (Hardin 1982, Axelrod 1984, Taylor 1987, Skyrms 1990). This tendency for confrontation is a result of the political and legal environment that emphasizes adversarial relationships and can lead to the use of two inappropriate tactics by the parties involved in a dispute. One is the attempt by each interested party to maximize their own interests at the expense of all other parties' interests. In Game Theory this situation is modeled as the classic Prisoner's dilemma. In the Prisoner's dilemma, the "temptation to defect," or not cooperate with the opposing parties, is heightened by each party's attempt to maximize their own interests without considering the interests of the other party. Thus, when faced with an uncertain future, loggers and grazers, for example, are tempted to maximize short-term gains by accelerating cutting and over stocking ranges. Environmental interests face an uncertain future of rapidly depleting timber stocks and deteriorating range conditions and are tempted to maximize their short-term gains by hindering or stopping logging operations and greatly reducing grazing allotments or raising grazing fees. The outcome in the Prisoner's dilemma is punishment for defection. That is, each side loses more than they would have lost had they cooperated. Loggers and grazers cannot maximize outputs, but environmental interests cannot maximize protection and preservation. Thus, the system carries on never producing a satisfactory outcome for the parties involved.

In a variety of resource disputes, like logging and grazing, this has led to a dialectical progression of policy flip-flops where one side's gain is countered by new attacks from the opposing side that reduce or negate the other side's gain, providing the basis for the next round of attack and defense. This happens because the Prisoner's dilemma does not arise once, but is confronted over and over as policies and decisions change. The best strategy for players in an iterated or reoccurring Prisoner's dilemma depends on retaliation and forgiveness, called tit-for-tat, (Axelrod 1984, Glance and Huberman 1994). That is, the best strategy is to do whatever the other player last did. As the overwhelming tendency in resource disputes is for all players or at least one major player to defect from the start, the best strategy becomes one of continual defection or noncooperation. The uncertainties of policy application and decisionmaking that result from this dialectical progression means that neither side sees the advantages of cooperating, which would result in optimal gains by all parties.

Players accustomed to constant defection are probably more likely to adopt a winner-take-all approach when disputes arise where there will be apparent "longer-term" winners and losers. This is the second inappropriate tactic that results in the winners being unwilling to compensate the losers. Situations such as the Alaska oil pipeline and the motors vs. oars controversy on the Colorado River in the Grand Canyon represent winner-take-all disputes. Essentially, the decisions are to build a pipeline or not build one and to allow motorized rafts on the river or not allow them. Thus, if the decision is to build the pipeline, the pipeline advocates win and the antipipeline advocates lose. Such situations require considerations of equity and fairness, where winners are willing to limit or restrict their actions or agree to the imposition by decisionmakers of limitations, restrictions, or other requirements that compensate the losers.

Social level-coordination–Problems at the social level can develop in a different manner. Here, the focus is on communities and the behavioral regularities that develop within the community or the groups that make up the community. In any situation, there are usually at least two, and typically more, different ways to solve a problem that produce equally acceptable solutions. When a given community or group within a community reaches agreement on one solution, the members have coordinated their expectations and preferences for their own and others behavior regarding the problem. The coordinated solution that becomes a regularity in community behavior is a convention.

Behavioral conventions were first considered by Hume (1978) in his *Treatise of Human Nature* as solutions to problems of justice and property rights. Hume stated:

> I observe that it will be to my interest to leave another in the possession of his goods, provided he will act in the same manner with regard to me. When this common sense of interest is mutually expressed and is known to both, it produces a suitable resolution and behavior. And this may properly enough be called a convention... (p. 490).

Lewis (1969) considered how conventions could develop from the solution of coordination problems. As one example, Lewis states:

> Suppose we take it to be our common interest that some scarce good, say grazing land, should be divided up somehow so that each of us can count on having the exclusive use of one portion...It matters little to anyone who uses which portion, so long as people never try to use the same portion and no portion ever goes to waste. Each must choose which portion to use according to his expectations about the portions others will use and the portion they will leave for him (p. 7).

Lewis (1969) recognized that solutions to a coordination problem can be arrived at without reaching agreement through oral communication. Considering the example cited above, there is no need for grazers to discuss grazing allotments with other grazers as long as they are confident that the other grazers will do their part. Thus, as Hardin (1982, p. 155) notes, it is possible to recognize the development of social contracts by convention that are based on implicit agreement and tacit consent. To paraphrase Lewis (1969, p. 27), the grazers in the above example may acquire their expectations about grazing allotments, or correct or corroborate whatever expectations they already have, by putting themselves in the other grazer's shoes, to the best of their ability. Participants in a coordination problem do this by considering higher order expectations, an ordinary expectation about someone else's *n*th-order expectation about it. For example, a third-order expectation involves grazers who observe each other observing each other, while observing each others actions. Obviously, the more sure grazers are of each other's preferences and actions, the fewer are the higher order expectations that need to be considered.

Meta-Social Problems–Cooperation and Coordination

The meta-social problem for ecosystem management arises on the one hand, because the application of societal solutions at the social scale is incommensurate with local, social actions. Meta-problems can result from societal solutions that are not supported at the local, social level and/or inconsistences in applying societal solutions at the local, social level (Olson 1971). That is, as locals, national public interest groups, and resource scientists react to shifts in national policies, through formal appeals, court action, or civil disobedience (Heckathorn 1988), the application of policies becomes inconsistent and uncertain. Meta-problems, on the other hand, can result from a lack of cooperation that makes it difficult for managers to find consensus and eventually results in failure to resolve disputes. Noncooperation is a function of the adversarial nature of the political and legal systems. The inability to resolve some disputes leads to inconsistency and uncertainty of national policy, which results in disputants focusing on short-term solutions to ecosystem management problems. The playing out of these social and political processes at the societal level has resulted in inconsistent policy application and flip flop decisionmaking. Inconsistency and flip flopping creates uncertainties for locals and national interest groups that can encourage them to only consider maximizing their short term interests.

The adversarial approach and emphasis on short term outcomes can be analyzed as conventional solutions to meta-social problems. The meta-social problem is essentially an iterated or re-occurring coordination problem, "... because in any given play of the game, each prefers to do what all others are doing, whether they are all...[cooperating]...or all...[defecting]" (Hardin 1982, p. 168). Even though there is no necessity for verbal communication in iterated play, tacit communication can develop as players sense that the other player's future actions are contingent on one's own immediate actions (Hardin 1982, p. 145). Tacit communication is possible when the players share a common intuition with other players or when players are punished or rewarded for maintaining the convention. Conventions for short term gains or adversarial relations can arise spontaneously through common intuition or through the efforts of a central coordinator that administers punishments or rewards (Hardin 1982, p. 191). The emphasis on short term gains by locals and national interest groups may be instances of the spontaneous generation of conventions when players share common intuitions about their best strategies. Faced with uncertainty and inconsistency, both locals and national interest groups presumably recognize that their best strategy is to get what can be got in the short term, and thus a convention emphasizing short term gains arises spontaneously. A convention of adversarial relationships, on the other hand, arises because of the central coordinating role of the political/legal system which can reward or punish players by providing or denying access to the decisionmaking process. Party politics in the United States and legal procedures are both based on adversarial relationships where the assumptions are that balanced policies and justice will eventually result from each sides aggressive pursuit of their own interests. The problem is that adversarial relationships discourage cooperation and thus add to the development of meta-social problems.

Solving meta-social problems–The classic Prisoner's Dilemma arises because the players involved cannot or do not communicate with one another, so there is no possibility for cooperation through verbal agreement. In disputes over resource development or protection, there is often a lack of effective, meaningful communication, even though the disputants send out numerous messages describing their positions and goals. This is because the messages generally convey information about positions and goals to group members but are ignored or discredited by opposing groups. Further, as discussed above, in iterated play even though coordination can be achieved through tacit communication, the conventions that are likely to arise spontaneously or through central coordination are most likely to favor defection, short-term solutions, and adversarial relationships.

The most effective way to encourage cooperation is to establish conditions that enhance effective, meaningful communication among all disputants. The single most important condition that enhances communication and the effectiveness of groups is their size. Smaller groups are more effective than larger groups because communication is more efficient and because players feel their individual contributions can have a greater impact on the group (Olson 1971, p. 55-56). Efficiency has to do with the number of message sources that each member has to attend to. The fewer the message sources, the more attention can be paid to each source, making communication more meaningful and effective. Members of smaller groups also have a larger stake in the group, and are thus more willing to contribute to the group because they have more to gain through participation in group processes. Disputants who communicate effectively are theoretically more likely to recognize the advantages of cooperating, which for ecosystem management should result in a greater emphasis on finding long-term solutions.

The human dimension of ecosystem management mandates an expanded role for resource managers, who no longer serve only as technical specialists, but must also serve as social facilitators in the policy development, decisionmaking process. Social facilitation should involve resource managers as promoters of effective communication and cooperative working relationships.

Community-Based Decisionmaking

The foregoing analysis suggests that disputes arising from the application of societal solutions to local, social problems will be important considerations in ecosystem management. Congress and the executive branch will continue to establish national policies for managing ecosystems or the components of ecosystems, but communities will also continue to develop behavioral regularities for using and/or protecting the resources in

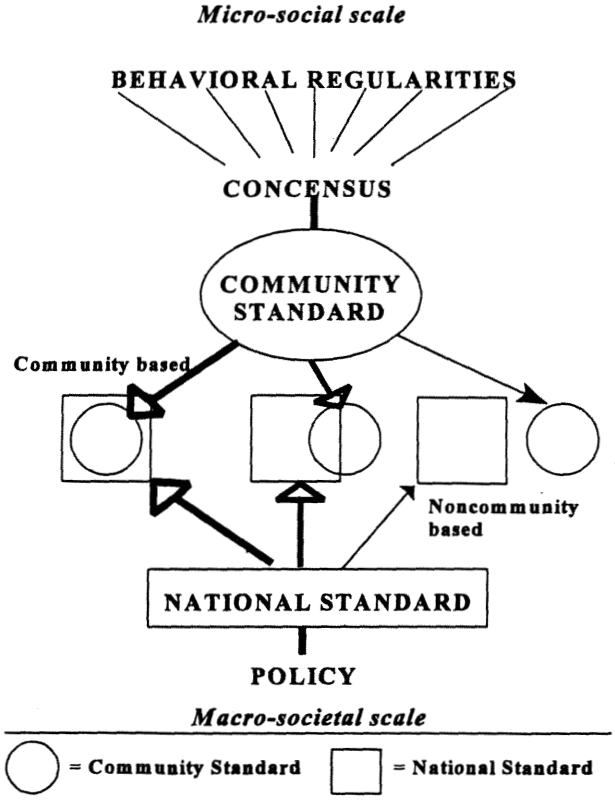

Figure 1–Model of a meta-social problem showing community based and noncommunity-based decisionmaking.

their locale. Figure 1 shows that in some instances community standards and national standards may correspond (circle in square), may partially overlap (circle half in square), or may be completely different (circle and square separate).

An important human dimension problem for ecosystem management is to develop processes for implementing national standards in such a way that they are compatible with community standards. This is called community-based decisionmaking. Community-based decisionmaking can be enhanced in several ways. To begin, resource managers must serve as central coordinators who impose a convention of cooperation on the parties involved in the policy application, decisionmaking process. In conjunction with the central coordinator role, resource managers can establish a basis for effective, meaningful communication by organizing smaller groups to consider the various options and opportunities for resource use and protection. When national standards can be made to correspond with community standards, problems of inconsistency and uncertainty can be avoided, which should enhance the implementation of long-term solutions to ecosystem management problems.

Even though resource managers take actions to encourage cooperation, some communities may opt to not cooperate. Consequently, it may be necessary to consider providing extra incentives for cooperative behavior. Extra incentives could include technical and financial assistance scaled to the level of cooperation and the level of correspondence between national and community standards. Resource managers would be responsible for informing communities of the incentives available and the benefits and costs of cooperation and noncooperation. In the current climate of community concerns with unfunded Federal mandates and the issue of regulatory takings, the provision of incentives to cooperate takes on heightened importance.

Conclusion

Time and geographic scale have been traditional human dimension considerations in the formulation and implementation of natural resource policies. As resource management agencies shift to the consideration of ecosystems as the basis for formulating and implementing resource policies, concerns with social scale must be added to the traditional concerns with time and geographic scale. Problems of social scale can be analyzed from a macro, societal perspective and from a micro, social perspective. Meta-social problems can develop when societal solutions to ecosystem management problems are implemented at the social, community level. Solving meta-social problems requires resource managers to assume the role of social facilitators who establish processes that encourage effective communication and cooperation. Community-based decisionmaking recognizes that communities may opt to not cooperate and that managers may need to be able to offer incentives to foster cooperation. Successful cooperative efforts should eliminate the inconsistencies and uncertainties of policy application and result in a greater emphasis on long-term solutions to ecosystem management problems.

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Desired Future Conditions: Vehicles for Integrating Social and Ecological Goals and Visions?

Donald E. Voth, Bill Pell, and Kim Fendley[1]

Abstract

The concept of Desired Future Condition (DFC) in the Ouachita National Forest's Ecosystem Management Program, and its Ecosystem Management Advisory Committee, are discussed. The Committee has emerged as a major factor in the Forest's on-going effort to implement ecosystem management. It has struggled with the idea of the DFC but has chosen not to address it directly. Rather, it has defined a framework for this, in which ecologically-based management and "the social context" both play major roles.

Introduction

The concept of Desired Condition or Desired Future Condition (DFC) is increasingly being used in public land use planning and management, especially by the U. S. Forest Service (USFS). On the Ouachita National Forest (ONF), 1.6 million acres of public land located in western Arkansas and southwestern Oklahoma, DFC appears to be becoming a key concept for implementing Ecosystem Management (EM). In this paper we trace the recent developments on the ONF which have created this situation.

Historical Context: National Forest Management Act Planning in the Ouachita National Forest

The ONF, in compliance with the National Forest Management Act, had initiated a comprehensive planning process in 1979, which was completed in 1986. Timber production had a high priority in the ONF and clearcutting had been used extensively. The 1986 Forest Plan projected an average of 15,000 acres of clearcutting per year, an amount achieved on the Ouachita throughout the 1980's. Two decades prior, the extensive holdings of a relatively progressive, local family timber companyincluding more than a million acres within the mandated boundaries of the ONF were purchased by a major international timber company, which in an effort to raise extensive amounts of cash rapidly, engaged in extensive clearcutting. These developments, coupled with the emerging public sensitivity to environmental issues, resulted in high visibility for, and extensive opposition to, clearcutting and to conversion of mixed species forest lands to pine plantations for timber production. The 1986 Forest Plan was immediately appealed by the Sierra Club. A new, progressive forest supervisor with a background in landscape architecture and a strong interest in participatory decision making was assigned to the ONF in late 1986. He soon recommended reentering the planning process, won approval, and led a supplementary planning effort between 1987 and 1990. While the initial planning process had included only the minimum amount of public involvement required, the supplemental plan provided increased opportunities for public involvement (Holthoff 1993, Holthoff and Howell 1993).

The initial planning process, and the initial plan itself, had largely satisfied timber interests, but those affiliated with environmental groups were quite displeased (Holthoff 1993, Voth and other 1994a). The supplemental plan, although it still did not satisfy environmental groups, did reduce their dissatisfaction. It only marginally increased the dissatisfaction of those affiliated with timber groups, and thus resulted in a general decrease in overall dissatisfaction (Voth and other 1994a).

However, even the supplemental plan did not completely eliminate clearcutting and it, too, was appealed by environmental interests. The conflict that emerged ultimately led to the now famous "walk in the woods" of USFS Chief Dale Robertson and Senator David Pryor, which was followed by (1) effective elimination of clearcutting in the ONF, a decision that was later defeated on appeal but which has since been, in effect, reinstated through a formal plan amendment, and (2) the designation of the ONF as a lead forest in the New Perspectives (NP) effort, a pilot program which subsequently evolved into EM (Robertson 1992).

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[1] The two Holthoff reports are based upon both in-depth interviews with many of the principals and sample surveys of participants and ONF staff. They try to judge the public involvement programs against public involvement standards, and find even the public involvement program of the supplemental planning process inadequate. However, there is no doubt, from these same data, that overall dissatisfaction with both the planning process and with the plans themselves declined, that the two major antagonistic groups converged somewhat, and that their views became more balanced around an overall average of views about both the plan and public involvement program used (Voth and others 1994a).

New Perspectives/Ecosystem Management in the Ouachita National Forest

New Perspectives on the ONF (1990-1992) included three main elements: (1) several special demonstration projects focusing upon alternative silvicultural methods, stream protection, and ecological restoration; (2) a research program which focused initially upon silvicultural alternatives (Baker 1991), and (3) a technical advisory committee [The Ecosystem Management Advisory Committee] (EMAC). When the USFS announced in mid-1992 that the entire National Forest System would be managed on an ecosystem basis, the Ouachita carried all three elements forward and developed additional ones to fill out its active pursuit of EM.

The research program has three phases: Phase I, made up of more than 20 stands demonstrating alternative harvesting methods; Phase II, 12 harvesting/site preparation treatments replicated on 4 stands each plus 4 untreated controls; and Phase III, focusing upon questions best addressed at the watershed and landscape-scale level and currently in the early stages of implementation (Guldin 1994).

As was indicated above, the ONF has formally implemented a plan amendment which effectively eliminates clearcutting as a primary practice. In addition to this decision and to the pilot NP/EM projects described above, the ONF has been aggressively pursuing EM in a number of ways, including (1) efforts to articulate its own definition and strategic direction of EM (ONF *n.d.*), (2) continuing efforts to explore how to improve its relationship to its respective publics, especially through the EMAC, and (3) perhaps most importantly, through the implementation of multidistrict or forest-wide projects (Shortleaf Pine-Bluestem-RCW Project, Old-Growth Restoration, etc.), as well as on a district-by-district basis. This progressive implementation of EM, without either reentering the planning process or formally defining the new goals and objectives of the ONF management under EM, has led to recommendations by some interest groups that the DFC should be addressed directly.

Ecosystem Management Advisory Committee's View of the DFC Question

The EMAC, originally made up of 13 technical experts from a variety of fields, was initially charged by the forest supervisor with assisting the forest in "defining the DFC" of selected management areas. However, since it did not regard itself as representative of the public, the EMAC initially decided not to address the DFC directly, suggesting that would have to be done in consultation with the relevant publics, or stakeholders. The EMAC articulated what has turned out to be a somewhat prophetic position paper concerning the DFC and how it should be defined (New Perspectives Advisory Committee 1992). It specified that DFC should be considered under three interrelated but separable frameworks: ecologically based management, multiple use management, and the social context (New Perspectives Advisory Committee 1992, pp. 1-2). We quote extensively from the EMAC's statement:

> "The responses of committee members centered on three general aspects of future conditions: ecologically based management, multiple use management, and social context. Brief summaries of these are presented here."

Ecologically Based Management

A central feature of the desired future condition in Management Areas (MA) 14 and 15 should be forest management which maintains the ecological integrity of forest stands and of the landscape as a whole. This represents a basic change in paradigms from "sustained yield" of products to "sustainability" and "stewardship" of functioning ecosystems. Relevant issues include maintenance of biodiversity, restoration and maintenance of old-growth communities in the forest mosaic, and determining and monitoring 'health' and productivity of the forest. Even such basic concepts as "what is natural?" must be addressed. The EMAC recognizes that no consistent definitions or strategies for addressing these issues as yet exists; it may participate in the development of those. However, management strategies must meet both site-specific and landscape-scale objectives, that is, the spatial and ecological relationships (including linkages and buffers) of managed and unmanaged areas (not limited to MA 14 and 15) may be as important as the specific management practices used. Watersheds are logical landscape units for organizing management efforts. It is felt that ecologically based management can also positively impact public perception and trust, discussed later.

Multiple Use Management

The Forest Service is mandated to produce a variety of products from national forest lands, including timber, wildlife, range, water, and recreation, by the Multiple Use-Sustained Yield Act. Therefore, national forest management must specifically accommodate these uses within MA 14 and 15. We recognize the value of these uses. However, new management perspectives can reevaluate the relative emphasis placed on each use and the geographic distribution of uses, as well as examine the ramifications of different–and new–forest management techniques on different forest benefits. A major challenge is altering the quality and quantity of outputs to meet changing expectations.

Furthermore, the committee feels that New Perspectives may require a re-examination of the fundamental multiple use approach since the multiple use paradigm does not include

ecosystem quality as one of the outputs of management and may thus inhibit ecosystem management. We therefore encourage the development of other measurable indicators of appropriate ecosystem management.

Social Context

Forest management is only politically viable when the Forest Service and the public have both "bought in" to forest management decisions. This can only occur when the public has been effectively involved in the decisionmaking process and the public trusts the Forest Service. Questions to be addressed include the degree to which the public can be informed and aware of changing public expectations, the receptivity of the forest staff to public input, and how the forest can respond to the variety of simultaneous demands. Experimentation with a variety of techniques and mechanisms for more effective communication and interaction between the Forest Service and the public is needed. The special status of those communities dependent on the forest for income must be considered as goals change. Furthermore, internal functioning of the Forest Service must adapt to change; for example, the staff of the forest must be rewarded for their contributions toward the emerging goals and values represented by New Perspectives" (New Perspectives Advisory Committee 1992, p. 1-2).

A major objective of the EMAC clearly was to see that each of these dimensions–ecologically based management, multiple resource management, and the social context–be given appropriate emphasis in both defining the DFC and in ongoing management actions.

What is Desired Future Condition?

These developments, and this statement by the EMAC, raised the fundamental question of what is meant by the DFC of the forest. Under the "multiuse" regime of the past, the dominant goal was to optimize the output of a certain mix of resources: timber, recreational, aesthetic, etc. To try to achieve this, traditional[2] planning methods in the National Forest System follow a highly prescribed process, with 10 steps, as follows: "Identification of issues, concerns, and opportunities (ICO's), Development of planning criteria, Collection of data and information necessary to address ICO's, Analysis of the management situation (AMS), Formulation of alternatives, Estimation of effects of each alternative, Evaluation of alternatives, Selection of preferred alternative (proposed Forest Plan), Plan implementation, Monitoring and evaluation of the plan" (Loomis 1993, p. 222).

Plan implementation, of course, involves its own detailed and highly prescribed process, wherein decisions and projects are identified, described, evaluated, decided, and implemented (Ingersoll 1992). In this traditional scenario the DFC was primarily a verbal description, management area by management area, of what the forest would look like to a visitor. It was not the dominant symbol driving planning, rather it was derivative, the highly localized visual consequence of the plan. Ecological considerations, if they entered at all, entered only as (1) constraints imposed in optimization models on the one hand and, perhaps, as (2) value weightspresumably derived from public opinionto be explicitly included in such optimization models. They had no fundamental content of their own which could enter into discussions of either the DFC or of how to achieve the DFC.

The concept has gained prominence recently under EM for two closely related reasons. First, and most fundamentally, EM requires a new vocabulary for the identification, definition, and discussion of the goals and objectives of management. This vocabulary would, ideally, include the specifics of ecological processes as well as the major variables which are descriptive of these processes. The kind of ecological criteria which emerge, of course, include such things as biodiversity, resilience, water quality, etc. Geography also becomes redefined, from arbitrarily defined management areas to various interrelated and nested ecological units.

Under the multiuse regime, the vocabulary that prevails in planning is the optimization of economic values associated with all uses, perhaps using formal optimization models, under whatever explicit constraints may be imposed by political and bio-physical reality and subject, of course, to political conflict and compromise. Desired Future Condition has emerged as an alternative to this vocabulary. As this occurs, of course, much more than semantics is involved. Its emergence suggests that, in the decisionmaking process, it, rather than the vocabulary of resources, should become the prevailing symbol for the identification, definition, discussion, and debate of the direction the forest should take. Secondly, apparently recognizing this transformation of symbols, interest groups in the ONF have increasingly begun to focus upon the DFC as the concrete embodiment of what will be meant in the future by EM.[3]

If this is true, and the role of DFC is being fundamentally transformed, a basic question ariseswhat role will it play under EM in the USFS? All forests have an operative plan,

[2] They really aren't that traditional, of course, since they emerged from the national Forest management Act (NFMA) which was passed in 1977, apparently under the assumption that a rational planning process could contribute to the reduction of conflict about forest management. U.S. National Forests have, in fact, gone through this process once, roughly between the years of 1985 and 1990.

[3] One example of applying the concept of DFC under EM is the brief document prepared by the Apache-Sitgreaves National Forests (USFA Southwestern Region 1993). They used it as in (b)–as a clarification and specification of what EM means under an existing plan.

and many will be reentering the planning process. Will the DFC serve (a) as an overall umbrella under which the goals and objectives of future (or revisions of present) plans are to be debated, or, on the other hand, (b) will it, in a more limited sense, be used as the symbol or set of symbols whereby the specific meaning of EM under existing plans is defined? What has changed, or will change in the near future, as the consequence of EM? Though there is much discussion about the use of the DFC, there are, as yet, few examples from which to draw.

Currently, there is a nationwide effort to define and standardize the meaning and appropriate uses of the concept of DFC (USFS, *n.d.*) since, it is alleged, the term has become fashionable, with DFC statements for ". . . budgets, organization structures, planned annual staff accomplishments, and a myriad of other things" (USFS, *n.d.*, p. 3). The document makes 26 separate points about what a DFC statement should be and what it should not be. It is no longer supposed to be "merely" a description of what a visitor would see. Rather, it is supposed to be ". . . a much more sophisticated statement focused on an integrated portrayal of land allocations, ecosystem functions, and human interactions" (USFS, *n.d.*, p. 1). The last point emphasizes the potential use of the DFC as a flexible tool in working with publics in the planning of projects.

The DFC is, then, an emerging concept which can be used flexibly and creatively to decide upon and to decide, in collaboration with the relevant publics, how the forest will be managed on a site-specific basis.

If a serious effort were undertaken to revisit the DFC of the ONF, a whole series of issues would need to be dealt with, as follows:

1. How is DFC intended to fit into the planning and implementation process under NFMA? Possibilities range from DFC serving as specific scale-level (e.g., Management Areas) "visualizations" of the goals of the plan to DFC serving as an umbrella conception of what the forest, as well as its respective parts, is intended to "look like" or "be moving toward," which, then, serves as a guide to the planning process itself.

2. What are the entities the DFC is supposed to describe? Are they the forest as a whole, districts, Management Areas, landscapes, communities, or, as seems most likely, some combination of these in some nested relationship? If the latter is true, what logic exists for moving from one level to another?

3. What are the parameters of description? The word "condition" is, by implication, static. Are the terms of description in DFC, then, "snap-shot in time" terms, or are they dynamic terms such as "moving toward . . . ," "increasing. . .," "decreasing. . .," etc.? To what extent are the terms of description quantitative? To what extent are they "measurable objectives"?

4. Who has the right and responsibility of deciding what the DFC is? To what extent is the public involved? Which publics? How are technical considerations and public desires combined in the formulation of DFC? What processes are used to arrive at a DFC? What kind of ongoing relationship with the public is to be found in, or achieved by, the DFC? Does the use of DFC imply a shift of authority to the public? How? With what justification?

5. Once defined, what status does the DFC have, and what status do those persons and organizations who labored to create it have? Can and will the ONF make any prior commitments about its use? What are they?

For social scientists the idea of the DFC presents many exciting challenges, the most important of which is considering the DFC of the social context itself. What can social scientists say about, and what can they contribute to, defining what this social context should be?

Revisit the Desired Future Condition in the Ouachita National Forest?

Several developments, internal and external to the EMAC, ultimately led to consideration of revisiting the DFC issue. Those leading the planning effort for Phase III of the EM Research program incorporated the concept of DFC into their planning effort, and actually engaged the interested public in a more or less formal effort to define the DFC of the respective research watersheds. Committee discussion periodically returned to two issues which had been explicit in the initial statement (1992): (1) alleged failure of the EM research program to fully incorporate the social context into its research program and (2) the fundamental dilemma of accountability and measurement when EM is adopted. There remains considerable concern about the lack of measurement or performance criteria applicable to EM. Of course such things as biodiversity, presence of "indicator species," and/or various complex visual indicators come to mind, but certainly none have, as yet, been treated with the same comprehensive and systematic way that the economic value attached to resources has (e. g., Loomis 1993). It is strongly felt, by some, that outcomes that cannot be easily measured will receive little priority.

The Arkansas Timber Purchasers' Association formally addressed both the EMAC and the supervisor of the ONF with its emerging position concerning EM (Crouch and Associates 1993, Crouch 1994). It indicated an acceptance of EM and stated that "Under the EM approach, the manager's goal is to achieve a specific set of biological conditions on a landscape or larger scale. This condition is referred to as the'desired future condition.'" It then

encouraged the EMAC to urge the ONF to, among other things, (1) establish a "shareholders committee" and (2) empower this shareholder committee to develop a forest DFC ". . . subject to good science and the appropriate laws governing the management and use of natural forest lands" (Crouch and Associates 1994. p. 2-4).

Opinions about the prospect of a serious effort to address the DFC of the ONF vary widely, both among members of the committee and among the individuals and groups that have been involved in the EMAC's deliberations. Those affiliated with environmental interests, and those critical of the ONF, tend to be opposed to such an effort. Their statements imply that they still see the concept of DFC as being static, unnecessarily controversial, and impossible to achieve since not enough is known about the ecosystems under consideration to create a meaningful DFC. They appear to prefer to focus upon the ONF's implementation procedures, rather than upon the goal-setting process implied by DFC. More importantly, perhaps, they prefer to focus upon concrete forest management actions rather than upon a goal-setting and planning process to achieve their objectives.

Proponents, on the other hand, emphasize that, since EM was adopted after the Forest Plan was prepared, the specific goals and objectives under EM have not been established. They contend that progressive implementation of EM through projects and plan amendments, without first engaging in a comprehensive goal-setting process, lacks coherence, and creates intolerable uncertainty. These are primarily those affiliated with timber production interests.[4] There is, however, little evidence that the general public perceives the formal definition of the DFC as an activity that it would be interested in or support.

Action of the Ecosystem Management Advisory Committee

The EMAC decided, at its June meeting in 1994, not to further pursue the question of defining the DFC directly. Rather, it chose to focus upon specific issues about forest management that had been raised by various members of the public and of interest groups at its meetings. As it turns out, though, the issues which were selected are, themselves, fundamental to any effort to define the DFC. They include questions of forest composition, forest inventory, forest classification, the potential management consequences of these, and the pre-settlement or historic state of the forest. It is quite clear that the public's interest in these issues is not purely academic, but that it arises out of concern about the direction that ongoing management takes the forest and the impact management has on forest composition. And, in this context, an alleged pro-pine and anti-hardwood bias is central to much of the discussion.

Reflections on Desired Future Condition Applied to the Social Context

Adoption of EM includes adoption of an ecological vocabulary, in the place of the predominantly economic vocabulary of Multiple Use Management. The concept of DFC has emerged from its previous obscure status as derivative, visual descriptions to potentially becoming the vocabulary of goal-setting under EM. Hence, its terms will probably be primarily those of ecology. However, if multiple use planning did not–as it was supposed to do–eliminate or even seriously reduce conflict about forest management, using an ecologically based vocabulary is not likely to do so either. It is people who usually sue the FS, not "resources." Nor will it be, under EM, "ecosystems." Indeed, converting the vocabulary to an ecological one may actually make the debate more acrimonious, since it is hard to see how ecologists will be able to avoid the vocabularies of "regulation," "protection," etc., terms that may well inflame the discussion.

This implies, of course, the need to directly address the DFC of the Social Context. It should be clear by now that nearly all of the previous discussion–the historical events it describes, the persons, groups, and organizations involved, and the various positions they have taken–is, in effect, a discussion about the social context of the ONF.[5] Applying the idea of DFC to it implies, as it does for resource extraction and for ecology, extracting ourselves from this context in order to describe what we would like it to be in the future. What goals should be sought in the relationship between the ONF and its publics, and, even more broadly, what goals should be sought in the relationship between human beings, and their social, cultural, political, and economic organization and nature? Addressing the former realm implies consideration of such things as (a) the regulations under which public agencies, and the ONF in particular, operate (Federal Advisory Committee Act, Surveys, Appropriations); (b) the ONF's planning, decisionmaking, and implementation processes and procedures, including, most importantly, public involvement in planning, decisionmaking, and implementation; and (c) the public's changing attitudes and opinions and, more particularly, the public's reaction and response to (b) above.

Applying the idea of DFC to the social context thus implies examining the processes of management and administration themselves. And, of course, it implies a diagnosis of what is wrong–of what needs improvement. Diagnoses are not hard to find (Voth and others 1994b), though systematic

[4] These are, of course, broad generalizations based upon the very limited data base generated by statements and presentations made at and in association with the January 13-14, 1994, meeting of the Advisory Committee.

[5] Disregarding, for the moment, the obvious and more general observation that the ONF and the forest lands it manages and, even more importantly, "nature," "wilderness," etc. are all social constructs.

research about them is still rare. This realm is still, unfortunately, considered to be primarily a realm of normative discussion and debate at best, and rhetoric and public relations at worst, and not a realm of scientific research.[6]

Research and other intelligence about social context or, more broadly and more generally, the "Human Dimension," like other intelligence about forest management, can be viewed in two ways. In a conventional research mode, it can be viewed as scientific informationabout public values and preferences, economic impacts, demographics, etc.to be incorporated by forest managers into their scientific and professional decisions which, when up-to-date and accurate, will improve the decisions and consequently result in public acceptance. For economic research, in particular, it seems sometimes to be implied that the public good can, in fact, be best achieved by pursuing this "scientific" model. When all possible values are measured and taken into account in scientific and professional decision-making, and appropriately optimized, (1) the resulting decisions are the public interest, and (2) the public should be expected to reflect this by accepting and supporting the decisions. To the extent it does not the public is being irrational, responding to "symbolic" values, etc.

This is, however, a very limited view of both the public interest and of human behavior. Serious consideration of the DFC of the Social Context will require a broader social science, including both information about demographics, attitude and values, etc., as well as highly strategic research that focuses upon public involvement and decisionmaking processes themselves. From this perspective the role of research is not merely, or even primarily, to establish scientific generalizations but to work with managers, in site-specific and time-specific environments, to provide strategic information. And the concept of the public interest is not some kind of abstract "wisest and best use" determined by scientists, but an ongoing dialog, planning, decisionmaking and implementation process in which the public is substantially engaged (Voth and others 1994b).

Fortunately, the EM research program in the ONF has begun significantly to support research which focuses upon the social context of forest management (Fendley and others 1993), as well as upon the "human dimension" more broadly defined. This research is designed to ascertain both the major methods of public involvement being used as well as the nature of the relationship the general public and interest groups would prefer to have with the ONF in planning, decisionmaking, and management. While the dialog on the nature of ecosystem management is continuing, and expanding to a nationwide issue, the dialog on the social context of public forests has just begun. With the acknowledgment that humans are a part of public forest ecosystems, this relationship needs to be addressed through both research and social action.

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Defining Future Forest Conditions for the Chattooga Basin: Methods and Preliminary Analysis

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Abstract

As part of the Chattooga Ecosystem Management Demonstration Project, we elicited information on desired future forest conditions for the watershed from over 180 Forest Service employees and members of the general public. We organized these responses into objectives hierarchies, which show what goals are important, what aspects of those goals are important, and what features of the ecosystem should be monitored to see if the goals are being met. We also constructed means/ends networks to represent respondents' hypotheses about how management activities affect the objectives that are important to them.

Background

Our project is part of the Chattooga Ecosystem Management Demonstration Project. The Chattooga Basin is the 180,000-acre watershed of the Chattooga River, a Wild and Scenic River, located where the states of North Carolina, South Carolina and Georgia meet. Two-thirds of the drainage is National Forest System lands, located in three ranger districts of three national forests in three States (fig. 1). A desire to better coordinate management of this watershed across administrative boundaries, and to embrace the principles of ecosystem management in designing forest management activities, prompted the selection of the area for a demonstration project.

The ecosystem management demonstration project includes a variety of scientific and management activities, ranging from surveys of biodiversity to plans for land acquisition. All of these activities are aimed toward forest management that sustains a variety of resources, integrates management at different spatial scales, collaborates with researchers, and emphasizes public participation.

Our project is part of the public participation component of the demonstration project, which includes both information about forest management flowing from the Forest Service to the public and information flowing from the public to the Forest Service. Among the hallmarks of ecosystem management are the directive to use desired future forest conditions to drive decisions on forest management, and the directive for the Forest Service to collaborate with the public in developing forest management strategies (Robertson 1992). Our interpretation of this direction is that we should involve the public in determining the description of the future forest that will dictate forest management.

Since we believe that different members of the public may have very different visions of the future forest, involving the public means obtaining input from the full range of perspectives, and then analyzing that input to show where different visions of the forest are compatible and may be achieved with the same types of management activities, and where they are conflicting, requiring that land and other resources be allocated among competing uses. This analysis is a necessary first step in developing some consensus about the vision of the forest that will determine future management. The purpose of our research is to develop and implement methods for obtaining and analyzing input from a broad cross-section of the public on their visions of future forest conditions, so that this information can be used in revising forest plans and project activities across the watershed.

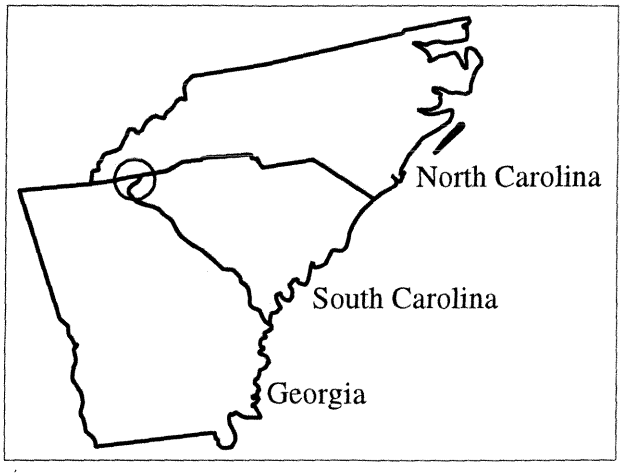

Figure 1–Location map for Chattooga Ecosystem Management Demonstration Project.

Methods of Qualitative Research

Qualitative research methods provide a means of carrying out the task of obtaining and analyzing public input on future forest conditions. Qualitative methods allow the researcher to collect and analyze data in the form of a respondents own words, rather than as predetermined categories of response (Patton 1990). These methods are especially suited (1) to innovative programs, where specifying possible responses ahead of time could inhibit hearing the full range of public opinion; (2) to programs where site-specific solutions are favored above centralized management; (3) to programs where it is desirable to

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engage the publics support for a collaborative approach, and (4) to programs where capturing the emotional content of public opinion is essential for addressing public concerns. The implementation of ecosystem management by the Forest Service exhibits all of these characteristics.

With a qualitative research framework as our guide, we collected data on desired future forest conditions through (1) group meetings with Forest Service employees from the three districts in the watershed, being careful to include all employees, including clerical staff and older personnel, as well as technical personnel (about 70 people); (2) individual interviews; and (3) written response forms (see appendix). The personal interviews were conducted by Maguire and her students (51), by Mr. George Reynolds of the Foxfire program (Rabun County High School, Clayton, GA) (41), and by Forest Service district employees (21). The reason for having Reynolds and Forest Service employees conduct some interviews was to gain better access to a segment of the public rarely heard: longtime residents of an area who may have strong opinions and share them amongst themselves, but who dont write letters or attend meetings, and who are reluctant to talk to "outsiders." The Foxfire program and the Forest Service employees used to make contacts in this segment of the population had developed good rapport with this community, a benefit outweighing potential biases.

Potential interview subjects and potential respondents to the written form were suggested by Forest Service district employees, by mailing lists the Forest Service maintains, by those who requested written response forms after hearing of their availability through media reports or at public meetings, by those who were interviewed, and by those who completed written response forms (respondents were asked to recommend people whose opinions were likely to differ from their own). This pool of potential respondents was thus obtained by a "snowball" technique (Goodman 1961), where closure is attained when the same names appear repeatedly.

The actual respondents to be interviewed or sent written response forms were chosen from the pool of potential respondents by a purposeful, not a random, scheme. This is consistent with the goals of qualitative research, which are to maximize the amount of useful information obtained for a given investment of effort, rather than to collect data which may be used to make inferences to other circumstances (Patton 1990). Since our research objective was to obtain input from the entire spectrum of opinion on future forest conditions, we selected respondents from the different geographic regions within the watershed, from a range of ages, from both genders, and from a range of occupations and interest groups, in order to maximize diversity of opinion. In addition, we wanted to make sure that we obtained input from three categories of people: (1) those who have been vocal participants in management of the Chattooga Basin in the past (e.g., the Chattooga Watershed Coalition); (2) those with assumed interest in forest management decisions, but whose positions on forest management in the watershed may not be well-known (e.g., timber operators, representatives of local government and environmental organizations); and (3) those mentioned earlier, the "silent" people, who have opinions but rarely divulge them outside their own circles. Inevitably, there is a degree of self-selection of respondents, since we could not interview people against their will or force them to fill out written forms. Closure of the sample of actual respondents is obtained when the opinions expressed largely repeat what we have already heard.

We used an open-ended questionnaire for the written response form (Appendix); the same questions served as a guide for the personal interviews and group meetings. We asked people what they wanted in the way of desired future forest conditions, why they wanted those things, what measures they would use to determine whether or not they were getting what they wanted, what means they would recommend for achieving what they wanted, what activities they believed should be either avoided or pursued in the watershed, what procedures they considered appropriate for obtaining information about desired forest conditions and for making forest management decisions, and what additional contacts they suggested we interview. The interviewer and/or an assistant took extensive notes during interviews; in addition, most interviews and meetings were tape recorded. Respondents were assured that, although we would reveal whom we interviewed in order to demonstrate the appropriateness of our sample, we would not attribute particular statements to individuals in any way that could be identified. Similarly, we know who received written response forms, but unless the form was signed by the respondent, we do not know who filled out which form or which ones were not returned.

We did not generally produce verbatim transcripts of the interviews or meetings. Rather, we organized the notes taken according to the categories described above, supplementing the notes by listening to the tapes, particularly in order to capture verbatim quotes from those interviewed. We returned these summaries to those interviewed so that they could make corrections and additions. We also produced summaries of the written response forms. Summaries of the interviews, meetings, and written response forms were stored as text files on computer for later analysis.

Preliminary Analysis of Results

The first step in analyzing the qualitative data gathered through the interviews, group meetings and written response forms was to categorize the responses according to the major questions in the interview guide. The first category consists of responses to the question about what people want in the way of future forest conditions (DFC's). These responses can be further divided into several subcategories. The first of these consists of respondents' descriptions of what they want the Chattooga Basin to look like 50 years from now. Some

sample responses are: "more open," "like it was 15 or 20 years ago." The latter, of course, calls for some additional explanation of just what about the way it was 15 or 20 years ago seems appealing. Other responses about DFC's were given in terms of the composition of the forest system: "a variety of trees," or "more hardwoods." Other comments describe the types of products respondents want the forest to provide: "rocks to build a fence or wall," and "moss to decorate with." Respondents also listed the kinds of activities they did and did not want to see in the Chattooga Basin: "the ability to run wild," "no type of commercial business." Some respondents described ecosystem functions that they valued: "all the natural processes," or "keep it healthy." Others described the kinds of land management they wanted: "more selective cutting," and "protected from any type of use that degrades the quality of the forest."

The second major category of response is answers to the question why do the respondents want the DFC's they described. Among the answers were: "because the forest is there for everyone," and "I would like our children to enjoy the same forest we did."

The third category of responses lists measures, or observations that people could make that would let them know whether or not their DFC's had been achieved. Examples of these are: "be able to ride motorcycles on logging roads," or "be able to go out and go camping in a spot where 10 feet from you there is not another camper," as a measure of the degree of crowding that is acceptable.

The fourth category is respondents' recommendations for the means that should be employed to achieve their DFC's, i.e., the types of management actions (or inactions) that they want to see used in the Chattooga Basin: "plant back hardwoods," and "block off certain roads (e.g., Burrell's Ford) and let the land heal and game replenish."

The next major category of response is respondents' assumptions about the way the world works. These were subdivided into assumptions about the nonhuman components of the system, i.e., the way that management actions taken get translated by the dynamics of the ecological system into impacts on DFC's, and assumptions about the human components of the system, i.e., the ways that humans and their organizations and institutions can be expected to behave. Examples of the former include "[without fire] leaves pile up so that if there is a fire it gets so hot it kills all the trees," and "the Chattooga Basin is too far north to tree farm." Examples of assumptions about the human parts of the system include "the timber industry is important, it is a vital industry," and "rafters are very courteous."

The last major category of responses is respondents' recommendations for the procedures that should be followed to gather information about DFC's and to translate these into management actions: "the community would come together and work the problem out," and "if you wanted to change it in any way, then it should take everyone's vote."

The next step of the analysis, after categorizing each response into a major grouping, was to identify all the responses in a category that appeared to mean substantially the same thing. For example, the following responses about DFC's all refer to a vision of the Chattooga as a wild and unmanaged landscape: "almost unused," "as wild and free as possible," "like nature made it," "pristine wilderness," and "a back-to-nature retreat." Similarly, these responses seem to describe the same view of desired forest composition, i.e., a variety of species represented: "a variety of vegetation," and "different species of all the trees."

This coding process (not yet completed) will result in a qualitative dataset in which each response is assigned to a major category (e.g., DFC's); a subcategory, if any (e.g., ecosystem functions); and a class of responses all of which mean substantially the same thing (e.g., "wild and unmanaged"). Associated with each response are the date the categories, subcategories and classes of response were first observed in the dataset; the date of each use of the category and class; the name of the respondent; and associated demographic data, such as age, gender, address, occupation, and organizational affiliations. The dates on which categories and classes of response were first created can then be used to track the accumulation of new information in the dataset (fig. 2), with the curve leveling off as subsequent interviews begin to repeat information already heard.

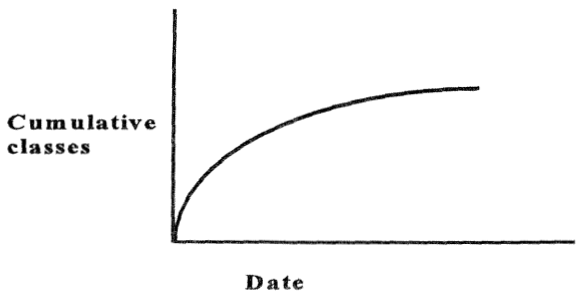

Figure 2–Plot of cumulative number of classes into which responses were grouped versus date of response. Addition of new classes tapers off as subsequent responses repeat material that has already been heard.

Objectives Hierarchies and Means/Ends Networks

The process of sorting qualitative data into categories and classes can be informative in itself, but we plan to organize the results of this sorting process further using some tools from multiattribute utility analysis: objectives hierarchies and means/ends networks (Keeney 1992). Objectives hierarchies

are branching diagrams (fig. 3) that show the relationships among overarching objectives, the fundamental goals that people take as given (e.g., maintain a healthy ecosystem); subobjectives that describe what is meant by the fundamental objectives or what aspects of the fundamental objectives are important (e.g., clean water and abundant game); and, at the lowest levels of the hierarchy, the measures, or attributes, that people would observe in order to determine whether or not their objectives were being met (e.g., number of deer seen as a measure of abundance of game). The branches at lower levels on an objectives hierarchy are answers to the question "What aspects are important?" with respect to the objectives listed at higher levels (e.g., "clean water" and "abundant game" are two aspects of what is important about a "healthy ecosystem"). The upper levels of an objectives hierarchy are answers to the question "Why are these things important?" when asked about the lower levels of the hierarchy. For example, the number of deer and birds is important because people care about having abundant game. The measures or attributes are answers to the question "How will I know whether I'm getting the things that are important to me?" For example, people know they have clear and drinkable water when they can see fish and insects in the streams and drink the water without getting sick.

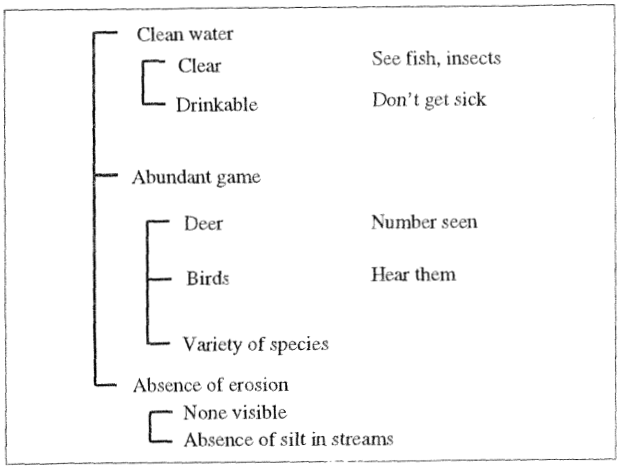

Figure 3–An example of part of an objectives hierarchy formed using responses on desired future forest conditions and ways of measuring when the desired conditions have been achieved.

Responses in the categories "DFC's" and "measures" will be used to construct comprehensive objective hierarchies that combine responses from all respondents. Combining objectives for all respondents, rather than constructing separate hierarchies for individual respondents or for those belonging to a particular interest group, serves to emphasize that successful forest management must meet the important goals of all interests, which are represented by the upper tiers of the combined objectives hierarchy. It also encourages those involved with forest management to adopt a collaborative approach to solving a common problem, rather than focusing on competing interests which must struggle over resource allocations. Not all parties will have the same priorities for the items that appear in the combined objectives hierarchy, nor will all objectives be relevant to all parties. Nevertheless, the combined framework serves as a benchmark for evaluating the merits of resource management alternatives, whether at the level of forest plans or individual projects.

The "why" responses from the sorted dataset (e.g., heritage for descendants) may or may not appear explicitly as the uppermost tier of the combined objectives hierarchy. They are, however, the most fundamental of objectives, those for which respondents can think of no further justification. They are also the responses that evoke the deepest emotions. It is worth paying attention to these "why" statements because they represent the fundamental values that people are willing to fight for. Management plans that do not meet these underlying, emotion-laden objectives will not be accepted.

Means/ends networks (fig. 4) show the relationships among "means," or management and user activities, and "ends," or the objectives that appear at various levels of the corresponding objectives hierarchy. Entries on the righthand side of the network are actions that might be taken. Entries to the left represent the features on which those actions are thought to have an impact. At the leftmost side of the network are objectives or subobjectives taken from the objectives hierarchy. In contrast to the objectives hierarchy, which has a strictly branching structure, the connections in the means/ends network can have many, interlocking patterns, since an action taken can affect more than one element on the lefthand side of the diagram. For

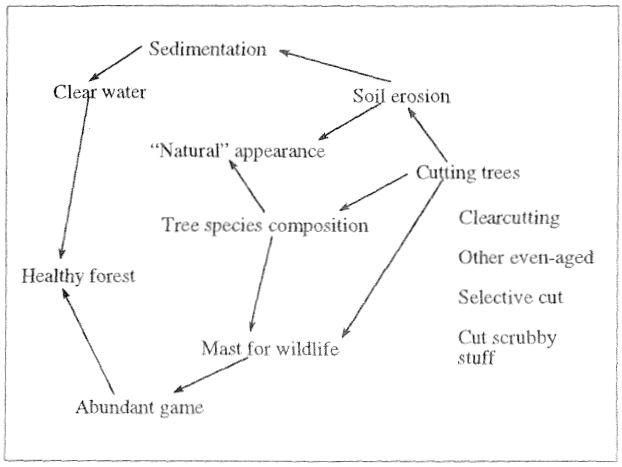

Figure 4–An example of part of a means/ends network formed using responses on means of achieving desired future forest conditions. Arrows show direct and indirect impacts of management activities on future forest conditions.

example, cutting hardwood trees can have direct effects on mass production and tree species composition, as well as indirect effects on soil erosion and game abundance.

The means/ends network is thus a graphical representation of hypotheses about how ecosystem dynamics (including, perhaps, the human components of the ecosystem) translate actions taken into effects on fundamental objectives. The details of a means/ends network are thus dependent on the factual knowledge that a respondent or group of respondents brings to bear on forest management. This is in contrast to the type of knowledge needed to construct an objectives hierarchy, which is a representation of the values of the respondents, and not subject to factual verification. The "assumptions" about both nonhuman and human components of the system expressed by respondents are valuable clues to the hypotheses that should be incorporated in the means/ends networks. Different respondents, drawing on different kinds and levels of expertise about forest management, will offer different hypotheses about the way the system works (as evidenced in the means/ends networks), as well as different views about what ends are most important (as evidenced by differing priorities among the items in a combined objectives hierarchy). For example, one respondent may assert that clearcutting causes erosion by disturbing both canopy and ground cover; another may assert that selective cutting causes erosion when more frequent entries into a stand require more frequent road construction and maintenance.

The means/ends network may have its best use as a testing ground for competing hypotheses about how the ecosystem works, allowing disputing parties to make their views of the facts clear to others and, sometimes, suggesting trials or tests that can be made to resolve such factual disputes. Since many resource management debates are characterized by an entangled mess of disputed facts and differing goals, it can be helpful to employ a structure that helps separate disagreements about facts from disagreements about values so that the former can be investigated and the latter respected (Maguire and Boiney 1994).

Further Analysis and Interpretation

We intend to complete the sorting and coding of the responses according to the scheme described earlier and then use the sorted dataset to construct a combined objectives hierarchy and a set of means/ends networks. The objectives hierarchy will itself provide useful information about the public's desired future forest conditions. The measures on the lowest tier of the objectives hierarchy form a link to the technical analysis of resources in the monitoring and modeling components of the demonstration project.

We can make this information more useful, however, by examining the hierarchy, in conjunction with the means/ends networks, to see how priorities among objectives differ for different interest groups and how hypotheses about the way the ecosystem works may differ among respondents. We will also analyze the links between means and objectives to see which objectives are compatible, and can be met simultaneously with a single set of management actions, and which are conflicting, and will require a competitive allocation of land and other resources.

After completing our categorization of responses and analysis of objectives hierarchies and means/ends networks, we will feed this information back to the respondent population and to the Forest Service via written reports and public presentations. This step of the project serves several purposes. It will provide information to the Forest Service about desired future conditions that can be incorporated into both forest plan and project level deliberations. It also provides the Forest Service with an assessment of the level of knowledge about forest management in different segments of the public, which can be a guide for public education efforts. It will allow different segments of the public to learn more about the goals being pursued by others and the assumptions others hold about how the world works. This can be a catalyst for sharing information and resolving factual disputes (Fisher and others 1991). This step of the project also serves a research function: one important way of validating this type of qualitative analysis is by feeding the categorization scheme back to the respondents and to potential users of the information (i.e., the Forest Service) to see if the analysis makes good sense to them (Patton 1990).

We may extend the categorization scheme used to analyze these verbal data to another study which forms a visual counterpart to this one. Renee Binder of the Pickens District of the Sumter National Forest, one of the three districts in the Chattooga watershed, is providing members of the public with cameras to record their views of what they do and don't want to see in the Chattooga in the future. These data could be analyzed with the same sort of scheme described above for verbal data.

Although the interview guide we used and the analytical framework we describe were motivated by our goal of eliciting and analyzing desired future forest conditions, respondents told us about lots of other things that don't necessarily fall into the categories we needed for that purpose. Thus we now have a very rich qualitative database relating to resource management, sociological change, and human values for the Chattooga region. It will be available for further analysis of other questions.

Acknowledgment

Thanks to Dave Cawrse, Coordinator of the Chattooga Ecosystem Demonstration Project, for Figure 1, for his comments on a draft manuscript, and for his support of this research.

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Appendix

WRITTEN RESPONSE FORM FOR PROJECT ON FUTURE FOREST CONDITIONS FOR THE CHATTOOGA BASIN

Thank you for your interest in our project concerning future forest conditions for the Chattooga Basin. You may use the following eleven questions to guide your response, but we'd be glad to hear about any other issues you'd like to write about as well. Please don't feel obliged to fill up the space provided; or, if you need more space, use the bottom of the last page or add more paper. Please return your form in the enclosed, stamped envelope to: Dr. Lynn A. Maguire, School of the Environment, Duke University, Durham, NC 27708-0328. If you have any questions, you may call Dr. Maguire at (919) 613-8034.

1. If you had the power to control what the forest in the Chattooga Basin would be like 50 years from now, what sort of forest would it be? You could describe your idea in terms of the types and ages of trees in the forest, what kinds of other plants or animals might be there, what kinds of products the forest might be good for, what kinds of activities might happen there, what ecological functions the forest might perform, etc.

2. Referring to the answers you gave to question 1, ask yourself what different aspects of these forest characteristics are important to you. For example, if what's important is "to be able to go to the Chattooga Basin and do the kinds of things my family has always done there," describe those things in more detail (like "hunting for deer, taking a picnic along the river," etc.).

3. Looking at your description of the future Chattooga forest, why do you want a particular kind of forest or particular kinds of activities? (For example, if you listed "big trees" for question 1, and "hardwood species" for question 2, some possible reasons might include valuable timber, the way they look, habitat they provide for other plants and animals, or that they represent undisturbed forest; you might have further reasons why you want each of these things, or they might just be valuable in themselves.)

4. How will you tell whether your goals for the Chattooga have been met? For example, if one of your goals is to improve fishing, would you be most concerned with the numbers of fish, species of fish, size of fish, or what?

5. In your view of what the future Chattooga forest should be like, are all parts of it the same? Or is there a mix of different types and ages of forest in different areas, or different types of activities taking place in different areas?

6. In your view of the future Chattooga forest, does the forest stay the same through time, or do you see forest conditions changing through time? If so, how do they change?

7. In your view of the future Chattooga forest, are there certain kinds of activities (e.g., recreation, forest management practices) that you definitely want to see or definitely don't want to see? If so, why do you want these things to happen or not happen? In what way are these activities consistent (or inconsistent) with the things that are most important to you (as in question 3)?

8. What are your ideas about the best way to gather information about desired future forest conditions for the Chattooga watershed? Why do you prefer the methods you've suggested?

9. How should forest management decisions for the Chattooga be made, based on that information (who should participate in the decision, what format should be used, etc.)? Why do you prefer the methods you've suggested?

10. Who (individuals or representatives of groups) should we talk to in order to get a wide range of opinion about what the Chattooga Basin should be like in the future? Please give us the name, address, what group they belong to (if any), and phone number, if possible. What people or groups outside of the immediate Chattooga area would be good to talk to about their views for the Chattooga?

11. Anything else you'd like to say about future forest conditions for the Chattooga?

Chattooga River Visitor Study: Applications in Ecosystem Management

Robert W. Dye

Abstract

The Forest Service has chosen 120,000 acres of National Forest land within the Chattooga River Basin to be used as a demonstration project showcasing ecosystem management. In 1993, approximately 70,000 people boated the Chattooga River. This recreational use of the river represents a considerable portion of human activity within the ecosystem. This paper details survey research as one way of gathering information to be used in understanding the recreational users' role in the ecosystem.

Introduction

In the fall of 1992 the USDA Forest Service and Clemson University began a study of Chattooga River visitors. This paper will focus on whitewater boaters on the Chattooga. The purpose of this paper is to examine survey research as one way of gathering information to be used in understanding humans as a part of an ecosystem.

The Chattooga River originated south of Highlands, NC, in the Nantahala National Forest. It flows for about 10 miles before reaching Ellicott Rock, which marks its departure from North Carolina. For the next 40 miles the river forms the boundary between Georgia/Chattahoochee National Forest and South Carolina/Sumter National Forest before flowing into Lake Tugaloo. The Chattooga is considered to be prime whitewater boating. Rapids difficulty ranges from class I to class VI.

The Forest Service estimates that in 1968, the year that Congress passed the Wild Scenic Rivers Act, 100 private boaters floated the Chattooga River. The Chattooga became a National Wild and Scenic River through congressional amendment to the Act in 1974. That year private use was estimated at 22,274 boaters and commercial use at 6,326 boaters. In 1993 15,440 private boaters and 51,583 commercial boaters floated down the Chattooga River. There are three commercial permits on the river.

Rafting represents the greatest majority of commercial use on the river. The following restrictions apply to commercial boaters: (a) special use permit required, (b) payment of a river use fee required, (c) a trip schedule must be followed, (d) number of boaters, (e) group size limited, (f) number of trips per day limited. Restrictions on private boaters differ from those on commercial boaters and are as follows: (a) self-registration permit required, (b) no river use fee required, (c) no trip schedule required, (d) group size limited, (e) number of trips per day not limited.

Problem Statement

Recreational use of the Chattooga River has grown dramatically. Since its designation as a Wild and Scenic river, use has risen from fewer than 1,000 users in 1971 to approximately 67,000 in 1993. Increased use of the river has led to increased contact between users, increased environmental impact, and increased public interest in the management of the river. Since the river is a recreational resource, an understanding of the social aspects of its use is critical to proper management. There is little current information describing the social aspects of recreational use of the Chattooga River Wild and Scenic River.

Purpose

The purpose of the study is to establish a river visitor data base for the Chattooga Wild and Scenic River. This data base will be used for the revision of the Sumter National Forest Land and Resource Management Plan. In addition this data will provide baseline information for monitoring resource impacts and visitor satisfaction. Information gathered will also be available to the Nantahala National Forest, the Chattahoochee National Forest, and the Chattooga River Basin Ecosystems Management Project. The database will provide essential information which can assist managers in understanding the user and in making decisions about use levels and facility development. The study will also provide direction for continued research in the river basin.

Study Development

Development of the study was coordinated by faculty and graduate students of Clemson University. Initial meetings with the Forest Service focused on the need for the study and possible outcomes. Representatives from each of the three ranger districts associated with the Chattooga were asked to be a part of the study development. As the survey was developed, meetings were held with other interested parties, particularly commercial outfitters. Comments made by these groups were very useful, and appropriate changes were made where possible. The three commercial outfitters working on the river were kept informed throughout the development of the study. In addition to critique of the questionnaire the outfitters were especially

Project Director, Department of Parks, Recreation and Tourism Management, Clemson University, Clemson, SC.

helpful in designing sampling strategies. All three outfitters agreed to help with sampling of commercial boaters. Beyond the normal outcomes of study development (objectives, sampling frame, etc.) this process of involving a variety of interests had other positive benefits. Throughout the implementation of the study the researchers enjoyed the full support of most commercial and private users. Additionally, the resource users who have participated in the research process seem to be more supportive of the results.

Objectives

The following objectives are designed to satisfy the stated purpose of the study: (a) to determine planning practices used by visitors, (b) to determine river users' satisfaction level, (c) To determine river users' feelings about encounters with other visitors, (d) to identify problems encountered by river users, (e) to identify users' feelings about management of the Chattooga River, (f) to determine the setting preferences of river users, (g) to determine experience levels of river users, (h) to determine the demographic characteristics of river users.

The specific study area was determined through consultation with the Forest Service. Sections Three and Four of the River were chosen as study areas because of the high use by both commercial and private boaters.

Section Three of the river is approximately 14 miles long and takes between 3 and 8 hours to float, depending on the craft and water level. There are numerous class II and III rapids, and several class IV. The primary takeout for Section Three is also the primary put-in for Section Four. The portion of the river downstream of the State Highway 76 bridge, before the river empties into Lake Tugaloo is labeled as Floating Section Four. This section is approximately 7 miles long and contains many class III and IV rapids. Class V rapids are not uncommon. In a 500-yard stretch of river just above Lake Tugaloo, there are one class IV and four class V rapids. This section of river requires a high degree of skill to be run successfully and even so is not without risk. Boaters must paddle approximately 2 miles across Lake Tugaloo to reach the takeout, which is located on Duke Power Company property.

Sampling Procedure

River users were intercepted onsite on random days between June 1, 1993 and October 30, 1993 or April 1, 1994 through May 31, 1994. Sample days were randomly assigned to seasons and section of the river based on probability proportionate to magnitude of use; total number of visitors per season per section of river was based on visitation for that season in the 1992 calendar year. On selected sample days, individuals were contacted between 1:00 PM and 7:00 PM. The sampling frame was designed to create a representative sample of commercial and private boaters on Sections Three and Four for the spring, summer, and fall.

There are three limitations to the sampling design. First, visitors who left the river before 1:00 p.m. and 7:00 p.m. were not contacted. Second, visitors who departed the river at some point other than the sampling location were not contacted. The final limitation is that no boaters were contacted during the "off season," that is, between November and March.

Private boaters on Section Three were contacted as they exited the river above the Highway 76 bridge. Private boaters on Section Four were contacted at the takeout on Lake Tugaloo. Onsite questionnaires for commercial boaters were distributed and collected by river trip leaders at the end of the commercial trip.

Instrument Content and Implementation

Two approaches were used to collect information: contacting visitors on site, and mailing a questionnaire to selected visitors.

Visitor Onsite Contact

All visitors exiting the river at the sampling point were asked to fill out a short onsite contact card. Contact cards were distributed to commercial river users by the leaders of their trips. Completed cards were collected by trip leaders and picked up at the outpost by study personnel.

The main purpose of the "Chattooga River Survey" contact card was to obtain names and addresses and some basic user information. The contact card was kept brief to encourage respondent participation, while minimizing disruption of the visitor's experience.

Mail Questionnaire

The primary instrument of data collection was a 16-page questionnaire titled "Chattooga River Visitor Study." This questionnaire was designed to meet the objectives of the study and was developed through a series of meetings with the Forest Service as well as representatives of commercial interests on the river. A random sample of visitors was selected from the completed onsite questionnaires.

Within 2 weeks of the contact date selected respondents were mailed a questionnaire packet. This initial mailing contained a cover letter, the "Chattooga River Visitor Study" questionnaire, a question and answer sheet, a "Chattooga Information" sheet, and an addressed postage-paid envelope.

Questionnaires were given a unique identification number. Once the respondent returned the questionnaire, the respondent's name was removed from the mailing list.

After the initial mailing, the follow-up strategy called for three additional mailings. Individuals who had not responded after 1 week were mailed a postcard. This postcard reminded the individual of the survey and encouraged its return, stressing the importance of the individual's opinion. Individuals who had not responded after 2 weeks were mailed a second packet. This packet contained a second questionnaire and a cover letter. Finally, a postcard was sent to individuals who had not responded after 3 weeks.

Mail Questionnaire Return Rate

Of the 1,159 questionnaires mailed, 34 were returned as undeliverable and 33 were returned past the acceptable deadline. Taking these 77 questionnaires into account, an adjusted total of 1,092 was determined. Of the adjusted total, 736 questionnaires were returned for an overall return rate of 67.4 percent.

Results

Complete results of the study have been presented to the Forest Service in a final report. By understanding the recreational user's role in the ecosystem the Forest Service is able to make more informed decisions about the management of the Chattooga River Basin. Information collected in the study is currently being used in the new land and resource management plan for the Sumter National Forest. Below is a summary of the information provided in the final report.

Most boaters surveyed indicated that they were satisfied with their experience and the job being done by river managers. Visitors perceive the quality of the experience available to be high. Contact with other boaters was not identified as a problem by boaters. Litter and erosion of trails and at river access were the most commonly reported problems. Limited access and the absence of manmade features were both highly rated as adding to the enjoyment of the river experience.

Both commercial and private boaters on the Chattooga support the notion of management actions that would protect the environment and the experience from damage by overuse. However, when confronted with specific management strategies to reach such an end, private boaters were not generally sportive. The most acceptable strategies included those which provided information to the user allowing them to better plan their own trip. Strategies calling for absolute limits were the least acceptable.

Determining Desired Conditions of Riparian Areas in the Southeastern United States: Examination of Two Decisionmaking Processes

Heather A. Pert, Steve L. McMullin, and C. Andrew Dolloff

Abstract

Riparian areas epitomize the current conflict over use of natural resources because they are valued by stakeholders who hold opposing, but legitimate, demands. In this paper, we (1) briefly review the value of riparian areas, (2) examine the source of conflict in determining land use of riparian areas, and (3) review two decisionmaking techniques and discuss the relative merits of each of these techniques in management of riparian areas.

Introduction

Riparian areas epitomize the current conflict over use of natural resources because they are valued by stakeholders who hold opposing, but legitimate, demands. Recreation, food and fiber production, wildlife, fisheries, water quality, and aesthetics are just some of the values associated with these high use areas. The linear distribution of riparian areas defies typical patterns of ownership or jurisdiction. Coordination among all upstream, downstream, instream, and near-stream users is vital to protect, manage, or enhance riparian areas. A resource manager operating under these conditions must implement or suggest management plans to landowners that integrate social and economic concerns with biological and physical criteria. Management plans and regulations should be rational, systematic, and legally defensible if implemented for public benefit.

In this paper, we (1) briefly review the value of riparian areas, (2) examine the source of conflict in determining land use of riparian areas, and (3) review two decisionmaking techniques and discuss the relative merits of each of these techniques in management of riparian areas.

Function and Value of Riparian Areas

Riparian areas, the zones of direct interaction between terrestrial and aquatic environments, help protect instream resources (Gregory and others 1991, Welsch 1991). Riparian areas influence water quality, floodplain hydrology, stream morphology, streamflow, fisheries, and wildlife. Riparian zones are extremely important for mitigating nonpoint source pollution since they filter sediments, nutrients, and pollutants entering the stream channel (Welsch 1991, Gilliam 1994). Inputs of large woody debris from the riparian zone to aquatic systems influence streamflow and sediment transport and are major components of high quality fish habitat (Harmon and others 1986). Riparian vegetation directly affects stream temperature, nutrient uptake and cycling, bank stability, and input of organic material (Brinson and others 1981, Gregory and others 1991). Leaves and other fine organic material from streamside vegetation are important foods for aquatic invertebrates that are in turn food for many fishes (see review by Murphy and Meehan 1991).

Wildlife habitat in riparian areas is frequently more diverse than the surrounding hill slopes (Brinson and others 1981). Many plant and animal species depend on the unique characteristics of riparian zones and wetlands to fulfill most of their life history functions (e.g., beaver, *Castor canadensis*; Brinson and others 1981). Still other species rely on the relative security of riparian zones for nesting or rearing young (Hooded mergansers, *Agelaius phoeniceus*) or to facilitate movements and migrations among habitats (Sharitz and Mitsch 1993). Recreational users are often attracted to riparian areas for such diverse activities as bird watching, wildflower walks, hiking, hunting, and fishing.

Riparian areas have been adversely modified through human activities such as agriculture, mining, deforestation, dams, and development; and through natural disasters such as hurricanes, floods, forest fires, insect outbreaks (e.g., gypsy moth), and disease (e.g., American chesnut blight). Attempts to protect ecosystem functions and restore degraded habitats are hampered by a lack of management guidelines designed to achieve specific conditions. Research about riparian function needs to be integrated with strategies for achieving multiple objectives of riparian management.

Barriers to Effective Decisionmaking

Barriers to effective decisionmaking in riparian areas in the southeastern United States include land ownership patterns, unclear legal mandates, conflicting management objectives, and uncertainty in the available data and outcome of management activities.

As major components of landscapes, southeastern riparian areas traverse jurisdictional and property boundaries. In the Southeast, over 90 percent of forested land is privately owned (Sharitz and others 1992). Further, 95 percent of the

Virginia Polytechnic Institute and State University, and Coldwater Fisheries Research Unit, USDA Forest Service, Southeastern Forest Experiment Station.

nonfederal forested wetlands area in the East (Cubbage and Flather 1993). Federal and state policy makers and land managers do not have direct control over designated land use on privately owned lands. They must work through incentive programs and regulations to encourage desired land use.

Lack of clear legal mandates in regulating land use affects both riparian areas and wetlands. No national regulatory laws apply specifically to wetlands and riparian areas (Braun 1986; Mitsch and Gosselink 1993). Instead, regulations designed to protect water quality are applied to wetlands and riparian areas. For example, most riparian regulation stems from the Amendments to the Federal Water Pollution Control Act of 1972, which is aimed at controlling nonpoint source pollution (Brown and others 1993). In the Southeast, compliance with nonpoint source pollution is primarily voluntary (Cubbage and others 1987; Salazar and Cubbage 1990; Hawks and others 1993) as most land is privately owned. Therefore, natural resource managers have limited ability to directly influence land use outside federal and state lands and frequently must rely upon voluntary compliance.

The biological and physical complexity of riparian areas further confounds decisionmaking for land use. Riparian areas can be difficult to define and delineate (Mitsch and Gosselink 1993; Sharitz and Mitsch 1993). The high productivity of riparian areas results in conflicting resource extraction goals. For example, extraction of timber resources may negatively affect wildlife and fisheries resources. Understanding the effects of management decisions on riparian areas requires input from a variety of specialists including hydrologists, fisheries and wildlife biologists, economists, silviculturists, and sociologists. Integrating the opinions of a variety of professionals is a time-consuming and cumbersome process. As a problem becomes more complicated, a stronger need arises for more information to decrease the probability of making a poor decision.[1]

As in all natural systems (Hilborn 1987), there is a great deal of uncertainty associated with riparian areas. Therefore, decisionmaking processes must recognize and incorporate uncertainty to make effective decisions. Two decisionmaking models will be examined which have potential use for addressing the concerns mentioned above when determining desired conditions of riparian areas.

Bayesian Belief Networks

Bayesian belief networks (BBN) were developed for use in artificial intelligence (Pearl 1988) but are relatively untested in natural resource management.[2] BBN's have recently gained attention as a method that incorporates uncertainty into the assessment of the potential threats from land-use activities (Lee and Rieman 1994). A BBN is a probability-based system, i.e., a "graphical representation of a multivariate probability distribution" (Haas 1991). For a detailed explanation of BBN's, see Pearl (1988), Olson and others (1990), Haas (1991), and Lee and Rieman (1994).

A BBN is a network of beliefs about the status of a system. In simplistic terms, a BBN uses prior probabilities and conditional probabilities to express the uncertainty in the true state of a sytem and to predict probabilistic outcomes for that system. The structure of a BBN is a series of belief nodes interconnected by directed arcs (fig. 1; Lee and Rieman 1994). Each node represents a random variable with three to five associated levels of probable outcomes (e.g., low, moderate, high). The uncertainty of the outcome is expressed by assigning a belief to each level in each node (Lee and Rieman 1994). All beliefs within a node are determined based on the best available information or expert opinion and must sum to 100 percent.

An example of an application of BBN would be to assess the effect of a proposed land management activity on a hypothetical riparian area (fig. 1). In this scenario the land manager is concerned about defoliation of the eastern hemlock (*Tsuga canadensis*) by the balsam woolly adelgid (*Adelgis picea*). Researchers are concerned that in several decades eastern hemlocks may experience a severe decline as a result of this pest. Eastern hemlocks are a dominant tree species in most of the riparian zones in this region. Land managers are proposing remedial actions to combat the pest but are uncertain of the outcome from the proposed activities.

A BBN model can be developed that incorporates the known and unknown information to predict the probable outcome. To construct a BBN the land manager must specify the "random variables and the joint distribution of these variables through a set of local conditional and unconditional distributions" (Haas 1991). Information is available on the status of the area and the predicted spread of the pest (fig. 1). Less may be known about the natural variability of the system and the resilience of the system to combined human-induced and naturally occurring perturbations. There may be several other variables that should be incorporated into the model in order to accurately predict the outcome. In this simplified model, values are assigned for the probable outcomes for each node that may affect the future of the stand (fig. 1). For brevity, there are several other variables not shown here which should be included on the model.

Sensitivity analysis can be conducted on the model, and nodes which strongly affect the outcome can be identified. For nodes that strongly influence the model, the land manager should obtain more accurate information. Currently, model components are developed by "experts."

[1] Rauser, H.M. Decisionmaking methods for ecosystem management decision support. In preparation.

[2] Lee, D.C.; Rieman, B.E. 1994. Population viability assessment using Bayesian Belief Networks: an example application to salmonids. U.S. Forest Service, Intermountain Research Station, Boise, ID. Draft manuscript, 25 pp.

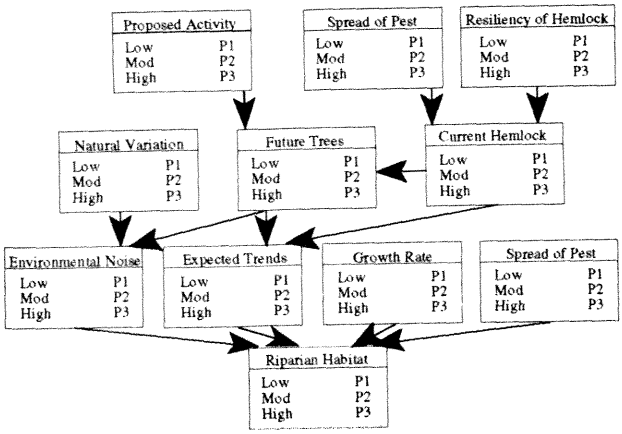

Figure 1–Hypothetical Bayesian Belief Network for determining effect of balsam woolly adelgid on riparian tree species. P1 = probability 1, P2 = probability 2, and P3 = probability 3.

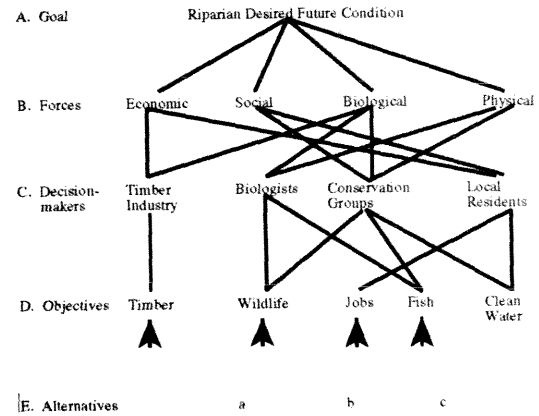

Figure 2–Analytic Hierarchy Process for determining desired conditions in riparian areas.

Where adequate measured data are lacking, use of expert opinion is important in natural systems. Expert opinion can range from the opinion of a single expert to the combined consensus of several experts. One group technique used in natural resource work for summarizing group opinions is the Delphi Technique (Zuboy 1981, Miller and Cuff 1986, Crance 1987). The Delphi Technique is a process whereby questions are posed to experts who iteratively answer and redefine the answers until consensus is reached (Linstone and Turoff 1975).

Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a participatory decisionmaking tool used for prioritizing alternatives in complex situations (Saaty 1980; reviewed in Schmoldt and others 1994). The AHP has been used successfully in a variety of fields including resource management planning for the National Park Service (Peterson and others 1994). The approach of AHP is to structure the problem into a hierarchy which helps clarify the components of the problem and identify possible inconsistencies.[3]

The hierarchy of AHP has several levels that reflect the components of the problem. Possible levels may include objectives, scenarios, events, outcomes, and alternatives (Schmoldt and others 1994). For example, a simple, theoretical hierarchy was formed to determine the desired conditions in riparian areas (fig. 2). As outlined above, land managers are concerned about the influence of the balsam woolly adelgid on eastern hemlocks in riparian areas. The land manager is attempting to determine what long-term strategy should be taken to ameliorate this problem.

The first step is to determine what the desired condition of the area should be and then what management activities will help to meet this goal. This simplified version has at the top of the hierarchy the goal of determining desired conditions for riparian areas in the Southeast (fig. 2A). The second level contains the forces that act on the main goal, in this instance they are economic, social, biological, and physical (fig. 2B). The third level contains the stakeholders or decisionmakers who influence the objectives in the fourth level (fig. 2C to D). The alternatives, the fifth level, might include possible land management activities such as harvesting hemlocks and replacing them with some other tree species (a), not harvesting the dying trees but planting another tree species in the area (b), or doing nothing and hoping the hemlocks are more resistant to the pest than predicted (c).

Once the hierarchy is formed, pairwise comparisons are made between all elements within each level. Depending on the nature of the problem, comparisons can be made with all-or-nothing allocation (integer values of 0 or 1) or partial allocation (integers ranging from 1 to 9) for each pairwise comparison (Peterson and others 1994). Matrices are formed for each possible comparison (Saaty 1980, Schmoldt and others 1994). Saaty (1980) developed the mathematics for making the comparisons and several computer programs are available that simplify the process of developing the hierarchy and calculating priorities. The final result of the AHP is a priority value assigned to each alternative.

The number of levels in a hierarchy and the structure of the hierarchy are highly flexible. A hierarchy can be structured to accommodate a single group or multiple groups. The hierarchy structure can be predetermined (static) or structured by the decision makers (dynamic).[4] One restriction of the hierarchy is a limitation of only seven

[3] Schmoldt, D.L.; Peterson, D.L.; Smith, R.L. The analytic hierarchy process and participatory decisionmaking. In preparation.

[4] See footnote 3.

pairwise comparisons (Miller 1956, Saaty 1980); however, this limitation can be remedied by restructuring the hierarchy (Schmoldt and others 1994).

Conclusions

The two decision analysis techniques, Analytic Hierarchy Process and Bayesian Belief Networks, have several features in common. They both structure a problem such that the framework allows careful scrutiny of assumptions, reasoning, and beliefs. The final decisions may be legally defensible because all assumptions and decision criteria are clearly stated throughout the analysis. Sensitivity analysis is a component of both models. Finally, it is possible to explore alternative scenarios with either model.

BBN has been used primarily for risk assessment and it may be difficult to modify it for use in participatory decisionmaking. Currently, the BBN requires strong programming and mathematical skills, which could limit its use by the average land manager. Also, assigning prior and conditional probabilities may be difficult and time consuming. However, BBN does not allow uncertainty to be incorporated into the decisionmaking process and assumptions can be tracked in the model. BBN may be a useful tool for assessing probable outcomes once desired conditions have been identified by another process such as AHP.

One of the strongest features of the AHP is its ability to incorporate diverse stakeholders in the decisionmaking process. Other strengths include (1) the ability to conduct sensitivity analysis on the hierarchy and identify strongly influential elements and (2) the ability to detect inconsistencies between pairwise comparisons and to estimate the importance of inconsistencies.[5] Several software programs are available for AHP, which makes it accessible to an array of users. The AHP could be used throughout the decisionmaking process to incorporate the views of diverse stakeholders.

Long-term management goals must reflect the values of the entire community in a given watershed or management area. Obviously, the desired conditions can vary from one region to another. Therefore, it becomes essential to define desired conditions for each management area, especially if the area is interjurisdictional. Within the Federal Government, many agencies are promoting new approaches to riparian management that emphasize the need for effective coordination. Under the paradigm of ecosystem management, impacts and influences on entire ecosystems are addressed and natural processes are highly valued. Natural resource managers and professionals are increasingly asked to consider all user groups, not just the traditional consumptive users, when developing management goals and research agendas.

This review is preliminary research for a project determining desired conditions in a southeastern riparian area. The intent of the research is to incorporate models such as AHP and BBN into the decisionmaking process. Participatory decisionmaking is becoming an increasingly popular and necessary tool for incorporating the values of diverse stakeholders. The models discussed above allow stakeholders to participate in decision analysis from the beginning, which helps to establish trust and open communication between stakeholders and regulators. This type of process may help regulatory agencies avoid some of the litigation and lawsuits which dominate much of today's public policy.

[4] See footnote 3 on page 25.

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Integrating the Human Dimension in Evaluating Alternative Uses for Winnebago Tribal Land

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Abstract

In 1992, an interdisciplinary research team from Iowa State University evaluated options for converting a tract of Winnebago tribal land from its current intensive agricultural use to other uses, including forestry and agroforestry. Tribal members participated in a nominal group process to identify and rank their objectives for the land. Decision criteria were expressed in different terms but the use of the Z-statistic allowed comparability among alternatives. Five weighting schemes, representing various perspectives that the Tribe can take, were applied in evaluating the seven alternatives that were developed. The best options were found to be two agroforestry alternatives that produce a diverse mixture of forest and agricultural crops. The study showed that a client-driven interactive process can be applied to generate and evaluate competing land use objectives that served as bases for developing alternatives to intensive agriculture.

Introduction

Landowners often want to realize several things from the same piece of land. This poses a big challenge to land managers who, in the evaluation of land use options, deal with a mixture of objectives that do not often fit a single category, and are likely to be conflicting or even exclusive. In addition, not all objectives are expressed in financial terms; consequently, the associated criteria cannot be easily evaluated in monetary terms nor do they all lend themselves to easy quantitative measurement. Examples are visual quality, the existence of a species, and other environmental goods and services that are called "nonmarket" because no perfect market exists through which they could be sold or traded. However, techniques have been developed to evaluate the values of nonmarket goods, such as contingent valuation, travel cost, and others (Shultz and Lindsay 1990; Bowker and Stoll 1988; Walsh and others 1984). In land use decisions, nonetheless, nonmarket goods have to be evaluated together with other outputs regardless of the units of measure used. Therefore, in evaluating land use change options, it may be necessary to add income as well as the number of potential jobs, wildlife and game, recreational opportunities, soil loss, and other goods and services that landowners desire. The first step, however, is to determine what the landowners want from the land.

A feasibility study for a Native American group illustrates the use of an interactive goal formulation process in combination with a weighting summation method in developing and evaluating various land use options for converting a tract of tribal land from agriculture to other uses. Central to this process was the early and active participation of the landowners, the Winnebago Tribe of Nebraska, in determining desired land use objectives and situations. At a time when financial gains seem to be at the top of most landowners' lists, the Winnebago Tribe has expressed a list of land use wishes that most forest land use planners are familiar with.

From Agriculture to Forestry

In 1992, an interdisciplinary team of researchers from Iowa State University completed a study of various land use alternatives for a 1,255-acre tract of land owned by the Winnebago Tribe of Nebraska. The research team was composed of rural sociologists, forest economists, forest biologists, forest soil scientists, and a political scientist. The evaluation involved the conversion of a piece of tribal land from its present intensive agricultural production into other uses, including forestry and a mix of agriculture and forest (or agroforests), within a 10-year period. The area, called Big Bear Hollow (BBH), has been rented to an outsider and has been in corn and soybean production for over 20 years. It is located on the Missouri River floodplain about 7 miles east of Winnebago, in the northeastern corner of Nebraska.

The Winnebago Tribe's philosophy of land stewardship is that humans are only temporary occupants of the land and should protect and preserve the land for future generations. This philosophy guides the tribe's planning activities for development and management of its lands and resources. The 1992 study was intended to assist the tribe in fulfilling the resource management goals expressed in its 1989 Land Use Plan. The tribe's general land use goal was the development of a "long-term land use management plan for BBH to attain economic, environmental, and social objectives through the promotion of tribal values" (Johnson-Trussell Co. 1989).

Objectives of the Study

The general objectives of the study were to develop alternatives for possible conversion of BBH from the current agricultural use into forest crops and agroforestry (a

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combination of forest and agricultural) crops, and to evaluate each alternative in terms of the economic, environmental, social, and institutional/political effects. The evaluation was guided by the tribe's general land use goal and by its goals specific to BBH.

Procedures

There were three phases to the study. The first phase was the scoping process to identify all tribal objectives relating to BBH, to identify the decision criteria to evaluate these objectives, and to establish baseline resource capabilities for the tribe's human/cultural and natural resources. The second phase involved the development of a set of alternatives based on tribal objectives and resource capabilities. The last phase involved the evaluation of alternatives using a weighting summation method and a comparison of these alternatives using five weighting schemes.

The Scoping Mechanisms

The nominal group process (NGP) was used to develop and rank the objectives that were identified for BBH. The NGP is a consensus-building procedure often used in identifying critical issues or in assessing information needs that initially requires a participant to list items in response to a question. The individual lists are pooled, followed by a brief discussion of the items in the list. The participant then independently ranks each item. A group rating for each item is developed by combining individual ratings (Schomaker and Lime 1988). The NGP has been applied in various fields, including planning, education, policy making, and management (Langone 1990, Mahler 1987, Schomaker and Lime 1988, Pokorny and others, 1988). (The Delphi technique is another consensus valuation technique that can be used to obtain this type of information but was not used in this study. The NGP is similar to the Delphi, except that participants are physically together and take part in group discussions. The Delphi may be used when the participants are geographically separated. A good reference for the Delphi technique is the book by Linstone and Turoff (1975) but there are numerous applications of this technique in several other areas as well.)

The NGP in this study started with a seed list of objectives obtained from tribal documents and earlier interviews with elders and community members. A group of Tribal Council members and tribal elders participated in the NGP and ranked these objectives following the process described above. After the first round of evaluation, the results were presented to the group for discussion. A reevaluation followed, producing a second and final overall group ranking that represented a consensus valuing of each objective by the tribe. The objectives were arbitrarily classified into four major groups: economic, social, environmental, and institutional or political.

The tribe's natural and human resources were assessed and a set of criteria was developed to evaluate the specified objectives. For instance, the tribe's recreational goal was measured using criteria dealing with opportunities for hunting and other recreational activities such as camping, hiking, mushroom hunting, and berry picking. Most criteria were developed using site-specific data collected about biophysical factors, such as crop water use. Other criteria were indexes, such as pesticide danger index, that were especially helpful where information was incomplete or not available. Where no apparent measurement existed for such goals as the transfer of knowledge from one generation to another, criteria were developed by consensus of the researchers through group interaction. More detailed description of the development and measurement of criteria is contained in the Winnebago Forest and Agriculture Alternatives Feasibility Study final report (1992). In accordance with the categorization of the objectives they were to evaluate, the criteria were likewise classified into four groups and are given in the following paragraphs.

The economic criteria used emphasized activities that provide net returns to people, such as jobs and farming income. These included the Present Net Worth (PNW) in dollars discounted at 6 percent rate, annual cash flow (undiscounted dollars), and employment. Based on components included in each alternative, cash-flows for the cropping systems involved were determined and opportunities for seasonal and full-time employment were identified.

The social criteria dealt with responses on educational and recreational concerns and internal cultural interactions. They included educational and recreational opportunities, hunting activities, tribal control of land use, enhancement of intergenerational interaction among members, and complementarity of alternatives with surrounding developments. Except for recreational use, these criteria were indexes that were developed based on the opportunities provided by the various components of each alternative. Recreational use was based on estimated number of people participating in camping, hiking, and mushroom hunting opportunities provided in each alternative.

The environmental criteria measured outputs and impacts for water, soil, wildlife, and habitat. They included well yield (in acre-feet per year), water use for irrigation (acre-feet per year), crop water use (acre-feet per year), soil loss (an index), organic matter (index), bulk density (index), nitrogen fertilizer (pounds per acre), pesticide danger (index), species diversity (number of representative animals), and game and wildlife habitat (a habitat value).

The institutional or political criteria measured the opportunities for outside funding and technical support for the alternatives. They included enhancement of Indian water rights claims, matching the tribe's land use plan with the alternatives, possible funding opportunities from the

Bureau of Indian Affairs and other sources, and building continuity (or continued tribal support) for the project. Indexes were developed to reflect relative rankings of alternatives with respect to each criterion.

The Development of Alternative Options for BBH

The development of alternative options was guided by the objectives obtained through the NGP, and by several additional land use guidelines from the Tribal Council and the Bureau of Indian Affairs. It was also based on the Tribe's natural and human/cultural resource capabilities. The number of alternatives that were developed reflected the spectrum of land uses from the purely agricultural use to complete forestry status, including some combinations of the two uses.

Each land use alternative consisted of one or more types of land use called management regimes. A management regime refers to a specific land use fit to the soil resource, with certain input requirements, and producing certain goods and services. Examples are irrigated soybean production, alfalfa production, managed mixed bottomland forest, short- rotation woody crop production, berry production, and the nursery operation.

Evaluation and Comparison of Alternative Options for BBH

Evaluation of alternatives involved determination of magnitudes associated with the decision criteria, the use of a decision matrix, and the application of a weighting summation method. The decision matrix is a useful tool in displaying a summary of the impacts of one set of items, such as a set of criteria, against another set (in this study, the set of alternatives). The use of the weighting summation method in this evaluation followed the procedure described by Canham (1990). This method has been used in studies involving alternative site locations for power plants, solid waste disposal plants, and power line locations (Hobbs 1978, Leopold 1969, Zieman and others 1971). Cole (1994) employed the matrix approach to assess threats to wilderness but dealt only with ratings and nominal scaling of the impacts of potential threats on wilderness attributes and did not include any comparison of alternatives.

Comparison of alternatives required that the simultaneous impacts of all criteria on each alternative be assessed and summed up first. A criterion measured the effect associated with an alternative for a 50-year period, and its impact could be easily compared across alternatives. The effects were measured in different terms, such as dollars, tons of soil loss, or wildlife habitat value, such that it was difficult to sum all of the magnitudes for an alternative, and to compare the alternatives. This comparability problem was solved by using the Z-statistic (Canham 1990) to scale the magnitudes for all criteria across all alternatives. For a criterion, the Z-score shows the relative relationship of an individual magnitude to the mean with respect to the standard deviation. The scaling procedure allowed for all magnitudes for any given alternative to be summed up in order to yield an overall score for that alternative. The Z-statistic is defined as:

$$Z_j = \frac{x_{ij} - x_m}{S_x}$$

For j=1 to n, the total number of decision criteria

where:

x_{ij} = the raw magnitude or response value (a data value) for alternative I, (I=l to k) the total number of alternatives

x_m = mean of all magnitudes for a given criterion

S_x = standard deviation of all magnitude values for a given criterion

Z_j = a standardized score for the jth decision criteria

Five weighting schemes were used to compare the alternatives, indicating different perspectives that could be taken by the tribe in evaluating the various options. These schemes were based on (1) actual criteria weight values as determined by the NGP, (2) equal weight for each objective, (3) high weight given to social objectives, (4) high weight given to environmental objectives, and (5) high weight given to economic objectives. For each weighting scheme, the Z-scores were multiplied by the weights assigned to the criteria. For example, in giving priority to social objectives, it was assumed that the associated social criteria were 10 times as important as all other criteria. Hence, the Z-scores for social criteria were multiplied by a weight of 10.0; for all other criteria, their Z-scores were multiplied by 1.0. In most cases, only one criterion was identified for one objective. However, in cases where two criteria were used to measure one objective, each criterion was given one-half value toward the attainment of that objective. The weighted Z-scores were summed for each alternative. The total weighted score for each alternative could then be directly compared. Under any scheme, the alternative with the greatest total weighted score was the "best" option.

Results and Discussions

The NGP generated a set of 21 objectives that is presented in table 1. The final round ranking showed that the four categories of objectives are scattered throughout the list. For instance, social and political objectives were the highest ranked (health risk and building continuity) as well as the lowest ranked (recreational opportunities and the relationship with the Army Corps of Engineers). Also high on the list were other political objectives, such as the enhancement of the tribe's water rights and the attainment of their land use plan goals; and several environmental objectives, such as enhancement of water quality and quantity, species diversity, and wildlife habitat. One objective, the enhancement of the tribe's water rights, was dropped since it was a legal issue beyond the scope of this

research activity. However, relevant information was presented to the tribe on how this objective possibly could be facilitated.

The seven alternatives that were developed are shown in table 2 with the estimated acreages of their various components. Representing feasible alternative uses of BBH, all options included the 55- acre shelterbelt component. Alternative 1, the status quo, involved all 1,200 acres in irrigated and dry land corn and soybean production. Alternative 2 retained 75 percent of the area in irrigated cropland and 25 percent in black walnut, cottonwood, and other native bottomland forest species. Alternative 3 had 50 percent in irrigated agronomic production, 20 percent in mixed native forest, and 30 percent in short-rotation woody crops. Alternative 4 had 25 percent in irrigated alfalfa production, 43 percent in forests, 28 percent in short-rotation woody crops, and much smaller areas for Indian corn, berries, and a wholesale container nursery operation. Alternative 5 retained the berry/corn/nursery areas, and put the rest (96 percent) of the area to forest to produce timber, wildlife, and recreational opportunities. Alternative 6 had a 40-acre demonstration/research plot in cooperation with the USDA Forest Service National Center for Agroforestry (located in Lincoln, NE), and put the rest to native forest. Alternative 7 represented complete conversion of the 1,200 acres to native forest.

Table 1—Nominal group rankings for the tribal objectives associated with alternative uses of Big Bear Hollow

Objectives	Final group ranking
1. To minimize health risks associated with farm chemical use	87
2. To build continuity	87
3. To enhance the water rights of the Winnebago Tribe of Nebraska	79
4. To enhance attainment of goals of the Winnebago land use plan	78
5. To enhance quality and quantity of the water coming from the area	76
6. To enhance wildlife habitat	75
7. To enhance diversity of plants/animals of bottomland ecosystem	75
8. To enhance the complementary nature of the project with Glover's Bend (adjacent forested land on Missouri River)	75
9. To foster the tribal philosophy of land use	72
10. To reduce soil loss	71
11. To enhance soil fertility	70
12. To foster long-term support of tribal goals and objectives by the BIA	69
13. To minimize loss of income from converting site to other land uses	68
14. To maintain about the same cash flow as from leasing BBH	68
15. To foster hunting and fishing opportunities for the tribe	66
16. To enhance the transfer of intergenerational tribal knowledge	66
17. To promote long-term opportunities for adult employment	61
18. To foster educational opportunities for the entire tribal community	60
19. To promote opportunities for seasonal youth employment	58
20. To foster long-term support of tribal goals and objectives by the Army Corps of Engineers	47
21. To develop recreational opportunities for tribal members	40

Alternatives 1 and 7 represented the two extreme positions of pure agriculture and pure forestry, respectively. Alternatives 2 and 3 represented predominant agricultural activities and some forestry, 4 and 5 were more diversified pursuits, while 6 provided predominantly nonmarket (recreational and wildlife) outputs with other market goods.

The impacts of all criteria on an alternative were determined but these data allowed comparison of alternatives for only one criterion at a time, e.g., soil loss index is highest for Alternative 1. These impacts were scaled using the Z-statistic to allow for comparability among alternatives and the scaled results (Z-scores) for selected criteria are presented in table 3. The summation of the scaled values for an alternative yields an overall weighted score that implicitly values all criteria equally in terms of importance, which would correspond to those obtained under the equal weighting scheme, one of the five schemes applied in this paper.

Table 4 presents the total weighted scores resulting from the application of five weighting schemes to the scaled data. Negative values for Alternatives 1 to 3 in all schemes reflected the fact that these alternatives had predominantly agricultural activities and had low forestry and socially and environmentally enhancing opportunities. Therefore, one could expect low nominal, equal, social, and environmental scores for these three options. These three alternatives were also low in economic weighting because they provide minimal employment opportunities. Alternatives 6 and 7 were low in economics because they provided little or no cash income and few employment opportunities. The consistent high scorers were Alternatives 4 and 5, which contained a diversified mixture of agricultural and forestry crops. The agricultural activities provide for cashflow and employment opportunities, while the forestry components offer more opportunities for educational, recreational, and intergenerational interaction opportunities and greater tribal control of land use as compared to alternatives with primarily agricultural or purely forestry leanings.

Table 2—The seven proposed alternatives and the estimated acreages of each component use

	Management Alternatives						
regimes	1	2	3	4	5	6	7
Shelterbelts	55	55	55	55	55	55	55
Irrigated corn and soybeans	1040	900	600	0	0	0	0
Dryland corn and soybeans	160	0	0	0	0	0	0
Managed mixed bottomland	0	226	191	325	773	764	0
Managed cottonwod	0	36	20	0	60	46	0
Managed mixed walnut	0	38	4	0	39	67	0
Short rotation woody crops	0	0	385	338	0	0	0
Unmanaged mixed bottomland	0	0	0	171	194	190	965
Unmanaged cottonwood	0	0	0	15	65	65	125
Unmanaged mixed walnut	0	0	0	4	22	28	110
Irrigated alfalfa	0	0	0	300	0	0	0
Agroforestry demonstration plot	0	0	0	0	0	40	0
Berry patch	0	0	0	2	2	0	0
Indian corn	0	0	0	40	40	0	0
Nursery	0	0	0	5	5	0	0
	<==========						==========>
	Intensive Agriculture			Diversified Agroforestry			Conversion to forestry

Table 3—Matrix of Z-scores for selected criteria across the seven proposed alternatives.

	Alternatives						
Criteria	1	2	3	4	5	6	7
Present Net Worth ($) (disc. @ 6%)	0.520	0.004	-0.042	1.200	0.930	-1.250	-1.370
Full-time jobs (no. of job opportunities)	-1.270	-1.270	-0.160	0.960	0.960	0.960	-0.160
Part-time jobs (no. of job opportunities)	-1.030	-0.740	-0.450	1.860	0.700	0.120	-0.450
Crop water use (acre-feet per year)	-1.380	-0.870	-0.440	1.670	0.330	0.320	0.370
Soil loss (index)	-1.560	-0.970	-0.500	0.500	0.810	0.800	0.910
Game/wildlife habitat (habitat value)	1.220	-1.240	-1.050	-0.800	0.430	0.560	0.840
Educational opportunities (index)	-1.750	-0.640	-0.360	1.030	1.030	0.200	0.480
Tribal control of land use (index)	-1.510	-0.940	-0.650	0.780	0.780	0.780	0.780
Recreational use (no. of people participating)	-1.620	-0.940	-0.320	0.250	0.860	0.850	0.930
Match with tribe's land use plan (index)	-1.770	-0.820	-0.180	0.450	0.770	1.090	0.450
Possible funding from Bureau of Indian Affairs ($)	-1.720	-1.150	0.480	0.830	0.480	0.500	0.570
Building continuity for the project (index)	1.090	0.830	-0.220	-1.540	-1.010	0.040	0.830

Table 5 summarizes the rankings of the seven alternatives using the five different weighting schemes. Using the nominal group scores, Alternative 5 was ranked first and Alternative 4 was second. These rankings were similar to those derived by using equal weights and by giving high priority to the social objectives. It may be noted that although magnitudes changed, these changes were proportionate and resulted in the same preferential ranking by the tribe in all three schemes. Giving high weight to the environmental objectives, Alternative 7 was first and Alternative 1 was last, as could be expected. Finally, when high priority was given to economic objectives, Alternative 4 ranked first and Alternative 5 was a close second. This could be expected because, compared to the other options, both alternatives provided for more cashflow and employment opportunities from both agricultural and forestry activities.

Table 5 also shows that Alternatives 5 and 4 seemed to be the best options, based on the five weighting schemes applied. These alternatives involved mixtures of forestry and agricultural (agroforestry) operations, and best addressed the equally diverse social, economic, environmental, and institutional objectives of the tribe for BBH.

Although no formal risk assessment was done, risk and uncertainty associated with the components of the alternatives were considered. A conservative approach was taken to determining outputs and prices for commodities with underdeveloped markets. Some forestry and agricultural outputs, such as nuts and berries, are for Winnebago household consumption, but pricing was based on regional markets. To a certain extent, risk was incorporated in the present net worth calculations via the real discount factor. For example, the nursery operation was considered a high risk proposition in that it required a high level of technical and managerial skills, high capital cost of establishment, and uncertainty associated with markets for the nursery products. Although possibly profitable as suggested by research, the short-rotation woody crops were also considered risky because no markets exist close to Winnebago, NE.

Summary and Conclusions

The Winnebago Tribe of Nebraska had expressed a desire to explore alternative use options for converting a piece of tribal land from its current agricultural use to other uses, including forestry. An interactive approach was used in the formulation of tribal goals for the land. The development of alternatives was guided by the tribe's general land-use goal, by their specific goals for the land, by additional land-use guidelines, and by the tribe's resource capabilities.

Twenty-one objectives for BBH were identified and ranked using the NGP. Seven alternatives were developed, representing a spectrum of land use packages, ranging from the status quo (purely agricultural production) to complete

Table 4—Sum of weighted scores for the seven alternatives, using five weighting schemes.

Weighting schemes	Sum of weighted scores						
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Nominal group[a]	-965.06	-757.89	-383.42	638.31	735.31	357.69	379.31
Equal weight[b]	-15.37	-11.42	-6.05	10.25	11.53	5.28	5.36
Social weight[c]	-75.67	-44.72	-19.91	44.18	45.91	24.63	42.28
Environmental weight[d]	-58.43	-54.95	-35.38	9.52	46.08	40.87	47.87
Economic weight[e]	-4.48	-9.67	-9.13	30.14	28.99	-17.67	-18.67

[a] Tribal weights determined from the NGP were applied.
[b] All objectives were given equal weight.
[c] Social objectives were given a weight of 10.0; all others were given 1.0.
[d] Environmental objectives were given a weight of 10.0; all others were given 1.0.
[e] Economic objectives were given a weight of 10.0; all others were given 1.0.

Table 5—Ranking of the seven alternatives using the five weighting schemes.

Weighting schemes	Ranking						
	1st	2nd	3rd	4th	5th	6th	7th
Nominal group	Alt 5	Alt 4	Alt 7	Alt 6	Alt 3	Alt 2	Alt 1
Equal weight	Alt 5	Alt 4	Alt 7	Alt 6	Alt 3	Alt 2	Alt 1
Social weight	Alt 5	Alt 4	Alt 7	Alt 6	Alt 3	Alt 2	Alt 1
Environmental weight	Alt 7	Alt 5	Alt 6	Alt 4	Alt 3	Alt 2	Alt 1
Economic weight	Alt 4	Alt 5	Alt 1	Alt 3	Alt 2	Alt 6	Alt 7

forestry (timber, wildlife, recreation) production. Based on the decision criteria, the alternatives were evaluated using a weighting summation method and by applying five weighting schemes to emphasize preferences in goals or components. Based on the five weighting schemes, the best options were two agroforestry alternatives that produce a diverse mixture of agricultural and forest crops. The agricultural activities addressed the tribe's economic concerns while the forestry component provided opportunities for the attainment of most of the tribe's social, environmental, and institutional objectives.

The research team presented an array of alternative choices to the tribe, identifying the best options from several vantage points. This allows some latitude to the tribe to determine to what extent it wants to pursue its diverse social, economic, and environmental objectives, and then to choose an alternative that best addresses these desired goals. Crucial to the whole process was the understanding by the tribe of the importance of its participation in identifying and articulating its own objectives for the land.

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Using Challenge Cost-Share Partnerships to Communicate With Ethnically Diverse Recreation Users in Southern California

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Abstract

Recreation managers have established more effective communication with dispersed recreation users of the Angeles National Forest in Southern California, through the development and use of Challenge Cost-Share Partnerships with regional nonprofit organizations. From 1988 to 1990, researchers conducted a series of surveys of recreational visitor populations in the heavily used dispersed recreation areas of San Gabriel Canyon, in the Mt. Baldy Ranger District. The findings revealed that most of these users decided to come to the National Forest only 24 hours or less before their arrival. This finding suggested that recreational use of the National Forest was mostly the result of spontaneous choice behavior and that communication with groups in advance would not be easy or certain. Thus, they would not have current information on changes in regulations or fire restrictions. Nearly 70 percent of the users surveyed were Hispanic, of which 81 percent listed Spanish as their primary language. The fact that many of these users were recent immigrants offered insight to their lack of familiarity with the programs and practices associated with an outdoor land ethic.

Introduction

The Angeles National Forest in southern California has become the quintessential urban National Forest. More than 15 million people reside within a 1-hour drive of the National Forest boundarythe skyscrapers of Los Angeles Civic Center are only 9 miles away. Forest managers serve an annual number of 30 to 35 million recreational visits.

Communicating complex messages about forest regulations, resources, visitor safety, fire restrictions and recreation opportunities to the user population was perceived to be somewhat ineffective in the context of the tendency to use traditional information delivery strategies. This problem is particularly evident in communicating with dispersed recreation customers. In 1988, a study was initiated to examine what could be done to improve the communication process between the USDA Forest Service district staff and seasonal visitors arriving in large numbers to dispersed areas of the Angeles National Forest.

The communication study had three primary objectives:

- to examine the decisionmaking process of the visitors in terms of planning their trip;
- to describe the trip characteristics of the dispersed site visitors; and
- to test the adequacy of a two-stage questionnaire in obtaining specific information about the communication networks of the new (nontraditional) visitors engaging in recreational activities at the dispersed sites.

Methods

In summer 1988, data were collected from more than 230 "non-traditional visitors" at nine sites in the Mt. Baldy Ranger District (MBRD). Based upon field observations of district staff and a report by the Supervisors Office (Hartley 1986), the data collected showed that a variety of activities and uses in specific areas were new to the lower canyon area and little was known about the customers. Data were collected from personal interviews and from the distribution of a self-administered questionnaire. The field investigators also completed a record about group characteristics and recorded comments provided by the users concerning how they felt about the area, the facilities, and the general management. The procedures involved a stratified random sample of nine sites for the interview procedures. The dispersed sites where the visitors were contacted were in the Mt. Baldy and Arroyo Seco Districts.

Results

Only a portion of visitor response is described herein and these results relate to their trip characteristics, trip-planning, and preferred style of communication. Complete information pertaining to the observations that follow can be found in appendix A of the project technical report (Simcox, Pfister and Hodgson 1989).

Trip Characteristics

The majority of the respondents (76 percent) indicated that they spent approximately 1 hour or less to reach the area. The variation in travel time was noteworthy: the average was 62 minutes with a standard deviation of 50 minutes.

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This average travel time applies to an extensive area of the Los Angeles Basin, and the responses of visitors to the question of "residence" (ZIP codes) showed that the MBRD serves a basinwide market. The summer trips involved large groups with an average size of 8 individuals and a variation ranging from 1 to 50 individuals. Ten percent of the groups had from 16 to 50 individuals in their party.

Trip Planning

The results revealed very little advance planning for the trip since most of the visitors decided 24 hours or less before arriving in the area. This response was true for the majority of the respondents (70 percent) and made the task of broadcasting advance public notices more uncertain. Generally everyone in the group participated in the decision to visit the area (65 percent), but this was not a time-consuming decision because the site was the only place they considered (61 percent). The majority (76 percent) of the visitors were self-identified "new users" because they visited the recreation site either once the previous summer or perhaps the day they were interviewed.

Communication Preferences

The investigators concluded from these results that the new customers have different characteristics, use patterns, and preferences in comparison to the established use patterns. The new visitors were often "New Americans" in the context that they had immigrated to the United States. They tended to prefer interpersonal oral messages to learn about the area and to learn about the opportunities available to them. The new visitors' knowledge and perceptions were based upon communication with peers and friends and not the printed material published by the managing agency. Nearly three-quarters of those surveyed first heard about San Gabriel Canyon from another person. Except for guidebooks, mass media were unimportant sources of information. This finding was consistent with previous studies that focused upon the communication networks of newly immigrated individuals. As stated by J.O. Yum (1983):

> "Newly immigrated individuals will seek out their own culture in a new country and will only expand their communication networks over a long period of time."

This meant that some of the visitors to the area, whose cultural experiences or values were based upon closely knit family systems, would tend to have a more limited communication network. That is to say an interpersonal communication network which can be contrasted with what would be characteristic of a California-born Anglo–the kind of visitor who is most likely to have one of the widest ranges of communication networks. This difference was revealed in the responses of the US-born visitors, who were more likely than other visitors to use guidebooks as a source of information about the area.

Also, beyond the questions related to the communication networks, there were questions related to spatial patterns and timing of public messages. Because the sociodemographic variation was substantial among the culturally diverse visitors, targeting public announcements to specific local residential communities would be difficult given the dispersed nature of the customers.

Moreover, given the spontaneous nature of the visitors' trip-planning, the resource managers' ability to systematically contact them in advance and deliver accurate and timely messages about regulations, site closures, or use restrictions is very limited. In addition, the recreation experience of the visitor was not tied to a specific entry point (e.g. ORV area) or an established check-in procedure (e.g.-wilderness permits), so the implementation of some form of onsite communication would have to be well thought out.

Research Applications and Recommendations

The recreation leadership group in the MBRD examined the research findings and recommendations generated by field investigations conducted by California State Polytechnic University-Pomona and California State University at Chico, along with other reports produced by the research staff at the Pacific Southwest Research Station (PSW), USDA Forest Service.

The studies suggest that natural resource professionals need to listen more attentively to the public to clearly understand their wishes and values (Magill 1991). Listening to, and communicating with, the dispersed recreation customers is a challenge. The Forest Service is effective in communicating and interpreting detailed, and sometimes complex, information to the public at "fixed" locations like information bulletin boards and visitor centers. But, the agency has no effective strategy for informing visitors in dispersed recreation settings. MBRD staff evaluated a range of options to help educate the user audience such as:

- Use existing systems and infrastructure. The public can obtain forest information from knowledgeable staff at 15 "fixed" locations. This number could be increased to about 40 seasonally if all fire stations were staffed with information personnel.

- Design new curriculum for the public school systems. Adapt messages to existing programs such as Project Learning Tree.

- Utilize the existing news and information media networks.

- Improve information and interpretive signs, handouts, and brochures.

- Increase the use of volunteer and other human resource programs.

- Develop and expand the use of Challenge Cost-Share Partnerships.

A Thorny Problem

It was evident from the research that limiting the delivery of complex messages about regulations and environmental awareness to signs and bulletin boards when the visitor profile revealed a bilingual audience with considerable variability in their literacy and their prior knowledge about the area was not going to be sufficient to result in compliant behaviors. The suggestion was for more emphasis on face-to-face interpersonal contacts in the recreational setting rather than off-site contacts. Nearly 70 percent of the users in San Gabriel Canyon made their decision to come to the forest within 24 hours of actually making their visit so that planning the outing was a spontaneous event (Simcox, Pfister and Hodgson 1989). However, having paid Forest Service employees make the contacts is impossible for at least four reasons:

- Lack of Bilingual Skills–Only two employees in the field operation functions of law enforcement, fire prevention, and recreation had fluent bilingual skills (Spanish/English).

- Shrinking Workforce–In the early 1990's the Forest Service downsized the workforce nationally. Few opportunities existed to fill vacant permanent or temporary positions with candidates who possessed bilingual skills.

- Time Constraints–Retraining existing employees to be articulate in a second language would be costly and time-consuming. Some indicated resistance to being so trained.

- Declining Budget–The MBRD is able to field only 14 employees at peak periods, because of budget and staffing limitations. Most of the time is consumed responding to critical incidents, or meeting the requirements of operations and management in developed recreation sites. Staff are generally unavailable for work that involves public contact with dispersed recreationists in the canyon bottoms and along stream sides and trails.

If the agency opted for training the existing workforce, the number of available employees is too low to effectively communicate with the number of users who need personal contact. An estimated 10 to 15 bilingual employees are needed during periods of high visitation to communicate messages about user safety, environmental awareness, and regulations. Considering the rates for returning visitor use, it is estimated that 1,000 to 2,000 contacts are needed per day during periods of high visitation.

Crafting a Solution

Because a skilled bilingual public contact staff will be slow to develop within the existing workforce, managers should consider opportunities outside the workforce.

In 1991, the MBRD began working with the California Environmental Project (CEP), a regional nonprofit organization that coordinates volunteer cleanup events and recycling efforts on private and public lands. CEP leaders indicated that they were interested in expanding their relationship with the Forest Service.

We shared the research findings provided by PSW with CEP. Both CEP and the Forest Service had procedures for cleaning up litter and graffiti on public lands. As cooperators, we recognized that cleaning up after users was only a part of the solution. The many canyons and dispersed recreation areas of the Angeles National Forest (ANF) had been cleaned and recleaned hundreds of times over the past three decades. To continue this process without a more permanent objective was both endless and hopeless.

After several sessions with CEP and PSW staff, we recognized a unique opportunity to develop a strategy. CEP has also been involved in a separate cooperative relationship with the Los Angeles Conservation Corps (LACC), another regional nonprofit organization, headquartered in South-Central Los Angeles. As part of the cooperative agreement, LACC provided paid crewsfrom the primarily Hispanic and African-American neighborhoods of the inner-cityfor the conservation and cleanup efforts of CEP. Thus, LACC had an unlimited supply of enrollees readily available, offering a variety of linguistic skills from several ethnic and cultural backgrounds.

In addition, because the cooperative volunteer relationship between CEP and the MBRD was formalized as a Challenge Cost-Share Partnership, a new source for funding became available to the Forest Service through a separate agreement with the Los Angeles County Department of Parks and Recreation. A portion of those funds have been made available for support of the partnership with CEP. Thus, as the Challenge partner, CEP could assume the role of clearinghouse for recruiting, training, equipping, organizing, scheduling, and supervising volunteers and LACC members.

Genesis of the "Eco-Teams"

The first step was to acknowledge the premise that interpersonal communication is the most efficient solution to contact and educate dispersed users. From there, focus was placed upon the opportunity presented by the relationship between CEP and LACC.

In concept, we were creating a highly mobile group of environmental educators, who would individually possess the following capabilities and attributes:

- Broad knowledge and understanding of general forest information, rules and regulations, fire prevention, outdoor safety precautions, and ecological systems.
- Ability to relate to and communicate with the user groups predominant in a particular dispersed recreation area, including bilingual skills.
- The desire to learn and train others.

A major emphasis for these contact teams would be to educate users about the individual and collective role they play in protecting the quality of the environment. The complex relationships between organisms (in this case, humans) and the forest environment form a community, termed an ecosystem, from which the name Eco-Teams was derived.

The Results–A Success Story

The first Eco-Teams were recruited by CEP in the spring of 1992 from the ranks of seasoned LACC crews. The Forest Service assisted CEP with the training and equipment. The recruits received 16 hours of intensive classroom training that included practice public contact scenarios. The trainees were then paired with experienced public contact staff to observe and assist with actual public contact work.

Beginning in late May 1992, as many as eight two-person Eco-Teams (ET's) were deployed in San Gabriel Canyon. The ET's contacted thousands of recreationists, distributed various forms of bilingual information and passed out litter bags. The following is a partial list of the accomplishments of the ET's from May 1992 to October 1993:

- Over 40,000 public contacts made on three National Forest Ranger Districts.
- During 1992, a 48 percent increase in voluntary compliance with the San Gabriel Canyon parking fee program.
- Forest users packing out an estimated 500 Eco-Team-supplied trash bags.
- A positive response from forest users, canyon businesses, residents, and Forest Service staff.
- A visibly more attractive, less littered National Forest.

The Challenge Cost-Share Partnership between the Forest Service and CEP has been expanded to include LACC and every Ranger District of the Angeles National Forest. The total net value of the Partnership was $57,000 in 1992, increasing to more than $433,000 in 1993. Challenge contributions to the partnership are about 5:1 in comparison to those by the Forest Service.

The MBRD sought, and obtained, funding support for the ET's from other grant programs including the Natural Resource Conservation and Education Program and the Urban Forest Demonstration Project.

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Integrating Social Sciences In Ecosystem Management: People-Forest Interactions In The Urban Forest

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Abstract

The social sciences (i.e., the study of people's values, experiences, behaviors, culture, etc.) are critical to the development and implementation of ecosystem management strategies. To be most helpful in developing these strategies, social scientists should focus significant attention on interactions between people and forests under various management strategies. The urban forest offers an outstanding laboratory for studying a range of people-forest interactions, and the results have important implications across the urban-to-wilderness spectrum.

Introduction

Integrating the social sciences into ecosystem management is critical to the development of forest management strategies that will both sustain ecosystems and meet people's needs and expectations. As the owners, managers, and users of forest ecosystems, people will ultimately determine the management strategies that are carried out. Therefore, understanding what people want and need from the forest, as well as what they are able to contribute to the task of forest management, is essential for successful ecosystem management. With more than three-fourths of U.S. residents living, working, and spending most of their leisure time in urban areas, a large portion of the population is involved in the management and use of urban forests. Many diverse individuals and groups own, manage, and use urban forest resources, and they interact with the urban forest environment in widely ranging ways that have significant consequences for forest ecosystems and the people who depend on them.

To be most helpful in developing and implementing these strategies, social scientists should focus significant attention on critical people-natural resource interactions and explore their implications for forests and for people in the years ahead. It is essential that we be able to identify, explain, and predict these interactions. People-forest interactions are particularly significant in the urban forest, and this paper discusses the results of social science research focusing on the urban forest and the insight it provides on how to integrate the social sciences into ecosystem management across an urban-to-wilderness spectrum.

Human Influences On Urban Forests

Human activities have important influences on urban forests. Changes in the urban infrastructure can displace trees; and the health and survival of trees can be threatened by construction, maintenance, trenching, soil compaction, pollution, and pesticides. Restoring and expanding the urban forest requires planting trees and other vegetation, which is a popular activity with important social implications. Tree planting events offer people an opportunity to express their commitment to the future, change the landscape and improve their environment, and empower and revitalize their communities (Dwyer and others 1991). But long-term survival of urban trees often depends on the care and protection provided by urbanites. Unfortunately, the deeply held values that motivate people to plant trees often do not find expression in regular tree care or forest management. Much attention is paid to planting trees, only to have some of those trees deteriorate or die due to lack of watering and basic maintenance. There appears to be a lack of understanding of the importance of tree care and other forest management activities to the growth and development of the urban forest. There are examples of the same inattention to tree and forest care in exurban environments as well, including lack of management of forest plantations and limited support for management of other forest environments.

If more effective ecosystem management programs are to be implemented, the public, policy makers, partners, and managers must gain a better understanding of the consequences of various management strategies in terms of the long term growth, survival, and development of forests. This information is the fundamental background for identifying the range of possible management strategies and their implications for the forest environment now and in the years ahead. Social science research should focus on effective ways of communicating the physical and biological consequences of management options, as well as on finding the links between this "production" information and the needs, behaviors, and benefits received by the people who own, use, and manage the forest ecosystem. This is no small task given the increasing complexity of

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forest ecosystem management and use, and our rapidly growing knowledge of forest ecosystems and their use.

The forest environment is the key link between production and consumption in that it is where producers and consumers interact. Ultimately people's needs and expectations should guide research on the "production processes" in that attention should be focused on producing what people need and expect. It is critical that production and consumption be considered jointly in decisionmaking, rather than exploring benefits after decisions have been made in an effort to justify those decisions. The latter approach has often been the case, where social science has been used to justify decisions rather than to guide the appropriate choice.

Given the important roles that urbanites play in forming forest policy across the urban-to-wilderness spectrum, and their high level of interaction with the urban forest, perhaps communication of the consequences of management options can give significant attention to the urban environment, including emerging efforts to implement ecosystem management in urban areas.

A Diversity of Managers

Part of the challenge of managing the urban forest comes from the large number of individuals and groups involved in that effort. Each of the groups manage somewhat different resources for varying purposes and have diverse sources of information. Many of the key decisionmakers who influence the urban forest do not necessarily have expertise in forest resource management. The professions involved range from foresters to arborists, landscape architects, horticulturists, engineers, planners, wildlife biologists, hydrologists, and others. Given the intricate pattern of forest ownership throughout the urban system, the activities of the various individuals and groups are interdependent in providing important benefits to urbanites. For example, the environment around a residential home is influenced not only by the trees on the property, but also by those on adjacent lots, along the street, and in nearby parks and greenways. The managers of each of these resources influence the quality of the environment for residents. On a larger scale, the efforts of a large number of urban forest resource owners and managers collectively influence the character of the urban landscape as well as the many benefits it provides. Unfortunately, comprehensive approaches to management of the urban forest have seldom been implemented or even considered to date. Comprehensive approaches to management of forest landscapes are uncommon in exurban environments as well. The challenge of implementing comprehensive landscape management appears to be particularly great with large numbers of private owners seeking diverse goals.

The implementation of comprehensive approaches to management of the forest ecosystem across multiple ownerships will require the development and dissemination of improved information on how the management of one ownership influences the use and management of other ownerships across the landscape. Obvious links among ownerships are important when it comes to esthetics, air and water quality, pest management, wildlife, and invasion of exotic plants; but new links are being found all the time as we explore the spatial and temporal dimensions of ecosystem management. It will also be necessary to identify promising strategies for developing and sustaining cooperative approaches to management of diverse ownerships across the landscape. Few successful examples of these approaches are readily available in urban or exurban areas.

Partnerships

New groups continue to form to plant and care for urban trees, and many existing community groups have also taken on these efforts. This is part of a broader "urban greening" movement that includes community gardens and beautification efforts. Citizen groups can generate support for the expansion and improvement of public urban forestry programs, and their involvement often makes these programs more effective. Sommer and others (1994a, 1994b) report that homeowners who participated in planting street trees in front of their homes were more satisfied with these plantings than homeowners who did not participate. Sklar and Ames (1985) report higher survival for parkway trees planted in neighborhoods through urban forestry-sponsored block parties than for trees planted by a program without community participation or ceremonial plantings. Community involvement in urban forestry is expanding beyond tree planting to include other important aspects of tree care and maintenance.

In Chicago, volunteers receive extensive classroom and "hands-on" training in tree care under the TreeKeepers program of Openlands Project. The Nature Conservancy has more than 5,000 volunteers working to restore and manage prairies, savannas, and woodlands throughout Chicago and surrounding areas. These volunteers receive a significant amount of training, including courses as part of a "Prairie University." Volunteers participate in a wide range of restoration activities and are organized into a number of highly active groups throughout the Chicago area. Individual stewards are given responsibility for the restoration of designated areas. Their efforts are returning increased diversity to the Illinois landscape.

In Baltimore, New Haven, and Detroit, inner city residents are actively involved in restoring the urban forest in their neighborhoods under the Urban Resources Initiative (McDonough and others 1992, Grove and others 1993). These efforts benefit the forest as well as the people involved in the activities. Results of ongoing programs suggest that volunteer and community groups working in cooperation with management agencies can greatly enhance

the urban forest and improve the quality of life in urban areas. In these partnerships, volunteers often learn a great deal about the technical aspects of urban forestry; while managers, planners, and organizers learn a great deal about people and their needs and expectations. This provides a sound basis for future dialog.

There is, however, still a very great need for more and better partnerships among managers and users in order to fully implement management of the urban forest ecosystem. Improved partnerships are key in exurban areas as well. Given the nature of management practices, less emphasis might be placed on volunteer labor in carrying out management activities while still involving volunteers in forest planning and decisionmaking.

Improved partnerships among managers and users in managing the forest ecosystem will depend on better information on the benefits that these partnerships bring to each partner as well as to the forest environment. It will also be important to identify promising approaches for initiating, developing, and sustaining highly effective partnerships. The Volunteer Stewardship Network, operated by the Nature Conservancy in Illinois, is offered as an example which institutionalizes the exchange and provides appropriate organization, training, and planning to support an effective partnership between managers and volunteers.

Forest Influences On Urban People

Urban forests have important effects on individual people and communities. Forests are a significant component of urban environments, and strongly influence the quality of urban life. Urban trees provide a pleasant, healthful, and comfortable environment; reduce the cost of providing a wide range of urban services (e.g., storm water management, energy conservation); and improve individual and community well-being (Dwyer and others 1992). Significant benefits also accrue to individuals and communities that become actively involved in urban forestry programs.

Benefits to Individuals

Urban forest environments provide psychological benefits to individuals who experience those environments, including esthetic surroundings, increased enjoyment of everyday life, and a greater sense of meaningful connection with the natural environment. Trees are among the most important features contributing to the esthetic quality of residential streets and community parks (Schroeder 1989). Features of the urban forest, such as number of trees per acre and view distance, strongly influence how people perceive esthetic quality and personal safety in that forest (Schroeder and Anderson 1984). Park and arboretum visitors have reported that trees and forests provide settings for significant emotional and spiritual experiences (Schroeder 1991a; Hull 1992a, 1992b; Hull and others 1994). These experiences are extremely important in people's lives, and can lead to a strong feeling of attachment to particular places and trees (Dwyer and others 1991, Schroeder 1991b, 1991c). Nearby nature, even if viewed only from a window, has a beneficial effect on job satisfaction and well-being in the work setting (Kaplan 1993). Ulrich (1974) reports that shoppers in Ann Arbor, MI who had a choice of driving on an interstate highway or a scenic parkway from their home to a shopping center tended to choose the parkway even though it required more travel time. An important reason given for the choice was the visual quality of the parkway. Open, park-like stands of large trees were preferred in surveys of nature preference at multiple-family housing sites (Kaplan 1982, 1985).

Reduced stress and improved physical health for urban residents have been associated with the presence of urban trees and forests. Landscapes with trees and other vegetation produce more relaxed physiological states in humans than landscapes that lack these natural features (Ulrich 1981, Ulrich and Simmons 1986). Hospital patients with window views of trees recover significantly faster and with fewer complications than comparable patients without access to such views (Ulrich 1984). Subsequent studies indicate that when medical patients have pictures of trees and forests in their rooms they feel less stressed and have lower blood pressure (Hull and Ulrich 1992).

The benefits that people receive from being actively involved in tree planting, protection, and care efforts are just beginning to be recognized (Lewis 1992, Westphal 1993, Schroeder 1993). Many individuals seem to gain improved physical and mental health from involvement in programs to plant and care for urban trees. In fact, involvement with trees and other plants is sometimes used as part of therapy for people with physical and mental problems (i.e., horticulture therapy). Thus, it appears that both people and plants can gain from people/plant interactions (Lewis 1992).

However, urban forests are not yet managed to provide the full range of important benefits that individuals can receive from the forest and involvement in its management. While the benefits of urban forests are heavily concentrated in onsite experiences of individuals rather than the production of commodities, the onsite benefits of exurban forests are rapidly increasing in significance.

More information is needed about the wide range of significant benefits that individuals receive from experiences associated with trees and forests, as well as the benefits received by those who are involved in planning, planting, and caring for these resources. It is critical that these individual benefits be linked to particular forest environments (structures) and management strategies. These linkages will help guide selection of management strategies that will provide needed benefits. In the past, limited information on

the full range of individual benefits that people receive from trees and forests, and–perhaps more importantly–lack of information on the critical links between forest structure, management strategies, and individual benefits has resulted in low levels of support for many management programs. In many instances it appears that the benefits were recognized in a general fashion, but decisionmakers were unaware of the efforts necessary to enhance them.

Benefits to Community

Urban forest resources also contribute to the economic vitality of a city, neighborhood, or subdivision. To create an attractive image, many cities, towns, and subdivisions are named after trees and forests (e.g., Elmhurst, Oakland, and Timber Trails). Many communities strive to be designated as a "Tree City USA," and many neighborhoods select tree planting as a community improvement project. Trees can dominate the urban environment and contribute much to its character. In the Chicago area, communities such as Evanston, Oak Park, and Elmhurst are well known for their mature forest environments. Community action programs that start with trees and forests often spread to other aspects of the community and result in substantial economic development. Trees and forests on public lands, and to some extent those on private lands as well, are significant "common property" resources that contribute to the economic vitality of an entire area (Dwyer 1993).

A stronger sense of community, empowerment of inner city residents to improve neighborhood conditions, and promotion of environmental responsibility and ethics can result from community involvement in urban forestry efforts. Active involvement in tree-planting programs has been shown to increase a community's sense of social identity, self-esteem, and territoriality; and it teaches residents that they can work together to choose and control the condition of their environment. Community tree planting programs can help alleviate some of the hardships of inner-city living, especially for low-income groups (Dwyer and Schroeder 1994a, 1994b).

In exurban areas, community ties to the forest are more likely to emphasize employment opportunities and wood products, as well as recreation and subsistence use; but ties between communities and forests remain strong in these areas as well. Tourism, mining, logging, wood processing, and other activities often shape the character of exurban forests and the associated communities. Many of these areas are preferred locations for seasonal (Stewart 1994), retirement (Stynes and Olivo 1990), or amenity migrant homes. Recreational use of public lands is especially significant near communities that have limited resources for development of community recreation resources.

Forests and forestry programs appear to hold significant promise for improving communities; but there are few programs in urban or rural areas that capitalize on this potential. To effectively use forests and forestry programs as tools for community development and improvement, additional information is needed about the extent of these community benefits that are associated with forests and forestry programs, as well as how they vary among communities and with different community types, forests, and forestry programs. This may well be the area where we know the least about the human dimensions of ecosystem management.

Summary And Conclusion

The urban forest illustrates the important role that social science can play in the development and implementation of strategies for ecosystem management that promise to sustain ecosystem health and productivity. Social science is essential to the development of these strategies given the critical role of people as owners, managers, and users of the forest ecosystem and their significant interactions with that forest. Efforts to identify, explain, and develop means to predict the people-forest interactions associated with forest management options are suggested as a key focus for social science research to support strategies for ecosystem management, with particular emphasis on research that addresses (1) the outcomes of alternative management strategies in terms of long term growth, survival, and development of the forest, (2) how the management of one forest ownership influences the management and use of other ownerships in the landscape, (3) promising strategies for coordinated approaches to management by the numerous owners across the forest landscape, (4) identification of the improvements in ecosystem management brought about by partnerships among managers, users, and others, (5) promising approaches to initiating, developing, and sustaining partnerships and enhancing the resulting benefits, (6) identification of the benefits that individuals receive from forests and involvement in forestry programs, (7) information on how the benefits received by individuals are influenced by particular forest environments and management programs, (8) identification of the benefits that communities can receive from forests and forestry programs, and (9) how these benefits vary among community types, forests, and forestry programs.

The suggested emphasis is on interaction between people and forests, which calls for integrating social science research with physical and biological sciences in ecosystem management. This is to provide critical guides for forest resource management and use that will further ecosystem health and sustainability. Particular emphasis is on developing means of predicting how users will respond to management options, and the kinds of benefits that individuals and communities will receive from forestry programs and the resulting forest environments. Linking important forest benefits with forest ecosystem management options is critical to developing successful management strategies and gaining the support necessary to implement

and sustain them. There is, of course, the need for other research in the social sciences; but at the present it appears that information of the people-forest interactions is critical to moving forward in implementing ecosystem management.

Given the intensive and complex people-forest interactions in urban areas, the urban forest is suggested as an excellent laboratory for research on people-forest interactions. The results of research in the urban forest might be especially useful in other environments given the significant interactions between people and forests in the urban environment and the importance of urban residents as owners and users of forest resources in exurban areas. The findings from research in urban areas can help guide research efforts elsewhere.

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If We Can Make It Here, We Can Make It *Anywhere*–A Case Study of Urban Ecosystem Management

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Abstract

Due to multiple jurisdictions, environmental quality issues, industrial and commercial interests, and diverse values, urban ecosystem management can be more complex than its rural counterpart. The ChicagoRivers Project worked within these constraints, using an assessment phase to develop a citizen-based action plan for the river corridor. The idealized image of an environment type (e.g., "clean river") held by some residents can affect expectations of the resource and its managers.

Introduction

To some, urban ecosystem management is an oxymoron. Yet ecosystem management offers many of the same benefits to planners and managers in an urban context as it does in rural and other settings. But these urban planners and managers also face the same challenges presented by ecosystem management, and in urban areas these challenges are often magnified. Multiple jurisdictions, industrial and commercial interests, environmental quality issues, and the diversity of human values all have impact on ecosystem management, and all are particularly complex in urban areas. Because they occur in such complex settings, urban ecosystem management projects can provide useful lessons for ecosystem managers working in a variety of contexts, particularly in the area of incorporating human dimensions into ecosystem management.

One good example of urban ecosystem management is the ChicagoRivers Project, a public-private partnership to enhance the Chicago River system. The ChicagoRivers Project integrates various aspects of ecosystems–the physical, the biological, and the social. Research in each of these areas provided the foundation for the project's grass roots planning and action efforts. Research in the physical and biological aspects of ecosystem management detailed water quality, bank characteristics, and remnant habitats needing protection and restoration. The inclusion of social science research strengthened the project by identifying the range of recreational uses of the corridor, and how public perceptions of a resource influence future enhancements of that resource.

In this paper I will look at the nature of urban ecosystem management, describe the ChicagoRivers Project, and discuss the role of perceptions in ecosystem management.

Urban Ecosystem Management

More than three-quarters of U.S. citizens live in urban areas, and 3 out of 100 Americans live in the Chicago metropolitan area alone. In metropolitan areas, the issue is less how to incorporate human dimensions into ecosystem management, but more how to adapt ecosystem management concepts, techniques, and practices to a predominately *human*-centered and *human*-made environment. Because of this, urban areas can provide many lessons in incorporating human dimensions into ecosystem management.

In any setting, ecosystem management faces many challenges, including multiple jurisdictions, industrial and commercial interests, issues of environmental quality, and the great diversity of human values. In urban areas, these issues are, if possible, even more complex than in rural areas. Urban areas have myriad jurisdictions, a wider variety of commercial and industrial interests, multi-sourced environmental problems, and diverse citizens bringing diverse values to their ideas of proper resource use and management.

Multiple Jurisdictions

In urban areas, many different levels of government may have jurisdiction over an area or project. City, county, regional, state, and federal agencies may all be involved. Departments of natural resources or environment play an obvious role, but so, too, do departments of planning, zoning, transportation, bridges, and water reclamation. Land ownership is equally complex, forming a crazy quilt of lands managed by various public agencies and lands privately owned.

Many of these jurisdictional interests can complicate a project or even bring it to a halt. But the situation also offers an opportunity for extraordinary partnerships, as each agency brings its expertise and resources to a given situation. Some agencies even find that through this interaction, and seeing how other agencies approach management issues, their own agency experiences positive change and growth.

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Industrial and Commercial Interests

Industrial and commercial interests in urban areas have a big stake in how ecosystem management is carried out. At times views may conflict among these interests about appropriate natural resource use. For instance, in the Chicago area, Commonwealth Edison (the electric utility) relies on river barges to supply coal to power its generators and uses river water to cool these generators. Other industries are equally dependent on receiving material by barge. At the same time, recreational boating is popular, and marinas and other commercial facilities that accommodate these sports are interested in the river, too. This creates a situation where barge operators and canoeists are interested in using the same narrow stretch of river, which raises safety concerns. And restaurant owners and developers are also interested in the river for its picturesque view that attracts customers. For them, the barges and canoeists are both a plus.

Like multiple governmental jurisdictions, multiple commercial and industrial interests could pose problems or create opportunities for ecosystem management. Either way, their presence in the area may alter the goals of ecosystem management and the uses that may be devised for various urban natural resources.

Issues of Environmental Quality

Although environmental quality issues are by no means limited to urban areas, they are often more intense in these settings and have unique aspects that urban ecosystem managers must address. For instance, a part of the Chicago River system was specifically made to deal with pollution. The Sanitary and Ship Canal was built as a part of reversing the flow of the Chicago River, to move waste water away from Chicago and away from Lake Michigan, the source of Chicago's drinking water. The canal also plays an important role in commerce and industry, but a major reason for its creation was to deal with urban pollution.

Other environmental issues in urban areas include non-point source water pollution; a greater range of possible contaminants in the ground, water, and air resulting from the wide range of industry and commerce; and the effects of a dense population such as increased ozone and CO_2 created by urban traffic. Each of these adds a layer of complexity that the urban ecosystem manager must contend with.

Diversity of Values

Urban areas are often culturally diverse, and this diversity affects the uses made of natural resources. The Chicago River is used by area residents for *tashlik* (the cleansing of sins) on Yom Kippur. Wild grape leaves growing on its banks are gathered for making *dolmas* (stuffed grape leaves, a Mediterranean delicacy). The river is also used for annual New Year's Day canoe trips, and for recreational barge-watching. Of course, the commercial and industrial interests discussed above also represent human values for uses of the local environment. These varied uses carry different values about appropriate use and enhancement of a resource or entire ecosystem.

In sum, these issues–multiple jurisdictions, industrial and commercial interests, environmental quality issues, and diverse human values–make urban ecosystem management even more complex than its rural counterpart. Urban ecosystem management often requires innovative approaches which provide excellent models for rural areas.

The ChicagoRivers Project

It is in this complex context of urban ecosystem management that the ChicagoRivers project has been working. Substantial improvements in water and sediment quality have been made to the Chicago River system over the past decade. These improvements, combined with the scarcity of open space in the metropolitan area, have caused residents to see the river as a valuable recreation and open space resource, with great potential for future enhancements. The developing public interest led to the creation of the ChicagoRivers National Urban Demonstration Project, a collaborative effort between the Friends of the Chicago River and the National Park Service. The project has created a partnership of different federal and local agencies, businesses, and citizen groups, to develop a citizen-based action plan for enhancement of the 150+ mile river corridor. Looking at the physical, biological, and social aspects of current and potential use of the corridor, the ChicagoRivers Project combines on-the-ground projects and strong local involvement with extensive research to support these planning and implementation efforts. It is committed to a local, neighborhood approach while maintaining a strong, regional focus.

The Demonstration Projects

Demonstration projects are integral to the ChicagoRivers Project. They demonstrate techniques for enhancing the corridor, the varied benefits of these enhancements, as well as various means to minimize or overcome possible conflicts inherent in the process. Several demonstration projects are currently underway. Each, of course, involves the river. But more importantly, each involves the neighboring community. Throughout the assessment phase, staff of Friends of the Chicago River were busy developing grassroots networks of people interested in the river. Out of this networking activity grew ideas for several river enhancement projects, three of which received funding in 1994 through the Urban Resources Partnership (a project bringing federal, state and local agencies together to solve local resource problems in major metropolitan areas).

These projects enhance the local ecosystem, while building a healthier ecosystem at the regional scale as well. Each involves local residents in the planning and implementation of the project, and each is based on the residents' diverse needs and interests. Research played a role in the development of each project as well, providing information about possible site locations and appropriate restoration processes, as well as the suitable level of development as indicated by the social science research projects.

The Lake Forest Project–The Lake Forest Project is restoring wetlands and oak savanna on property owned by the Lake County Forest Preserve District. Formerly agricultural land, the wetlands were disturbed by drain tiles and channelization. The ChicagoRivers research assessment phase found that the site had restorable wetland and savanna fragments, and that local residents were interested in ecological restoration with minimal recreation development.

Many agencies have joined the original ChicagoRivers partners in this project, including the Lake County Forest Preserve District, the Natural Resources Conservation Service, the Lake County Stormwater Management Commission, and local municipalities and school districts. When completed, the project will offer environmental education, including use as a field biology lab for a nearby high school, and passive recreation opportunities; and will contribute to improved water quality, flood control, and biodiversity.

The Gompers Park Project–Gompers Park is a popular park on Chicago's northwest side. Located in a diverse neighborhood of single family homes and small apartment buildings, the park provides recreational opportunities ranging from baseball to fishing. The local residents, who are actively involved in park policy and management, worked jointly with the Chicago Park District to develop this project. Some residents remember wetlands in the park during their childhood and are very interested in restoration of their park. The project will therefore restore a section of the park along the river to original grade. Local residents will then be trained in wetland's function, its relationship to other habitats, and restoration processes. They will be responsible for carrying out the restoration activities (under professional guidance) and for maintaining and interpreting the area. When completed, the project will control flooding, extend the use of a popular ball field, be a vital natural resource education site, and a point of local pride.

The Beaubien Woods Project–Beaubien Woods is a Cook County Forest Preserve site on Chicago's southeast side–a diverse area of landfills, heron rookeries, stable neighborhoods of single family homes, and vast public housing developments. Several groups have come together for this project to restore its native habitat. Fishin' Buddies is a mentor program bringing positive African-American role models to children while taking them on fishing excursions, often to Flatfoot Lake in Beaubien Woods. The Forest Preserve District of Cook County has begun an ambitious restoration program, in conjunction with the Illinois chapter of The Nature Conservancy. One component of their restoration partnership is the Mighty Acorns, a program in which children participate in restoration efforts and other natural resource education activities. In the Beaubien Woods project, the Forest Preserve District is developing a restoration plan. The children and adults of the Fishin' Buddies program will participate in the restoration efforts under the guidance of the Forest Preserve District and The Nature Conservancy. The Mighty Acorns program is expanding to include the Beaubien site and children from the area. When completed, the project will have restored the aquatic and land environments of Beaubien Woods and Flatfoot Lake, contributed to the understanding of natural resources and ecosystem management for adults and children in the neighborhood, and created a healthy open space for area residents.

Major Partners and Their Roles

Several federal and local agencies have played a major role in the assessment phase of the project. Under the coordination of the National Park Service and Friends of the Chicago River, the U.S. Fish and Wildlife Service, USDA Forest Service, U.S. Army Corps of Engineers, and the Metropolitan Water Reclamation District of Greater Chicago (MWRD) have carried out various aspects of the river system assessment. Where appropriate, these agencies are continuing their involvement in the implementation phase of the project.

Other local agencies have supported and guided the project, and they are becoming more directly involved as the project moves into the demonstration phase. These groups include the City of Chicago Department of Environment; The Chicago Park District; The Forest Preserve District of Cook County; and different neighborhood, industry, environmental, and sporting groups.

The Research Studies

Research studies investigated different aspects of the physical, biological, and social components of the river corridor. Habitat, water quality, bank characteristics, recreational use, perceptions of the river, and other issues were addressed. All the resulting information has been compiled by the US Army Corps of Engineers into a GIS database, which will be available for use by any local agency, school, or individual.

Physical assessments–The U.S. Fish and Wildlife Service characterized the bank throughout the corridor. The bank ranges from a natural, vegetated bank to concrete and steel riprap. In many places, erosion is a problem; in others, the bank often looks "natural" when in fact it has been significantly altered from pre-settlement conditions.

The MWRD conducts water quality tests throughout the waterways in the greater Chicago area on a regular basis. MWRD staff continued this work, compiled existing water quality data for the study corridor, and consulted with other agencies on their research components. The MWRD worked particularly closely with the U.S. Bureau of Mines in a closely related (but separately funded) study. In this study, the U.S. Bureau of Mines gathered data on the sediment contaminants and their bioavailability, and created model site remediation approaches for the North Branch of the Chicago River.

Biological assessments–The U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers assessed the habitat potential throughout the corridor. The U.S. Fish and Wildlife Service updated the wetland inventory, identifying remaining wetlands and areas with strong potential for restoration. Other habitats like oak savanna were also assessed, and fisheries potential was assessed in some areas as well. This research located several previously unknown populations of Illinois threatened and endangered species, including the white-fringed prairie orchid.

Social assessments–The USDA Forest Service and U.S. Army Corps of Engineers conducted the social assessments of the corridor. They collaborated on a metropolitanwide telephone survey that asked about people's recreational use of the corridor, and their perceptions of the river.

The Forest Service also conducted focus group interviews with residents living near the corridor; an onsite recreational survey; and expert interviews with stakeholders, including land managers, business and industrial representatives, developers, recreational providers, and environmental groups. Each of these surveys explored current use, perceptions of the corridor, and ideas for future enhancement of the corridor for recreation and improved environmental quality.

Impact of the Research on Implementation

Together, the research assessments provided a detailed picture of the corridor, its current condition and uses, as well as indicating the future capabilities of the corridor. They also provided insight into desired and potential future conditions for the river corridor. The findings of these assessments were useful in the next phase of ChicagoRivers: the development and implementation of demonstration projects aimed at enhancing the corridor at the neighborhood level.

Effect Of Perceptions On Ecosystem Management

One benefit of the social science research went beyond its ability to identify current use and desired changes. Some of the social science research investigated citizens' perceptions of the river corridor. Researchers found that water quality was important, which was not a surprise, but they also found that respondents have an idealized view of what a clean river is. This perception of a clean river affected residents' ideas of what they'd like to see the rivers in the Chicago River system become. This effect of perceptions on ecosystem management is not limited to urban settings, although it may be more readily apparent in those settings. Stakeholders' perceptions of the ecosystem will play an important role in ecosystem management in any setting–from urban to wilderness. The "clean river" example from this study is used to discuss these issues.

What Is a Clean River? Participants in the focus groups and respondents to the on-site survey gave a number of responses that indicate many people have a particular image of a clean river. For instance, when asked to speak for the river, focus group participants made comments like these (emphases added):

> "I am a river. I want to be clean and *clear*."
>
> "It would be nice to be back to the state I was in before Chicago became a city, where one could *see a few feet into me*."
>
> "I'd love to be *clean and blue* as I was before the bad chemicals made me cough."

Other comments about the river include:

> "[The river is] *brownish water and that's ... pollution*, I don't know that you'd go down here and drink it, you know it's not a Colorado creek ..."
>
> "It would be nicer if it *weren't muddy* and you *saw fish jumping*..."

These comments paint a picture of a clean river as blue or clear–not muddy or brown–with fish jumping. In short, the prototypical clean river is a trout stream. But the Chicago River is not a trout stream, it never was, and it never will be. It is a quiet, slow, mud bottomed, prairie river. It has its own charms and character, different from those of a trout stream.

If the perceptions of what a "clean river" is cannot be met–and in this case they most certainly cannot be met–this can have several effects. It can affect what people envision for the future of the river, and it can affect what they expect of the river and river managers. The bottom line is: residents may not know the clean Chicago River when they see it.

The ChicagoRivers partners did not know this gap existed before the perceptions research was conducted. If the ChicagoRivers project had not included studies about area residents' perceptions and values, this information would not have been uncovered. Several changes based on these

findings have already taken place. The Metropolitan Water Reclamation District is working with Friends of the Chicago River on an education and outreach program, which aims, in part, to help people understand the Chicago River system and its future potential. A greater public understanding of the nature of the Chicago River System may lead to a greater understanding and appreciation of Chicago's prairie past and development as a major metropolitan region. This, in turn, could be a part of a greater public understanding of the region's ecosystem. The river, the region, and the citizenry can all benefit.

This particular example deals with an urban river and water quality, but people may have idealized images of almost any environment. For example "healthy forest," "wetland," "park," "prairie," or "wilderness" each may conjure images rarely met by existing conditions, however pristine. Developing an understanding of these images is a crucial role that social science can play in the development of ecosystem management–whether the management setting is an urban area, wilderness, or somewhere in-between.

Conclusion

Ecosystem management is a challenge wherever it is undertaken, but in urban areas the challenges can be even more complex and difficult. Multiple jurisdictions, environmental quality issues, varied industrial and commercial interests, and a diverse human population with diverse values and ideas about appropriate resource use, add to the complexity of urban ecosystem management. These various complexities can create roadblocks, but can also create opportunities for partnerships and greater success. This makes urban settings useful laboratories for developing successful ecosystem management techniques, particularly techniques for understanding the human dimensions of ecosystem management.

The ChicagoRivers Project is the product of the urban laboratory. It has successfully demonstrated how to create partnerships between agencies, and between public and private groups. It has also successfully combined research with on-the-ground action to enhance the corridor ecosystem. The biological and physical research detailed the habitats' current and potential condition. The social science research component of the ChicagoRivers project found that many respondents had idealized images that were not readily applicable to the local ecosystem. Understanding this gap, and working to close it where possible, can enhance ecosystem management.

The ChicagoRivers Project found one possible step toward closing this gap–the involvement of local residents in the demonstration projects to restore their local ecosystem. Through involvement in these projects, residents may develop perceptions of the components of their ecosystem–the river, the forests, the prairies–that are more in keeping with the realities of the ecotypes. This would be a major achievement for a pioneering urban ecosystem management project.

Institutional Challenges in Integrating the Sciences

Guess Who's Coming to Dinner? Integrating the Sciences

Susan I. Stewart and Herbert W. Schroeder

Abstract

Differences in the way disciplines define research questions and in the methods by which they seek answers makes integration of natural and social sciences difficult. We describe barriers between the sciences, then discuss three models for integrating them: (1) assimilation, (2) melting pot, and (3) mosaic. These models suggest ways of maintaining a diversity of approaches and methods in the conduct of interdisciplinary research.

Introduction

Ecosystem management has recently been adopted by the Forest Service as its approach for managing forest environments. An important theme in ecosystem management is that people are part of ecosystems. This means that research to support ecosystem management must look not only at the biological and physical dimensions of ecosystems, but also the human dimensions. There are inseparable connections and complex interactions among the human, biological, and physical dimensions of ecosystems. The need for a high degree of integration among the physical/biological sciences and the social sciences in ecosystem management research appears evident. Nevertheless, while many calls for interdisciplinary research have been issued, few examples of effective integration between natural and social sciences can actually be found.

The difficulties in integrating the physical/biological sciences and social sciences lead to questions about what integration really means, how it can best be achieved, and even whether it is always desirable. Because the biological and physical sciences predominate in the field of natural resource management, the issue of how best to work across disciplinary boundaries is often framed as "How would we need to change the social sciences in order to make them more compatible with biological and physical sciences?" Social science has in fact often borrowed from and emulated the philosophy, methods, and models used by biological and physical scientists. For example, the travel cost model, which predicts that visitation at a recreation site will be directly related to site attractiveness and inversely related to travel cost, is patterned after the model of gravitational attraction in physics, and is even referred to as a "gravity model" (Randall 1987). On the other hand, some social scientists feel that the deterministic, reductionist approach that has traditionally characterized the biological and physical sciences is of limited usefulness in the study of human experiences and behavior. These scientists may be more inclined to ask "How would we need to change physical and biological sciences to make them more compatible with the social sciences?"

Questioning which areas of study should change and adapt is reminiscent of debate over cultural integration within society. After years of societal change, debate and study, social philosophers recognize that integration can take many forms, each with advantages and disadvantages for majority group members, minority group members, and society as a whole. Our perspective in this paper is that scientific integration, like cultural integration, can follow many different paths. Being aware of the alternative models for integration and their potential outcomes can help us decide which is most appropriate and productive. Following a discussion of the most significant differences between the sciences, we present three models of integration and discuss their potential advantages and disadvantages for ecosystem management research in the Forest Service.

The division of scientific inquiry into disciplines and subdisciplines is a natural outgrowth of specialization and theory development, but it creates barriers to conducting integrated, problem-oriented research. The most immediate challenge we face in integrating Forest Service research efforts is overcoming the barriers between social and biological/physical sciences, so this paper will highlight differences between these two broad areas. We recognize, however, that the differences among disciplines and subdisciplines within either the social sciences or the biophysical sciences may be as great as the differences between these two broad areas of study. As an example, psychology encompasses both cognitive and phenomenological approaches, which are diametrically opposed in many ways. In talking about how "social scientists" and "physical/biological scientists" conduct research, one runs the risk of oversimplifying–in fact it is almost inevitable. In this paper we will take that risk in an effort to highlight the major obstacles to working together.

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Barriers to Integration

Scientists differ greatly in how they think about research: both how they ask research questions, and how they answer them. The differences range from mundane matters of habit or convention to philosophical issues that reflect the predominant world view of researchers in the field. We present the ideas below in roughly the order they would arise in development of an integrated research proposal.

Asking questions

One of the first decisions faced by a research team is determining exactly what or who is the focus of the study. There are great differences in the way scientists define and use their units of analysis. For example, psychologists most often treat the individual as a unit of analysis, while sociologists focus on a group, geographers a spatial region, meteorologists an air mass, silviculturalists a stand of timber, and so on. The desire to replicate or build on earlier studies from one's own field can give a scientist powerful motives to resist agreeing to a unit of analysis they or their colleagues have not previously used. Some disciplines use a wider range of units than others. Those that focus on problem oriented research (e.g., recreation, community development) tend to use many different units of research, sometimes within the same study–a practice that more theory oriented researchers find unsettling. Some social scientists might even argue that the concept of a "unit of analysis"–which implies breaking a problem down into a set of distinct units or components that are individually observed, categorized, and measured–is inappropriate for the holistic style of research that is increasingly being used in some fields of the social sciences.

The problem of choosing appropriate units of analysis in integrated, ecosystem research comes up repeatedly in ecology and human ecology literature (e.g., Catton 1994; Steiner and Nauser 1993). Andrew Vayda, an anthropologist and human ecologist, terms the debate over units of analysis "unit-mindedness," and says it is arcane and counterproductive. Instead, he advocates letting the research question determine the units (Vayda 1983). He notes that often tenuous assumptions of stable boundaries and conceptual definitions are unnecessary if we let the context of the study dictate the units. Unfortunately, generalizability is lost when units of analysis are different for every study. Sociologists, political scientists, and economists may be forced to use predefined sociopolitical units because such units are the basis for government data sets (Rockwell 1994). The boundaries of the biological and physical units of interest to the research team may not coincide with sociopolitical boundaries, but the cost of collecting primary data on more appropriate units is prohibitive. Although deciding on units of analysis is clearly one of the more mundane, or at least less philosophically loaded issues, it is one that poses major practical problems for working together.

Establishing the purpose of a given study is another step in the research planning process where disagreements might arise. For some studies, the purpose may be to generate a rich description of some event, relationship, or phenomenon. For others, it might be to develop a model or theory to explain and predict some process, relationship, or event. Examples of both kinds of research can be found in most social science disciplines. In the biological and physical sciences, it is not as common to conduct an entire study whose purpose is solely descriptive. Those who pursue theoretical research often view descriptive research as preliminary, inferior, and characteristic of "immature" sciences. Their commitment to the goals and values of their discipline makes it hard for them to appreciate that descriptive research can serve important purposes of its own without leading to the development of generalizable theory.

In every study, data are generated or collected, measured, recorded and analyzed; but the methods used to do so vary greatly. Deciding which methods to use has both practical and philosophical significance for many researchers. To some extent, methods are dictated by units of analysis and by the purpose, setting, and type of study. Methods are sometimes a matter of custom within disciplines. Quantitative measurement and analysis methods are often general and systematic enough to translate across disciplinary boundaries. The translation becomes more difficult, however, when it comes to qualitative methods, which are sometimes viewed as unworkable and unscientific by those unfamiliar with them. Many qualitative methods were developed by scientists who reject the positivist approach to scientific inquiry. The methods they developed are consistent with their belief (which is not universally shared even within the social sciences) that subjectivity is an inherent aspect of any knowledge, and that phenomena are best understood from the subject's (rather than the researcher's) point of view. Because the choice of methods is often wrapped up with a scientist's fundamental philosophy or world-view, it may be very difficult for a scientist in one discipline to understand the purpose and the value of the methods used by a scientist in a different field.

Paralleling the issues of descriptive versus theoretical and quantitative versus qualitative research is the issue of holism versus reductionism. When the purpose of the study is to generate a comprehensive, overall description of a phenomenon, a holistic scope that defines the question in very broad terms makes sense. For example, a holistic study of visitors' use of a recreation site might try to encompass all the values, meanings, behaviors, and experiences that are part of a person's visit to the site. Such a study would probably include qualitative, open-ended methods, at least at the beginning, and would aim to present as complete an understanding as possible of what

happens when an individual comes to the site. If, on the other hand, the researcher's purpose is to develop a rigorous, causal theory, a reductionist approach might be more appropriate. A reductionist approach takes a complex phenomenon and explains it in terms of simpler, lower-level processes. This is an approach that often has been taken in the physical and biological sciences (and in those areas of social science that emulate the natural sciences). A reductionistic study of recreation site visitation might break sites down into sets of simple attributes, measure people's preferences for each of the attributes, and then derive a quantitative formula to predict how people combine attributes into an overall preference for the site. Such research can yield powerful and useful models for certain kinds of management decisions. Some social scientists would argue, however, that these models cannot provide a complete understanding of the way in which people experience and value recreation sites. Similarly, some ecologists argue that the traditional reductionist approach favored in the biological and physical disciplines is inappropriate for the study of ecosystems (Odum 1977).

Answering Questions

The final result of any research effort is some kind of answer, which can take the form of a practical solution to a problem; a theoretical proposition, refutation, or clarification; or the description of some event, relationship, or phenomenon. A single research study may answer questions on a number of different levels. In this regard, the scientific disciplines are not different. Where they do diverge is in the nature of the answers they generate, and the way in which they communicate findings. The terminology, metaphors, and certainty with which results are expressed differ across disciplines, and this can interfere with the exchange of ideas.

Each discipline develops its own terminology. This facilitates communication within the discipline but can make it difficult for scientists to read outside their field. Scientific journals, which lend credibility to an area of scholarship and provide a forum for disseminating research results, tend to nurture and encourage the creation of jargon. This is a barrier to integration, because scientists from different disciplines need to be able to read, understand, and criticize one another's work. Peer review, a central feature of the scientific process, is especially important in interdisciplinary research. Using technical terms is sometimes justifiable and necessary, but at other times it is simply a matter of habit, which can inhibit scientists–and, for that matter, practitioners–from understanding the essence of a research report and joining in the discussion of ideas.

It takes a conscious effort on the part of scientists to put aside the discipline-specific terms and use commonly understood words, symbols, and relations to explain their ideas; but it can be done. In a recent issue of the journal Human Ecology devoted to climate change, guest editor Joel Gunn talks about developing a model which "provides a common conceptual workspace" for scientists from many disciplines (Gunn 1994). He describes his climate change model as a "fundamentally verbal and typological" one, and advocates the use of this kind of model in interdisciplinary research as a way of including all disciplines in the dialog.

Scientists employ different metaphors for thinking about the phenomena they study. The use of metaphors is one of the most important (and often one of the least conscious) features of the scientific process. Metaphoric thinking permeates the entire research process, and the use of different metaphors is one barrier that sets scientists apart from each other. Biologists and physical scientists often use metaphors that describe the variables and relationships they study as though they were parts of a machine. Like a machine, the natural world can be viewed as a set of linked, functional parts, where the workings of one part affect the workings of another part in a fixed and predictable pattern (Abram 1991). Using the term "black box" to describe a subprocess that is not yet fully understood reflects this analogy, making reference to a machine that has some of its gears hidden from view. The mechanistic view leads scientists to search for the simplest, most robust causal relationships that link events together.

Some social scientists employ mechanistic concepts to understand human beings and societies. Other social scientists are more likely to think about problems, phenomena, and relationships from a teleological standpoint, using metaphors that suggest that the system they observe is driven by intentional, goal-directed behavior. Their frame of reference is the human experience of free will and conscious choice. The teleological metaphor is more accepting of multiple answers, partial answers, open-ended concepts, and descriptive rather than predictive knowledge.

There is a tendency to retain familiar metaphors even when we are working outside our discipline. For example, the natural sciences may tend to take a mechanical view of human nature. This leads to a search for mechanisms that explain behavior without considering the possibility that people may have freedom to choose their actions in new or creative ways (Searle 1984). On the other hand, William Catton, writing about the origins and development of human ecology (Catton 1994) notes that social scientists sometimes inappropriately describe ecosystems as if they were free to act based on intention. He points out that social scientists often wrongly envision Darwin's "struggle for survival" as a fight between species motivated by a conscious, reasoned, will to live. The point is not that either the mechanistic or the teleological metaphor is right or wrong, but that we are often unconscious of our use of metaphors and of the assumptions they lead us to make (Lakoff and Johnson 1980).

Social and biological/physical sciences also tend to differ in the extent to which they pursue or accept a single answer to some question. Robert Sullivan (1993) refers to this as the issue of decidability. In reviewing a book of essays on philosophical differences between the sciences, he notes that although philosophers of science have yet to agree on exactly why the sciences differ in this regard, physical and biological scientists do seem to agree on objective facts within their disciplines to a greater extent than is the case in the social sciences. While there are differences of opinion among social scientists regarding the decidability of social scientific fact, social science findings are usually not expressed in the same kind of concrete, absolute language that is used in reporting physical and biological science research.

Models For Integrating The Sciences

The barriers that divide the sciences can seem formidable. When we characterize academic differences as customs or habits within the disciplines, we do not mean to imply that changing them will be easy. On the contrary, ideas and practices that are habitual and customary are often the hardest to change and may give rise to some of the most contentious and divisive issues in interdisciplinary research. Efforts at planning interdisciplinary research can easily digress to a series of "trials" where scientists judge the practices, assumptions, and methods of their colleagues from other disciplines. While such close scrutiny can be valuable, it has limited usefulness if the scientists are not at least minimally familiar with disciplines outside their own (Taylor and Vining 1994). Research planning discussions need to be based on some shared understanding of how much autonomy the team members have in directing their own course of study. In some cases, interdisciplinary research involves tight coordination or even control of the overall process by one scientist; in others, the team members may work on loosely related aspects of an applied problem, each taking their own approach to solving it (Steiner and Nauser 1993).

With a host of barriers to overcome and a need for flexibility in structuring research teams, scientists engaged in interdisciplinary research might benefit from the lessons of cultural integration. Cultural integration often involves an interaction between a majority or "mainstream" culture and a smaller or less powerful minority group. Because social science is a relatively new and small part of Forest Service research, we will treat it as the "minority culture" and biological/physical sciences as the "majority culture" in the discussion that follows. In settings where the social sciences are long established and the physical and biological sciences are newly active, many of the same dynamics described here can be expected, with roles reversed. Based on concepts of cultural integration, three different models for integrating the sciences seem possible.

Assimilation

The first model of integration to be discussed is the assimilation model. Assimilation is a natural outcome when a new, less powerful group strives to succeed within a larger, already established community. When assimilation occurs, members of the minority culture are absorbed into and adopt the characteristics of the majority culture. Under this model, social scientists in the Forest Service might try to conform to the traditional image of the natural sciences by becoming more rigorous, reductionist, and quantitative.

As an example of assimilation, much of the research on values that has been conducted in the Forest Service and other government agencies reflects assimilation of social science into the world-view and approach of mechanistic natural science. Research on a wide range of human values has been conducted based on rational planning models that were originally designed for physical, biological, and economic outputs of forests. Values have been defined in quantitative (often monetary) terms and linked to biological and physical variables by means of deterministic, predictive equations. The result of this research is models of human values that essentially resemble production functions for timber stands. One argument frequently used in support of this approach is that this is the only kind of research on values that is useful to forest managers. In the 1970's and 80's, social scientists who pursued this strategy were relatively successful in introducing human preferences and values into the scientific framework of Forest Service research.

One advantage of assimilation is that it can achieve a high degree of unity and coherence by fitting diverse topic areas into a single dominant conceptual or theoretical frame of reference. This makes it much easier to coordinate research and link models together. It is probably true that in agencies such as the Forest Service, social science research will be accepted and utilized most readily if it is presented in terms and forms similar to the biological and physical research that managers are accustomed to using.

The drawback to assimilation is that it may reinforce a narrow and exclusionary view of the world. Some of the richness of minority cultures (in this case, the unique methods and approaches that social scientists have developed) is left behind. Assimilating social science completely into the approach of the biological and physical sciences may not be the best way of employing social scientists in the Forest Service. There is an obvious and growing need within the Forest Service to build more knowledge and sophistication into the process of involving and serving people. If social science disciplines within the Forest Service remake themselves in the mold of the physical and biological sciences, they will not yield the kind of new perspectives and insights that are most needed.

The Melting Pot

A second model for achieving integration is the melting pot model. In this model of integration, both majority and minority cultures are changed, resulting in a new homogeneous culture unlike any of the component cultures. A melting pot is most likely to occur when no single group is powerful enough to impose its culture on others, while at the same time each group is willing to subordinate its own unique traditions to a common goal or vision shared by all the groups. Forest Service research has potential to integrate the sciences in this fashion, since it draws scientists from many disciplines, removing them from traditional university settings to conduct urgent, problem-oriented natural resource management research.

One caution when using the melting pot paradigm is to take care that the strengths of individual disciplines and specializations are not lost. At its best, a scientific melting pot would blend the best features of the disciplines it draws from into a new, more complete whole. At its worst, it would reduce them all to their lowest common denominator and produce a bland, ineffectual mix.

The Mosaic

The final model for integration is termed the mosaic. In forming a mosaic, each culture maintains its own unique features and distinctions, but all groups are equally valued and have equal access to resources. It is a fundamentally different kind of integration than assimilation or melting pot, in that it does not involve changing anyone's culture. Rather, it aims for power sharing and cooperation across diverse cultures. The mosaic model focuses on removing inequities between groups while at the same time encouraging each group to preserve and celebrate the cultural habits, customs, language, art, and so on, that embody the group's history and identity.

Mosaic style integration, however, may run the risk of incoherence and lack of common purpose within the resulting group. Encouraging mosaic style integration in scientific research is certainly not a prescription for simple, efficient functioning. Encouraging each discipline or area of study to proceed according to its own standards for science has the potential to create chaos and confusion, especially for managers who must make decisions based on the results of science. The barriers to integration discussed earlier may continue to exist under this model. Each discipline may pursue its own agenda, instead of working together to achieve a common goal. The freedom to practice science according to the traditions and dictates of one's original scientific discipline may impede progress toward successfully working in interdisciplinary groups.

On the other hand, the mosaic model may offer the best hope for genuine innovation in ecosystem research. It could make new ideas and perspectives available to resource managers, where these ideas and perspectives might not survive in the assimilation or melting pot models. The mosaic model helps ensure that disciplines whose methods and approaches do not closely resemble the physical and biological sciences will still have a chance to contribute their expertise to addressing resource management issues.

Conclusion and Recommendations

Integrating research efforts presents a significant challenge for scientists, but there are also significant motivations to try to make it work. Physical and biological scientists are realizing that social scientists can help address the problems that arise in developing and implementing socially acceptable ecosystem management strategies. It is increasingly clear that forest management plans based on the best biological and physical science cannot be implemented unless they also take into account the human context. Social scientists, on the other hand, are realizing that their theories and methods for studying individuals and society have little consequence unless they can be applied to important issues in the real world. Integrating social science with biophysical research programs in a major natural resource agency such as the Forest Service is an exciting opportunity to take social science beyond academia.

It is not our intention to advocate one of the three models of integration as being always better than the others. Each model lowers some barriers but may raise others. One could probably find situations in which any one of the three would be the most appropriate or effective. In the present context of rapid change in the Forest Service, however, we do not feel that the assimilation model is the best choice for integrating the social, biological, and physical sciences. Too much of what the Forest Service appears to need from the social sciences could easily be lost. The melting pot model and the mosaic model seem to offer better options for the kind of innovation and broadening of perspective that is called for under ecosystem management.

It is difficult to direct the process of integration; it takes the attention and awareness of everyone involved to create the kind of scientific community we wish to have. As scientists we all need to be aware of what we assume about how science should be done. We also need to be aware of what we assume about other scientists and the manner in which they conduct research. Stereotyping applied across scientific disciplines can be just as misguided and counterproductive as when it is used across cultural groups.

The history of immigration in this country and in others is a dramatic testament to the many different outcomes possible when groups from different cultures merge. While perhaps not as profound or far reaching as the integration of whole human cultures, the integration of scientific disciplines will influence the way we do our jobs in the future. It is a very

important step in producing useful ecosystem management research.

When we talk about people being part of ecosystems, we need to remember that we, as scientists and managers, are also people. Including human dimensions means including ourselves; studying the human dimensions of ecosystems means, in part, studying ourselves. In our role as scientists, we are probably most accustomed to focusing on the world outside of ourselves. As we go through the process of integration, some amount of introspection is warranted as well.

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Legal and Institutional Obstacles to Implementing Ecosystem Management

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Abstract

To successfully implement ecosystem management, natural resource managers must balance both public and private interests and environmental preservation with human development in overcoming legal and institutional barriers. Institutional barriers to ecosystem management include uncertainty regarding ecosystem management and interorganizational coordination; perceived threats to private interests and public trust; and institutional structure, culture, and attitudes. Legal obstacles include the Federal Advisory Committee Act, the Endangered Species Act, the National Environmental Policy Act, and the National Forest Management Act.

Introduction

Recent conceptions of ecosystem management include both ecological and human components. Although natural resource professionals recognize the inherent difficulty in balancing environmental preservation with human development, none have gathered together the many specific barriers that must be overcome to successfully implement ecosystem management. Through interviews with 54 resource professionals including Forest Service Regional social science coordinators, general counsels, regional and forest-level ecosystem management coordinators, forest supervisors, district rangers, Bureau of Land Management (BLM) planners, non government organizations (NGO), and private industry executives, this paper identifies 20 barriers to implementing ecosystem management.

This paper focuses specifically on the legal and institutional barriers that natural resource professionals must overcome to successfully implement ecosystem management. The paper has two objectives, which were formulated in relation to the expressed needs of the Eastside Ecosystem Management Project:

1. to identify perceived legal and institutional barriers to ecosystem management as conceptualized by natural resource managers and professionals struggling with its implementation, and

2. to provide a brief analysis of the related literature regarding the barriers those professionals identified.

Time constraints did not allow a scientific sampling of professionals and the authors do not suggest that the barriers reported here are exhaustive. A survey of a different mix of resource professionals or a survey of the general public might produce a different collection of barriers. However, the professionals surveyed here are intimately involved in implementing ecosystem management on a daily basis. Therefore, the barriers identified provide a valuable road map for further study.

Recent Conceptions of Ecosystem Management

All recent attempts to define ecosystem management struggle to strike an appropriate balance between ecological and human elements. The ecosystem approach to managing natural resources formulated by Slocombe (1993a) defines the goal of ecosystem-based management as providing

> "a framework and a research agenda that will facilitate the joint achievement of environmental protection and economic development through modified planning, management policy, and decision-making activities."

After completing an extensive literature review, Grumbine (1994) formulated the following working definition:

> "Ecosystem management integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term."

Each of these definitions struggles to balance competing concerns: preservation and development, ecology and economics, science and values.

Conflicts have steadily increased between development and preservation interests on our nation's public and private lands. The existing legal framework does not specifically endorse ecosystem management. Agency cultures, partially spawned by a piecemeal legal setup, frequently conflict with interagency coordination and ecosystem management principles. The public land agencies each are constrained by their different Organic Act mandates and relevant environmental laws in attempting to coordinate management of land areas separated by political boundary determinations rather than ecological ones. The agencies' multiple use mandates are confusing at best and do not

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provide direction or a strong legal springboard for ecosystem management. To enable ecosystem management to flourish, natural resource managers, NGO's, and the general public must minimize the barriers identified below.

Barriers to Ecosystem Management

Twenty barriers were identified through interviews with 54 natural resource professionals The results are listed in table 1. Each barrier will be addressed in order, beginning with the most often mentioned and proceeding to the least often mentioned.

Table 1–Barriers to ecosystem management in rank order. Results of informal interviews with 54 resource management professionals, 1994

Barrier	Number of respondents mentioning the barrier	Percentage of total respondents
1. Uncertainty of ecosystem mgmt. (E.M.)	34	63
2. Fed. Adv. Committee Act	25	46
3. Interorganizational coordination	24	44
4. Perceived threat to private interests	16	30
5. Institutional culture	16	30
6. Institutional attitudes	14	26
7. Institutional structure	14	26
8. Multiple publics	14	26
9. Budget structure	13	24
10. Building public interest in E.M.	10	19
11. Scattered land ownership patterns	8	15
12. Endangered Species Act	7	13
13. Nat'l. Env'l. Policy Act	6	11
14. Time frames	6	11
15. Managing expectations	5	9
16. Nat'l. Forest Mgmt. Act	4	7
17. Conflicting organic mandates	3	6
18. Monitoring	3	6
19. Air and water quality laws	2	4
20. Constraints of State law	2	4

1. Uncertainty of ecosystem management

The most often mentioned barrier to implementing ecosystem management, identified by nearly two-thirds of respondents (63 percent), was confusion about the ecosystem management concept. That uncertainty is expressed in two forms: (1) uncertainty about the definition of ecosystem management, and (2) uncertainty regarding management direction, commitment, and leadership in respect to ecosystem management.

Agency officials at all levels thought that ecosystem management stills lacks a precise definition, while both NGO and private industry respondents were uncertain of its meaning altogether. Analysts generally concur that confusion surrounds ecosystem management's definition. Agee and Johnson (1988) note that ecosystem management is not yet a clearly defined concept. Slocombe (1993a) found that critics commonly criticize the way ecosystem is defined, claiming that the methodology relies too much on analogy and comparison, is too broadly applicable, and overlaps or duplicates methods and work proper to other, specialized disciplines. Analysts credit the underlying scientific concepts with contributing to the ambiguity of ecosystem management definitions. Scientists generally include such terms as dynamic, complex, changing, interrelated, and unstable in their definitions of ecosystems. Defining ecosystem boundaries in a dynamic world is at best an inexact art.

Uncertainty regarding the public agencies' management direction and commitment to ecosystem management also permeated the survey responses. A common theme among the Forest Service respondents was that ecosystem management decisions are not well communicated among the different levels of the agency, especially from the upper to the lower ranks. Four respondents noted the inconsistent levels of commitment and implementation of ecosystem management throughout the agencies (both between different forests and districts; between upper- and lower-level management, and between the Forest Service and BLM). District rangers noted that without clear direction from upper management, many employees have adopted a "wait and see" attitude. The lower-level agency employees are simply not internalizing the changes in management philosophy. Some employees wonder whether ecosystem management is just a passing fad. A dozen respondents indicated a need for bold leadership with a clear break from past management practices.

Respondents from all perspectives mentioned the uncertainty of managing ecosystems as a significant barrier. A common theme among respondents was that, because the field is dynamic and constantly changing, management must be framed as a learning experience for everyone involved. One forest-level ecosystem management coordinator summed up the problem as follows:

> "the combination of extremely complex science (and ignorance about scientific processes) and human elements coupled with inadequate information on options and programs makes ecosystem management particularly difficult."

Three respondents suggested that land managers must design flexible policies that accommodate changing public perceptions because of the uncertain nature of ecosystems themselves. Forestry training programs must

> "emphasize the management of uncertainty as a basic element of forestry (rather than assume it away), with ecological resilience, socioeconomic consequences and scale effects being crucial variables in decision-making" (Machlis 1991).

The dynamic nature of ecosystems prevents application of a general scientific formula: maintenance will vary site-by-site and species-by-species, and change over time. (Keiter 1989)

2. The Federal Advisory Committee Act

The Federal Advisory Committee Act (FACA) noted by 46 percent of respondents, was the most commonly mentioned legal barrier to involving humans in ecosystem management and the second most mentioned barrier overall. The respondents' greatest concern was that the fear of violating FACA has created a chilling effect on public participation. A Forest Service regional social science coordinator concluded that the adverse court ruling in Northwest Forest Resource Council v. Espy regarding FEMAT's timber industry challenge to President Clinton's forest plan caused tremendous disarray in the Forest Service administration and general counsel offices. Agency staff already engaged in public participation are canceling meetings to avoid FACA violations. In contrast, a few respondents (7 percent) specifically said FACA was not a barrier to ecosystem management. In addition, a significant percentage of the managers who mentioned FACA (an additional 16 percent) considered it a barrier, but certainly not an insurmountable one. They thought the perception of a FACA problem was much bigger than the actual problem. Nearly all respondents, however, were unclear about what types of public contact were and were not allowed under FACA.

Essentially, FACA was enacted to guard against unfair industry influence over government advisory committees. FACA's prior legislative history and subsequent court interpretations more clearly indicate the Act's purpose.

> "The legislative history indicates that the Act was intended to make the operations of advisory committees more open and, by such means as requiring 'fairly balanced' membership, to remedy the problem of special interests using advisory committees to advance their own objectives." (Marblestone 1976)

A July 12, 1994 letter from Forest Service Chief Jack Ward Thomas explained FACA's purpose as follows:

> "The Federal Advisory Committee Act (FACA) was designed to 'help level the playing field,' to keep individuals or groups from getting special treatment from the Federal government, and to help ensure equal access for all." (Thomas 1994)

FACA imposes regulations on advisory committees used by the President and Federal agencies to obtain advice and recommendations. FACA defines "advisory committee" as any "committee, council, conference, panel, task force, or other similar group" which is:

1. established by statute,

2. established or utilized by the President, or

3. established or utilized by any agency official to obtain advice or recommendations. . . .(7 U.S.C. § 2283(3) (1988)).

The definition highlights four parameters of any advisory committee: (1) a group of knowledgeable persons, (2) assembled for a specific purpose, (3) utilized by the executive branch, (4) that renders advice or recommendations. Only exceptions in the statute, discussed later in this section, exempt a group that fits these parameters.

The scope of FACA is not restricted merely to groups formally designated as advisory committees. A committee need not be created by the President, Congress (i.e. by statute) or by an agency to fall under FACA's jurisdiction. The question of applicability of the Act depends on the nature and substance of the relationship between the non-Federal group and the Federal agency. An outside or existing group may be considered an advisory committee under FACA if it is "utilized by" the executive branch in an advisory capacity. FACA regulations define "utilized (or used)" as adopting the advice of a non-Federal group (i.e. through institutional arrangement) "as a preferred source . . . in the same manner as . . . from an established advisory committee" (41 C.F.R. § 101-6.1003(1993)). The "totality of the circumstances," or the specific facts, surrounding the actions of a group, rather than its official capacity, determine the applicability of FACA. Factors include: the purpose of any meeting, who attends, whether consensus is an objective or result, frequency of meetings, and the rotation of individual memberships.

Several of FACA's regulatory provisions contain specific requirements that could affect public participation in an

ecosystem management context. Since coverage under FACA is fact specific, case law, rather than regulatory interpretation, is the most reliable indicator of the Act's applicability. Unfortunately, FACA enforcement is relatively new in the natural resources arena and has been applied only to a few specific fact situations. Therefore, the predictability of future FACA-related violations regarding ecosystem management collaboration is fairly poor. This low level of legal predictability has contributed to the frustration felt by natural resource managers actively engaged in public participation.

Generally, FACA prohibits non-Federal members of an advisory committee from participating in the *decisionmaking process* of an advisory committee. Decisions on the expenditure of Federal money and the adoption of Federal policies, programs, plans, and projects must be made by *Federal officials*. When these decisions are made by a *group* of individuals including both Federal and non-Federal members, or by Federal officials "utilizing" such a group, the group may be an "advisory committee" that comes under the requirements of FACA. The District Court, in *Northwest Forest Resource Council v. Espy*, held that FEMAT was an advisory committee in violation of FACA. The court ruled that State university professors were not "full-time Federal employees" under FACA even though they were paid by the Federal Government for several months during their FEMAT participation. Thus, the team, established by the President, included non-Federal employees who provided advice and recommendations to Federal officials. Since not all committee members were full-time Federal employees, the FEMAT team was required to follow FACA guidelines. The court neglected to decide, however, whether FEMAT's advice could be used in developing regulations to implement the President's Forest Plan. That issue was left for later courts to decide.

FACA prohibits recurring meetings initiated by a group where the group's view is used as a preferred source of advice or recommendations to the Federal Government. Group meetings must remain open to the public and allow volunteers to attend meetings and otherwise participate. For example, the D.C. Court of Appeals, in *Association of American Physicians and Surgeons, Inc. v. Hillary Rodham Clinton*, held that the President's Task Force on National Health Care Reform was not an advisory committee by defining Mrs. Clinton as a "special government employee" rather than a private citizen. However, an "interdepartmental working group" comprising Federal employees, "special government employees" employed for limited duration, and "consultants" who attended meetings on an intermittent basis might be an advisory committee. The case was remanded to the District Court for additional findings. The court reasoned that

> "[i]n order to implicate FACA, the President, or his subordinates, must create an advisory group that has, in large measure, an organized structure, a fixed membership, and a specific purpose."

FACA does not apply to groups specifically exempted by an Act of Congress: groups with non-recurring meetings; individual advice, information gathering or fact exchange; or groups composed wholly of full-time Federal employees. The exclusion of these nonorganized groups is quite narrow. The exclusion applies when the following conditions are met:

> "the entire process of the Federal official's convening and meeting with the group is informal in nature; the group meets once or perhaps twice; has no continuing function and has no organization; the meeting does not involve substantial, special preparation; the non-government participants act as individuals, i.e., the group as such does not take positions." (Marblestone 1976)

Only groups having some sort of established structure and defined purpose constitute "advisory committees." Thus, FACA was not intended to apply to all amorphous, ad hoc group meetings.

3. Artificial political boundaries create a need for improved interorganizational coordination

A common theme articulated in various ways as a barrier by 44 percent of the respondents was that artificial political boundaries between the agencies reflect a need for improved interorganizational coordination. Both BLM managers and Forest Service district rangers noted that turf sensitivity among the agencies in a geographic area has created artificial political boundaries between the agencies. Respondents from both the Forest Service and the BLM commented on the need for offices geographically located upstream and downstream from each other to coordinate activities and exchange information. Academics agree that ecosystem management is constrained by agencies' boundary mentality which includes interagency mistrust, turf-power consciousness, insular management, and different philosophies (Agee and Johnson 1988). "Turf" sensitivity is not unusual within the Federal bureaucracy, especially among public land management agencies accustomed to a largely discretionary management style (Keiter 1989). The inability to apply management evenly across political boundaries and a lack of cooperation between agencies, organizations, and the private sector has erected perceived barriers to ecosystem management (Fischer 1991). Using ecological boundaries requires cooperation between Federal, state, tribal, and local management agencies as well as private parties (Grumbine 1994).

Five respondents from various levels commented on the difficulty of bringing all of the significant parties with different interests to the same table. District rangers and forest-level ecosystem management coordinators said that people are always very busy and they "burn out" quickly with the complicated issues that need to be addressed. Particularly important is the need to get all the "appropriate level" players (i.e. stakeholder groups) to the table at the same time. NGO's, private industry executives, and agency managers were all sensitive about going to a meeting with someone from an organization that is not on their level and cannot make equal concessions and work toward real resolution of relevant issues. Cortner and Moote (1992) believe that for ecosystem management to work, it may require merging some of the existing institutions, or at least designation of a lead or "umbrella" agency rather than attempting to coordinate activities among the existing resource management institutions.

4. Perceived threat to private interests

Thirty percent of the respondents identified the perceived threat of "ecobased" management to private interests as a major barrier. BLM planners, ecosystem management coordinators and NGO's in particular, commented on the bias against the term "ecosystem management" because its ecological connotations caused private landowners to fear increased regulation of private land. Conversations with private executives confirmed their perceptions; every private executive expressed concern about a larger, more restrictive government regulation scheme. Private landowners are passionately attached to their land, want to maintain a legitimate economic return from it, do not want to be patronized, and are worried about a long term commitment of their land to a big government plan that limits future decisionmaking flexibility (Gray 1992). A regional social science coordinator noted a perception among private landowners that big government might try to tell them what to do with their land. For some, ecosystem management

> "conjures up images of a new, overbearing governmental planning authority, deciding the best use for private as well as public forest lands, and then imposing its will on private owners through regulations and other limitations on land use." (Sample 1992)

The willing participation of private landowners is essential to the success of ecosystem management.

5. Institutional culture

The institutional culture in the Forest Service with its technical experts, narrow biological focus, and functional approach was cited as a barrier by 30 percent of the respondents. The general theme among the comments was that agency employees tend to be specialists, which contributes to their inclination to view problems in a functional way. One respondent noted that "technical specialists tend to have narrow points of view. The more education they have, the narrower their point of view becomes." Magill (1991) noted that foresters exhibit a homogeneity of attitudes and actions possibly traceable to their technical training and organizational indoctrination. Grumbine (1994), upon completion of an extensive literature review, concluded that most ecosystem management authors are biologists who emphasize scientific aspects, while underestimating the policy implications of organizational change and the complexities of blending diverse human values into management prescriptions. This homogeneity may render the organization "highly resistant to any change in goals" (Twight and Lyden 1992). Super and others (1993) noted that "hard scientists" have traditionally viewed the social, cultural, spiritual, economic, ethics, and other components of the human dimension with some skepticism. Decker (1987) believes that this philosophical barrier is a much greater hindrance than deficiencies in particular skills. Natural resource professionals

> "tend to lack a social orientation; rather, they are oriented to the protection and management of 'things'–trees, water, forage, and wildlife." (Magill 1991)

A related theme, mentioned by six Forest Service respondents, is that agency employees need more training in social interaction techniques. A forest supervisor felt that the Forest Service lacked the appropriate social expertise in this era of downsizing and that hiring employees with the appropriate skills is necessary. A March 1993 Forest Service Washington office independent review of how well the human dimension perspective is being integrated into ecosystem management efforts at the Forest Service regional office level discovered few effective efforts to fully incorporate the human dimension with the substantial biological and physical efforts already underway (Super and others 1993). Foresters are accustomed to speaking in terms of board feet and find it much more difficult to describe the meaning of wilderness or the value of biodiversity (Vining 1991). Ecosystem management will require a shift in professional methods from a focus on scientific measurement to consideration of sociopolitical techniques of communication and consensus management (Cortner and Moote 1992).

Another Forest Service theme, mentioned by five respondents, is that many foresters in the agency still have a professional bias toward logging activities as the preferred management alternative. A perception of this bias is echoed in the literature:

> "a combination of directives and incentives has been in place so long that many forest managers have all their

training and experience in the management of timber sales." (Goldstein 1992)

In the past, logging has been viewed by Forest Service officials as the best way to achieve a wide array of management objectives, from fire and insect control to wildlife management. The Forest Service has also emphasized timber harvesting in regions where timber is of marginal quality and the costs of production far outweigh the returns (Leal 1990). A district ranger felt that a new definition of "achievable work" unrelated to targets and timber production is required before employees would take ecosystem management seriously. Four respondents noted that the agency lacks incentives to do ecosystem management-type work. Some type of structural change appears necessary because as Sax and Keiter (1987) observe: although many parties still insist that the Forest Service is "timber driven" and commodity goals prevail over every other goal, irreversible pressures continue to push the Forest Service away from such institutional single-mindedness. These pressures include litigation by citizen groups, growing local constituencies with environmental and recreational demands, and the influence of neighboring national parks (Sax and Keiter 1987).

6. Institutional attitudes–fear of public involvement

Twenty-six percent of respondents, consisting mainly of forest supervisors and forest-level ecosystem management coordinators, considered managers' fear of public involvement among the most important barriers identified. A commonly echoed theme was that managers prefer controlling decisionmaking and are uncomfortable with an open public forum. A forest-level ecosystem management coordinator said that

"Forest Service managers generally believe that they are the experts regarding natural resource decisions anyway and do not want their scientific expertise diluted by including the less-knowledgeable public."

Boyle and Shannon (1994) found that Forest Service employees "have great ambivalence about accepting the public's knowledge about what they consider a scientific-based decision." Evidence shows that resource professionals welcome public input to their programs, but doubt its validity (Magill 1991). In contrast, studies of participants in national forest planning show that citizens prefer planning procedures that involve two-way communication and allow shared decisionmaking (Force and Williams 1989).

"As long as professional foresters consider public deliberation of forest policy to be unrelated to their job, they will remain outside the policy communities that are struggling to comprehend forest ecosystems both biophysically and socially." (Shannon 1992)

Another theme among respondents was that many managers fear the increased criticism of a more open public decisionmaking process. This defensive way of thinking has been caused by conservation groups fighting every single Forest Service decision. Environmental groups have increasingly used administrative appeals and litigation to successfully challenge resource management policies and practices (Grumbine 1994). A district ranger thought that managers commonly felt that a more open process just maximized the possibilities of a lawsuit. Also, the Offices of General Counsel (OGC) advised managers to engage in a conservative NEPA process (i.e. open the process to public participation only where NEPA requires it, even though no law prevents maintaining an open process throughout). Successful implementation of ecosystem management will require overcoming agency managers' learned fear of public involvement.

7. Institutional structure

Twenty-six percent of respondents, mainly Forest Service employees at the regional and local levels, mentioned that the Forest Service's structure made implementation of ecosystem management difficult. The common theme was that the agency is structured around functional goals which relate to the budget line items. One respondent remarked that this structure promotes a "stovepipe" perspective among agency officials who become interested only in completing their own programs. A district ranger said that often promotions are tied to completion of these functional goals. A forest-level ecosystem management coordinator observed that this structure does not reward risk-taking or innovation, thereby discouraging forward-thinking ecosystem managers. Boyle and Shannon (1994) discovered that Forest Service employees find the current reward system "inconsistent with where the Forest Service should be going as an organization."

A regional social science coordinator noted that the functional agency structure causes a second problem: interdisciplinary teams are used only for review and not for planning. In addition, the research scientists are separated organizationally from the public resource managers, making coordination of science and management practice difficult. Finally, the splintered nature of the land management scheme between agencies (i.e. USFS, BLM, State) is frustrating to private industry which must constantly respond to several agencies at once. Cortner and Shannon (1993) found that whenever informal discussions actually influenced planning or policy, citizens worked directly and closely with local staff. But, when access was limited merely to formal channels, and staff merely acknowledged citizen comments, the citizens were more likely to use other forums, such as the courtroom, to affect agency decisions and policies.

8. The challenge of responding to the concerns of multiple publics

Twenty-six percent of respondents, representing the gamut of groups polled, commented on agency difficulty in responding to the needs of disparate groups. Finding common ground between consumptive-use activities and the tourism-recreation industry has proven exceedingly difficult (Gillis 1990). Confronted regularly with conflicting public opinions regarding the importance of environmental protection versus resource development, the agencies have been unable to convey to the public how to weigh often competing national and local interests in establishing priorities (Keiter 1994, Sirmon and others 1993). Interest groups with conflicting values in competition for limited environmental resources have been pitted in an adversarial process that does not reward compromise (Loeks 1985). Caught among the environmental, tourism, and resource lobbies, managers have recently avoided making controversial decisions (Goldstein 1992b). Federal land managers have found their options increasingly narrowed by political pressure at one end of the spectrum and the threat of litigation from environmental groups at the other end (Goldstein 1992b). An important challenge to ecosystem management is finding common ground between agencies, their employees, and the public to establish unambiguous common goals (Agee and Johnson 1988). Perhaps one necessity of effective ecosystem management is to develop a toleration for ambiguity and disagreement among these groups to avoid deadlocks.

Agencies have unwittingly promoted divisiveness and polarization in their contacts with the public by exerting authority instead of sharing power (Sirmon and others 1993). One cause of this problem is that the Forest Service resisted change and stuck to its old paradigm for too long, thereby losing its credibility in the public arena (Daniels, O. 1994). During the past two decades, communication between resource managers and their constituents has become increasingly adversarial (Vining and Schroeder 1987). Environmentalists are suspicious that foresters, and the Forest Service in particular, are not matching their actions on the ground with their policy pronouncements (Cortner and Moote 1992). For the most part, old participation techniques consisted of bureaucratic exercises

> "to exchange information, to request comments on issues or proposals that had already been formed, or to hold public meetings or consultations about restricted alternatives." (Cortner and Shannon 1993)

Participation techniques were narrowly designed to ensure agency compliance with statutory and regulatory requirements.

> "Forums for true public deliberation expand understanding, incorporate diverse perspectives, shape interests as consequences are clarified, build trust, expose the processes of value formation, articulate visions of the future, and define public problems." (Shannon 1994)

All of the NGO's contacted for this paper confirm that the public generally does not trust the agencies to manage the public lands. Forest Service respondents noted a need for an internal and external education process to combat the growing lack of trust.

9. Agency budgets

Twenty-four percent of respondents were particularly concerned about the format and incentives created by the congressional appropriations process that determines Forest Service expenditures. Their common concern was that the line-item funding structure encourages continued functional management that emphasizes reaching specific targets rather than encouraging holistic land management. Keiter (1989) argues that budgetary incentives have created an agency culture closely tied to tradition and uncertain about the advantages of new ideas such as ecosystem management. Two district rangers believed that Congress' insistence on line-item accountability fractures the agency, and prevents it from working as one cohesive unit.

Another common theme among respondents was that the traditional appropriations process creates perverse incentives by rewarding timber-related activities and production of board-feet only. Traditionally, agency budgets have been tied to resource production by the congressional appropriations process (Wilkinson 1992).

> "Resource-oriented appropriations encourage the administration and Congress to specify output targets, especially for timber, because such targets are easily specified and are controllable by Forest Service managers." (U.S. Congress 1992)

Congressional stimulants to logging include high road building appropriations and rebates to companies that build new roads to reach harvesting sites on national forest land (Goldstein 1992a). Because Federal agencies are dependent on congressional approval for funding, it is unlikely that changing management's focus to ecological health rather than production will happen without a change in the appropriations process (Cortner and Moote 1992). Sample (1990) notes the difficulty and imprecision of translating line items into integrated resource projects and then trying to accurately allocate time among the resource line items. Thus, Forest Service officials have been foreclosed by the budget structure from giving ecological considerations priority over congressionally mandated timber production targets.

10. Building public interest in ecosystem management

Nineteen percent of respondents remarked on the need to build public interest in ecosystem management. Their shared concern was the necessity of public involvement to implement successful ecosystem management. One regional ecosystem coordinator perceived that conservation groups understand the importance of ecosystem management, but the general public does not. A regional social science coordinator summarized the problem as follows: "the public is apathetic, does not seem to care, and just wants its recreation." Caldwell (1970) agrees that most average citizens who live in urban areas are likely to be totally unfamiliar with ecosystem concepts and unable to evaluate the concepts' significance to their lives. While society has dramatically shifted its perception of forest management, its demands for resources have persisted (Hegreberg 1994). Before ecosystem management can succeed, the public needs a widespread understanding of why new policies are required, what outcomes are anticipated, and a reorientation of its ethics (Goldstein 1992b).

11. Scattered ownership of public lands

Fifteen percent of respondents, including NGO's, private industry executives, BLM planners, and officials at all levels of the Forest Service, consider the scattered, checkerboard ownership pattern of lands between Federal agencies, States, and private owners a major political barrier to implementing ecosystem management. The respondents' comments reflected a common theme: ecosystem management plans must cross jurisdictional boundaries, which will be a logistical nightmare. The political boundaries on public lands simply do not reflect ecological conditions. Few areas of the United States exist where delineation of ecosystem boundaries does not encompass a mixture of public and private lands, often in an intermingled pattern inconsistent with ecological boundaries (Sample 1992). A difficulty in implementing ecosystem management is that, through generations of carving up the land, the legal system that evolved "created ownership patterns, expectations, and claims of rights that build on the destruction and severance of functioning natural systems" (Sax 1991).

> "Management units often bear no relation to the realities of ecological systems (even the home-range of the species for which protection is sought), their connections to economic and social processes, or local peoples' cultural and political identity." (Slocombe 1993a)

Arbitrary management units lead to great difficulties in achieving sustainable development planning because they fail to foster a sense of community among the people in the unit and make consistent management of a complete ecological unit impossible. The legal system may need to undergo a fundamental shift toward protecting resources with a recognition that all land is not the same.

12. The Endangered Species Act of 1973

Although only 13 percent of respondents considered the Endangered Species Act (ESA) a barrier, all of the private industry respondents considered the ESA the most significant barrier. Private industry executives were particularly troubled that ESA analysis does not include economic or human considerations. ESA listing determinations are based "*solely* on the best scientific and commercial data available." All respondents who identified the ESA as a barrier thought that the Act's single species focus and concentration on only threatened and endangered species did not fit well with the ecosystem management goal of preserving all species more equally. Private industry respondents were concerned that the ESA concept of "viable populations" was unreasonable in many contexts. For example, one respondent questioned the merit of preserving grizzly bears in all of their former ranges in light of the tremendous human hardship and economic expense resulting from preservation efforts. He wondered why preservation of the grizzly bear was necessary all over the Northern Rockies when viable populations exist in Canada and Alaska. Similarly, private respondents questioned ESA's definition of "suitable habitat," particularly in regard to anadromous fish habitat and provisions in "PACFISH" calling for wider riparian buffer zones. They thought the definition of "suitable habitat" lacked scientific foundation because it did not include the ocean, where fishing and pollution directly affect fish populations. They felt it was unfair to single out forested areas for regulation when the combined effects of ocean fishing, dams, and agricultural runoff prevent significant fish populations from ever reaching forested upland areas anyway.

All respondents who identified the ESA as a barrier thought the Act's major ecological shortcoming as a basis for ecosystem management is its single-species orientation. Recovery plans must "give priority" to endangered or threatened species. Only listed species, which are already on the edge of extinction, qualify for this priority protection. Therefore, ESA recovery plans may prevent actions that benefit some species to protect others. For example, one respondent noted that, in the Hood River area, spotted owl habitat consisted of thick stands of diseased fir trees. Based on historical data, land managers know that the area formerly consisted of open pine savanna. The land managers believe that a prescribed burn would best serve the ecological health of the area, but such an action is barred by the spotted owl critical habitat designation. The health of one species–the spotted owl–requires the demise of others–forest species composition and health. Any ecosystem management plan must provide some mechanism for addressing these

species-management conflicts in developing large-scale management plans. Otherwise, declining ecological health and increased litigation may result.

13. The National Environmental Policy Act

Eleven percent of respondents identified the National Environmental Policy Act (NEPA) process as a barrier to ecosystem management. Two regional social science coordinators commented that the traditional NEPA process does not require consideration of social factors, and past court decisions tend to lessen the importance of social aspects of forest planning. By social aspects, the interviewees were referring to the effects of management plans on communities, economic opportunities, and the like. NEPA, of course, encourages social involvement in the form of public comment, review, and critique. One of the coordinators thought that agencies tend not to include social involvement factors in their analyses because NEPA does not specifically require it. Unless social effects are tied to physical effects, agency interpretations of NEPA send the wrong message to land managers regarding the ecosystem management process. The other Coordinator thought that court decisions have lessened the importance of social/psychological outcomes. He noted that Forest Service compliance with the NEPA process is stuck in a traditional mode of making sure the letter of the law is met, rather than using the substance of the law to seek other innovative methods of achieving meaningful public participation.

Other respondents pointed out that, as FEMAT indicates, it is impossible for planners to evaluate all the effects of, and alternatives to, an ecosystem-level plan. Basically, NEPA ensures that Federal agencies evaluate environmental effects in their decisionmaking processes. NEPA requires the preparation of an environmental impact statement (EIS) for "major Federal actions significantly affecting the quality of the human environment." The EIS must disclose the impacts of the action, examine alternatives, and involve the public and other agencies in its preparation (Kirby 1984). NEPA's major impacts on forest planning have been (1) to require consideration of environmental impacts, and (2) to require public disclosure of the planning process. Both of these impacts are also important components of ecosystem management. However, NEPA's procedure for considering environmental impacts may hinder, rather than aid, ecosystem management planning. A NEPA EIS must examine alternatives to the preferred course of action. Any ecosystem management plan, due to its broad scope and holistic approach, may have a virtually inexhaustible list of alternatives. Most EISs that do not satisfy NEPA procedural requirements fail because they do not consider all of the alternatives. Thus, NEPA may provide a vehicle for virtually any disgruntled party to derail efforts at implementing ecosystem management. As evidenced in the FEMAT process, it is literally impossible to analyze all potential effects of an ecosystem management plan. The massive amount of paperwork would be crippling, the science cannot be complete, and all alternatives cannot possibly be considered (although NEPA requires it). Ecosystem management contemplates constantly evolving management activities as scientists increase their understanding of the interaction between different ecological disciplines. It is virtually impossible for land managers to fully analyze all environmental consequences before implementing an ecosystem management plan, or every time changing science dictates shifting management philosophies.

One possible solution to the problem of analyzing all potential alternatives to an ecosystem management plan lies in a recent Forest Service trend toward programmatic EIS's. Subsequent site-specific environmental analyses are "tiered" to the programmatic EIS, without repeating the programmatic analyses. Ecosystem management plans, to comply with NEPA requirements, may also by necessity be accompanied by "programmatic" EISs which leave site-specific details until later. As new information becomes available, the "program" will not change, but the site-specific detailed plans may be amended. But, this set-up does increase the danger of failure of the overall goal of an ecosystem management program. Due to its holistic nature, an ecosystem management plan may be significantly altered by a successful challenge to one or more of its site-specific parts. In other words, the whole may not equal the sum of the remaining parts.

A second potential NEPA problem in relation to ecosystem management planning is NEPA's timing requirements. As discussed, NEPA saddles agencies with significant procedural obligations before taking any management action. NEPA requires agencies to address the economic and environmental ramifications of every action. The formal NEPA notice and comment periods generally require all comments to be submitted within a 45 day period after the plan is revealed. To prevent huge delays, collaboration regarding ecosystem management plans must begin earlier in the planning process (i.e. when the agency is actually formulating the plan). Although public participation sometimes does occur at an early stage, court rulings and the lack of formal requirements has lessened official emphasis on early involvement. Agency officials must involve the public in the planning process earlier than they have been accustomed to in the past.

A third problem regarding NEPA's procedural requirements is that they do not prompt ecosystem-scale analyses. The courts have not consistently interpreted NEPA to require environmental analysis at the relevant ecosystem scale. For example, in *Kleppe v. Sierra Club,* the Supreme Court held that regional coal development could begin without a regionwide EIS. In *Robertson v. Methow Valley Citizens Council*, the Supreme Court held that the Forest Service

had fulfilled its NEPA procedural requirements and could authorize construction of a ski resort, even though it would eliminate the local mule deer population. The Court held that the Forest Service had no authority to mitigate effects outside of its jurisdiction nor could it compel any other government agency to do so. This decision does not fit well into the new paradigm of ecosystem management. NEPA does not legally require protection of ecosystem resources that cross interjurisdictional boundary lines.

14. Timeframes

A theme among 11 percent of respondents was that more time and patience are needed to build trust among natural resource managers and with the public. A forest-level ecosystem management coordinator remarked that scientific approaches are methodical, time-consuming and expensive; therefore, quicker approaches must be developed or expectations regarding appropriate actions within timeframes must be lengthened. A tremendous challenge to successful ecosystem management is successfully meshing the extended timeframe of nature with the compressed timeframe of humans (Super and others 1993).

Natural resource managers developing plans for long term ecosystem productivity face relentless challenges from the short term exigencies of economic return, population growth, and political ambitions (Burgess 1991). Somehow, ecosystem management must coordinate these different time frames in a cohesive manner. Managing ecosystems

> "requires a change in thinking, a change in basic philosophy, a change in training of resource managers, and most importantly, a change in the short-term economic and political strategies that drive modern society." (Burgess 1991)

To be successful, we must expect mistakes and build some flexibility into the law (Rosenbaum 1992).

15. Managing expectations

Nine percent of respondents, including mainly Forest Service officers engaged in on-the-ground management, emphasized the importance of managing the public's expectations as the agency proceeds with its ecosystem management plans. A common theme was that, right now, the ecosystem management process is creating higher expectations than may be possible to achieve in the given time frame. A forest-level ecosystem management coordinator thought that ecosystem management "will, by definition, create a smaller pie with less to go around for everyone." A district ranger worried that "the romantic notion of pre-European settlement is unrealistic." Much of the discussion about the virtues of ecosystem management may have already created impossibly high expectations in the minds of politicians and the public (Brewer 1991). The specter of unattainable goals raises very real problems for those entrusted with ecosystem management responsibilities (Brewer 1991).

16. The National Forest Management Act

Seven percent of respondents commented that the substantive requirements of the National Forest Management Act (NFMA) create significant obstacles to implementing a long-term, holistic ecosystem plan. One problem cited was an "us against them" mentality among the agencies regarding forest plans that hinders working toward collaborative, broad plans with joint signatures. One Forest Service respondent recommended no more single agency plans because they are obsolete for ecosystem management. Grumbine (1994) agrees that ecosystem management has developed partially because Federal management, through national forest planning, has failed legal challenges, ignored conservation biology concerns, and left the public's expectations for meaningful participation in decisionmaking unfulfilled.

Several provisions of NFMA contain very specific, substantive requirements that may cause difficulty implementing holistic ecosystem management. Respondents' NFMA concerns related to the following substantive provisions:

Section 6(f)(5) requires the agency to revise forest plans when "conditions in a unit have significantly changed, but at least every fifteen years." Two survey respondents thought that the revision requirement erected a barrier to the ecosystem management process because the regulations require development of a brand new plan all at once whereas ecosystem management represented a more adaptive, evolving management scheme.

Section 6(g)(3)(E)(ii) allows timber harvesting only where "there is assurance that such lands can be adequately restocked within five years after harvest." Two respondents thought that this restocking requirement was generally quite difficult to achieve and could present problems for broad, holistic management schemes.

Section 6(g)(3)(F)(iii) requires that "cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain." The regulations establish limits on the amount of edge areas and the size of openings allowed. One respondent thought these regulations would be difficult to satisfy in a larger ecosystem management context.

The implementing regulations allow only single agency plans that stop at administrative boundaries. Two respondents noted that ecosystem management plans will include multiple agencies and extend beyond national forest boundaries. They thought that landscape management would be difficult to fit into the existing NFMA planning

structure. One respondent thought NFMA's diversity requirement would limit flexibility in ecosystem management planning.

Although some of NFMA's prescriptive requirements may make ecosystem management planning difficult, the Act's non-specificity in other areas may allow managers to build flexibility into the planning process. For example, NFMA's diversity requirement is deliberately non-specific leaving much room for individual interpretation. The law provides little guidance regarding what diversity is and how much is required. However, the regulations adopted to fulfill this statutory mandate require the consideration of conservation biology concepts in the forest planning process. Those concepts do not necessarily conflict with flexible ecosystem management planning.

17. Different organic mandates of public agencies

The major public land management agencies–the National Park Service (NPS), the United States Forest Service, the Bureau of Land Management and the United States Fish and Wildlife Service (USFWS)–must comply with the different mandates found in their respective organic acts. As noted by 6 percent of the interview respondents, the dissimilar organic mandates of the public land agencies create regulatory uncertainty for any broad, holistic management scheme implemented across the ecological landscape. Land managers responsible for actually implementing land management practices were concerned that this regulatory environment sent them mixed signals regarding proper legal authority for their actions.

The organic mandates of the four major public land management agencies may constrain land managers' attempts to implement ecosystem management. Both the Forest Service and the BLM have multiple-use mandates that include traditionally favored resource extraction and production activities. To the Forest Service, ecosystem management means maintaining a steady flow of timber and other resources while maintaining long term forest health. In contrast, the USFWS focuses on maintaining wildlife expectations for hunters and fishermen. To the NPS, ecosystem management means allowing natural processes to occur on a larger scale, while also accommodating park visitor needs and protecting neighboring land owners. These four major public land management agencies have not focused on the ecological needs of the landscape in a consistent manner in the past. A difficult legal issue is how to reconcile fundamentally different legal mandates and policies when management decisions are likely to have adverse environmental or economic impacts on nearby resources, lands, and communities (Keiter 1991). Thus, the transition to holistic ecosystem management plans that include lands administered by each of them may prove difficult.

The complex web of different organic mandates and laws governing agency actions raises a number of concerns. First, the laws were enacted at different times over a century-long period and serve different, and often contradictory, purposes. Nonetheless the agencies must abide by them. Second, the many conflicting requirements make comprehensive ecosystem management planning an exceedingly difficult task. Third, the complexity of the legal framework, as noted by respondents in this survey, may lead agency officials to concentrate on making their management plans "bomb-proof," rather than spending time working with the public toward implementation of reasonable ecosystem management plans. Although agency planners recognize that they must plan across agency boundaries, they are reluctant to enter any interagency agreement that might compromise their own ability to meet other legally mandated resource policy goals (Keiter 1994). The current law provides no mechanism by which the various agencies can confidently make value judgments between conflicting statutory responsibilities in pursuit of ecosystem management. Without clear leadership, many managers feel hampered by these conflicting duties. However, the ambiguous mandates may also provide opportunities for local-level ecosystem plans by maverick, aggressive land managers.

18. Monitoring

Six percent of the respondents noted the need for methods to measure the success and effectiveness of ecosystem management satisfactory to all parties. Problems mentioned included a lack of baseline data, limited past involvement in information collection (i.e. vegetative information), poor records management, a lack of historical information, and the need for more money dedicated exclusively to project assessment.

> "The Forest Service gives monitoring a low priority because monitoring does not provide tangible outputs for which the managers can be rewarded and because the agency lacks penalties for inadequate monitoring." (U.S. Congress 1992)

Boyle and Shannon (1994) found that Forest Service employees believe monitoring of resource actions will strengthen management accountability, even though it might somewhat strain manager-scientist relations.

The success of ecosystem management will be difficult to monitor due to an absence of common standards of measurement among agencies. For example, between the states and the Federal government in the Yellowstone region, there are five different sets of criteria for identifying rare and endangered species (Goldstein 1992a). Also, ecosystem function is difficult and expensive to measure (Roberts 1991). Establishing a good foundation of baseline information on resources and people is critical. Without

baseline data on ecosystem components, as well as a method to uniformly employ this information, managers will continue to be unable to develop effective cooperative research management plans. The lack of research and data integration constrains efforts to assess cumulative effects.

19. Air and water quality laws

Just 4 percent of respondents brought up air and water quality laws as a potential barrier to ecosystem management, but they each raised the same, interesting point. Ecosystem management, to simulate natural ecological conditions, may require some prescribed burning. Even if these burns initially have public support, once people realize that their air or water must temporarily become dirty, they no longer will support the practice. Respondents thought this problem will be most acute in forests near urban centers and in areas where air and water quality already barely comply with legal standards. The managers' concerns also find support in the scientific community. The scientific community has increasingly recognized that managers must, to the extent feasible, simulate fire regimes that historically molded plant communities to sustain the diversity of life originally associated with an area (Van Lear 1991). These efforts may run afoul of clean air and water laws. For example, some analysts believe that the effects of airborne pollutants and external manipulation of surface water quality and quantity constitute the principle external threats to national park ecosystems (Stottlemeyer 1987).

20. Constraints of State and tribal law

Although only 4 percent of the total respondents mentioned State laws as a barrier, the percentage consisted entirely of BLM planners. The legal framework governing Federal planning and management of national forests, through the Forest Service Organic Act and the Multiple Use-Sustained Yield Act of 1960 (MUSYA), recognizes State responsibility for water rights and for fish and wildlife (U.S. Congress 1992). NFMA also implicitly grants the States authority over waters and wildlife in the national forests when it directs that national forest planning remain consistent with MUSYA. Thus, legitimate barriers to ecosystem management may arise from conflicts with state law especially in regard to water use in the arid, overpopulated West.

Recommendations

Offering comprehensive solutions to the barriers to ecosystem management is beyond the scope of this paper. However, this recommendations section highlights some general themes to begin to address the barriers. These recommendations are based on comments by respondents and our observations throughout the survey.

1. Provide ecosystem management training for agency personnel

A common theme among respondents is a desire for more training explaining ecosystem management principles and emphasizing the importance of public involvement. Agency transition to ecosystem management will require education of both the public and agency personnel. Super and others (1993) agree that if people with social science skills are not directly involved, ecosystem management will not adequately consider the human dimension. Magill (1991) concurs:

> "Positive change in resource professional skills and attitude might come through improved career guidance, more training in the social science, and increased exposure to alternative solutions."

2. Evaluate agency culture

Both agency personnel and private industry executives strongly believe that the resource professionals and the agencies must continue to broaden their narrow scientific focus and emphasize the importance of involving people in ecosystem management. Forest resource managers must learn to think strategically and become skilled facilitators of ongoing civic deliberation (Shannon 1992).

3. Embrace a flexible management philosophy

As one respondent noted, "managers must understand their facilitation role and embrace the new management philosophy." A theme among respondents was to embrace a management philosophy like adaptive management. Adaptive management embraces uncertainty in both ecological and social systems. Uncertainty requires that management be treated as a continual learning process and that management decisions be recognized as "gambles" (Walters 1986).

> "Adaptive management assumes that scientific knowledge is provisional and focuses on management as a learning process or continuous experiment where incorporating the results of previous actions allows managers to remain flexible and adapt to uncertainty." (Grumbine 1994)

4. Modify planning processes

Many recommendations have been made to change agency incentives away from commodities production. Recommendations include: (1) change the RPA and forest planning from its output-centered focus (within sustained-yield constraints) to a desired sustainable ecosystem model that secondarily estimates outputs (Kennedy and Quigley 1994), (2) shift the traditional administrative boundaries in National Forest planning units to landscape ecosystem

criteria, and (3) base the planning on development of desired future conditions and work backwards from there. Planning modification suggestions include: (1) eliminate the increase in funding tied to timber harvesting on marginal lands, (2) keep a portion of the recreational user fees within the budget of the forest that collects them, and (3) increase grazing fees (Goldstein 1992b).

5. Restructure budget process and change allocation of agency funds

A common theme, summarized by a forest supervisor, is that the agency "needs to develop an understanding that functionalism is hurting forest management." The agency must change its budget emphasis from output-based to a system enhancing ecosystem management. A common suggestion was to emphasize desired future conditions rather than output levels. Another was to earmark certain funds specifically for ecosystem management.

> "The combination of pleas for budget and organizational restructuring . . . is a powerful cross-agency cry for change in the purpose and manner in which dollars are used." (Boyle and Shannon 1994).

6. Change agency incentives

A common theme among respondents was that the Forest Service must change its incentive structure. The agency needs to reward innovation and risk-taking, and the system is just not set up to do that now. The Forest Service's current structure has

> "helped create target-based policies that complicate, if not make ecosystem management impossible; and it has established management incentives based on controlling information, rather than on opening lines of communication that lead to informed decisions." (Boyle and Shannon 1994)

Because ecosystem management is a flexible, adaptive, innovative, interdisciplinary process, those ideals must be instilled and encouraged in individuals trying to implement it. Effective incentives, rewards, and consequences must exist to encourage resource managers to carry out ecosystem management (Super and others 1993).

7. Increase professional diversity within agencies to reflect ecosystem management goals

Ecosystem coordinators, in particular, believe that the agency must increase its diversity by hiring professionals with social science skills that reflect the human and public participation elements of ecosystem management. Diversity may breed increased openness to change. Ecosystem management requires a wide range of skills, many of them nonscientific, to be successful. Agencies should strive to match that diversity within their own organizations. An interdisciplinary staff, with both scientific and political skills, will be better suited to implement an interdisciplinary plan like ecosystem management (Kennedy 1991).

8. Redraw administrative boundaries

A theme mentioned by six respondents is the politically difficult solution of redrawing administrative boundaries. Congress could integrate ecosystem lands by combining the public lands within the same ecosystem into a single region under one responsible agency. Another approach is to establish a regional authority to conduct research, planning, and zoning for an ecosystem. The regional scale is important to capture cumulative effects and to ensure that management includes terrestrial/aquatic linkages and interactions (Slocombe 1993b).

9. Restructure management units

A more feasible solution, mentioned by four respondents, is to restructure the management units within the existing administrative boundaries. For example, one District Ranger has developed a landscape stewardship model that divides his district into four geographic areas. A separate staff team is assigned to manage each of the different areas. Thus, each officer is tied to a particular geographic land area rather than assigned a particular functional duty. The four geographic teams are supported by a highly trained technical support team. "Recognition of the greater ecosystem, much like recognition of a problem, is an important first step" (Slocombe 1993a).

10. Establish clear agency goals

A common theme among respondents is the need for both a clear break with past agency practices and a clear, bold statement of goals for the future. The agency needs a straightforward policy stating that management will synthesize knowledge and applied science to signal that there is a will to change allocations of people and money (Boyle and Shannon 1994). In plain language, the trick is to combine sound ecological science with democratic public participation to implement ecosystem management in a manner that will "catch the public's imagination" (and agency employees' imaginations too), as did the early days of conservation inspired by the leadership of Theodore Roosevelt and Gifford Pinchot.

11. Improve intra-agency communications through leadership

A common observation among respondents was that the message of ecosystem management is not filtering down through the ranks. On-the-ground managers are unsure about the meaning of ecosystem management and the

agency's commitment to it. Intra-agency communication must be improved both between upper- and lower-level management and among the various regions and forests.

12. Change the law?

An immediate typical response from respondents regarding what to do about legal barriers is "change the law!" Agency managers are frustrated by the myriad time-consuming legal requirements associated with managing the land. Successful implementation of ecosystem management may require a major overhaul of the complex set of Federal, State, and local laws and policies that currently govern natural resources management (Norcross 1991). For the most part, our country's legal structure has been built upon resolving single issues, managing single resources, or regulating single agency jurisdictions. Essentially, no laws or policies coordinate the many levels of government and integrate the many aspects of managing a particular ecosystem. That setup makes ecosystem planning particularly complex, although it may also offer localized opportunities to move forward on smaller scales. A more realistic, feasible solution may be to revise regulations rather than amend statutes.

13. Improve monitoring

A common theme among respondents was the need for improved monitoring of agency management actions.

> "Monitoring is the missing ingredient for ensuring resource management accountability, where research becomes synthesized into management to evaluate the effects of choices." (Boyle and Shannon 1994)

Continuity of management in a particular resource area also could potentially increase public trust and credibility as the agency land manager develops a rapport with the local community.

14. Improve and increase public involvement

Better, increased, public involvement was the rallying cry among ecosystem management coordinators. Suggestions included: get people involved up front; require more negotiation and listening; increase the amount of time spent with the public; work together as teams more often; develop formal public outreach programs; get more people dedicated exclusively to public involvement; make the public feel needed; show them we care; take success stories and promote them; and increase communication about values.

15. Interagency working groups

A common theme among respondents was that more interagency working groups might help alleviate some of the problems of interagency coordination across administrative boundaries. A BLM planner identified the "Colorado Ecosystem Partnership Group" as a good example. He said that directors of the Forest Service, Park Service, BLM, and USFWS get together to talk about what can be done to promote ecosystem management. The group has evolved to include other professionals. He noted that if the agencies cooperate in sharing resources, it will help blur lines between them. An effective interdisciplinary team process will focus on identifying tradeoffs and other implications of managing ecosystems (Super and others 1993).

16. Create structural support within Federal agencies

During our study, we observed that finding out who was responsible for ecosystem management activities was often a difficult task. Employees within the same office often do not know who is working on ecosystem management. Very often responsibilities are splintered among various employees who are unclear what each is doing. Two common themes echoed among respondents were: (1) funds committed to ecosystem management are lacking, and (2) a pervasive feeling among agency employees that ecosystem management tasks are extra work, loaded on top of already busy schedules. People and resources need to be specifically earmarked for ecosystem management.

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FEMAT to SEIS: Transforming The Social Assessment

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Abstract

The following paper is a first-person account of the social assessments of the 1993 Forest Ecosystem Management Assessment Team (FEMAT) and 1993-94 Supplemental Environmental Impacat Assessment (SEIS). The FEMAT process, led by Jack Ward Thomas, was a Forest Service and Bureau of Land Management response to President Clinton's "Forest Conference" held in Portland, OR, on April 2, 1993. There were several subteams as part of the FEMAT process, including one that was concerned with the social aspects of changing management in the Pacific Northwest and northern California. This paper documents some of the almost frantic pace of FEMAT, with a 60-day deadline, then the transformation of the written material into an EIS format for public review and decisionmaking. It was an interesting and challenging experience for both the agencies involved and the people assigned to the projects. This accounting gives some feel for the teamwork and timing that were essential to the processes that may set the agenda for the two agencies for years to come.

Introduction

April 2, 1993 began a process that involved the President of the United States, the Vice President, five Cabinet members, and scores of invited citizens in a townhall-type meeting on the banks of the Willamette River in Portland, OR. The purpose of this forest conference ("timber summit") was for invited citizens to present their concerns, opinions, and proposals to the President concerning the management of Federal forest lands in the Pacific Northwest and northern California. The unprecedented conference was the culmination of more than a decade of controversy involving the spotted owl, jobs, old growth, and environmental concerns. It also involved 13 national forests, 7 Bureau of Land Management (BLM) districts, and other Federal lands covering some 24.5 million acres (Caldwell, Wilkinson, and Shannon 1994; Thomas and Raphael 1993; Yaffee 1994). The conference provided a forum to yield possible solutions to the forest management crisis facing Federal land managers, the timber industry, communities, environmentalists, tribes, and others. An interagency, interdisciplinary team was already being assembled as early as March in anticipation of the conference to assess the situation and devise a number of possible solutions based on best available science. Plus, the assessment and management options had to be completed and reported to the President by June 2d (60 days after the conference)!

FEMAT Process

The scientific analysis process formally began shortly after April 2d, with Jack Ward Thomas chosen as the overall leader and Martin Raphael as deputy leader. The analysis team, which originally had no name, was finally settled on as the Forest Ecosystem Management Assessment Team or FEMAT for short. The message was clear for federal employees–no other activities in the affected agencies had higher priority than FEMAT. University experts were also hired for the duration of the project. Some agency employees, such as myself, were called to temporarily "assist" the FEMAT and found out that assisting was the same as being drafted into the process–you did not leave until it was finished. With the help of a great many people, plus an occasional "push" from Department and White House staff, people came together in a very short span of time to assess a situation that had never been fully assessed since the beginning of the controversy more than a decade previous. Most of the FEMAT team members were in Portland by the middle of April.

Space was rented on the 14th floor of the U.S. Bank Tower building in downtown Portland to house the burgeoning team members and support staff. The team of nationally renowned experts who were assembled in the building were referred to as the "tower of power" by other agency employees. With White House authority used liberally to "grease the skids," the governmental "red tape" was reduced greatly. New computers and software were ordered and delivered sometimes in the same day! As with a critical fire situation, money was no problem–whatever was needed was purchased or rented.

Six FEMAT assessment teams were organized: terrestrial ecology, resource analysis, aquatic/watershed, spatial analysis, economic assessment, and social assessment. Yet, under the time pressures, each team tended to work separately and in "closed door" sessions to complete their almost impossible task. The social assessment group was led by Roger Clark and George Stankey, both long-time Forest Service researchers in the recreation and social science areas. In rapid fashion, they were able to pull together a cadre or team of several sociologists from leading universities to design and implement a social assessment for the FEMAT process. The social team was also helpful in writing commissioned papers to provide needed background information for the assessment. They referred to themselves as "pencil-neck geeks."

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The expanded social team spent 14-18-hour days writing, telephoning, teleconferencing, faxing, E-mailing, and holding meeting after meeting to try to make sense of what was going on. Wthey worked 7 days a week, all staying in Portland, eating together, and constantly analyzing and trying to figure out the best and quickest way to get the results needed in the unrealistic timeframe. The team members developed an interpersonal closeness, but stress was high, tensions rose, and tempers sometimes flared. It was an unusual and desperate situation. Time, or the lack thereof, was the real problem–many of the researchers would have liked to spend years studying the socioeconomic conditions and consequences of the options, but there were only 60 days to design, implement, digest, and write about the whole process from start to finish. Also, the other FEMAT subteams were faced with the same timeframe and performance pressures.

Then there was a growing concern that no options (alternatives) were made final until late in the process. One option (9) was "fleshed out" only days before the draft document was presented to the President, while option 10 was constructed afterward to widen the range of choices. This alone became a serious problem, especially for the socioeconomic teams, as the expected impacts would appear to change very little between any of the options.

The social assessment process consisted of several concurrent efforts. A content analysis method was used to summarize what people said at the forest conference. An assessment was made of the possible impacts on the Native American tribes in the affected area. Another effort was made to collect data regarding recreational, scenic, and subsistence activities in the region. Then several teams of Forest Service and BLM employees were brought to Portland to give their impressions of selected "case study" communities and possible effects of management changes. A group of county extension agents were asked, via a mail survey, to analyze the current status of communities with which they were familiar. Previous State studies on communities in crises were utilized. A contract was let with Portland State University to summarize the Federal census data on population and socioeconomic aspects of every county under study.

Finally, two groups of community and county leaders/planners were called to Portland to estimate effects on rural communities due to changing Federal policies through several representative options or harvest levels listed by FEMAT (Thomas and Raphael 1993; Clark and Stankey 1994). Problems were found with simple but important words that the panels were using, with each panel giving slightly different definitions for "community capacity." Panel members were given opportunities to discuss the expected consequences for communities in their area of expertise. The second panel deliberations were recorded using a court recorder for each state subgroup. The panel experts were then given colored dots to place on maps of the three States to make a visual depiction of their analyses. As the details of the options were not clear at the time that the expert panels met, they were unable to analyze the socioeconomic effects of every Option, as several were still being developed and others were so close in terms of outputs that it was difficult to distinguish between their socioeconomic consequences. Interpolation was necessary for the FEMAT report for the alternatives not analyzed by the panels. Important also to realize was that the social team, as well as the other teams, comprised researchers and academics with only minimal assistance from planners and NEPA experts, which would be needed in the next phase.

Everything was rushed, and after working 6 frantic weeks, a rough draft was taken to the President for review and to identify a preferred option (option 9). Another month was requested and given to allow time to finish the FEMAT report and revise several of the options. With most of the research completed, writing then became the major hurdle to get past. This extra allowance of time was needed to finalize what became the 1,019-page FEMAT report. There was considerable discussion as to having the report published separately as a Pacific Northwest Research Station publication or whether to have it as a stand-alone report for this unique situation. This was resolved by having the report printed as part of an environmental impact assessment that was going on concurrently.

Transition to the SEIS Team

At the time when the FEMAT team was finishing the rough draft (late May) to take to the President, another team was formed to transform the FEMAT report into a supplemental environmental impact assessment (SEIS) format. The SEIS team was led by Robert Jacobs, Deputy Regional Forester for the Pacific Northwest Region of the Forest Service. Arnold Holden (Region 6) and John Singlaub (BLM) served as assistant team leaders. This SEIS was intended to modify existing Forest Service and BLM plans to adhere to the principles outlined in the options of FEMAT. The SEIS team was composed of an interagency and interdisciplinary group of Federal employees from the Forest Service, BLM, Environmental Protection Agency, Fish and Wildlife Service, and legal counsel from USDA and USDI. The SEIS team was also stationed on the 14th floor of the Bank Tower. Initially, the SEIS team was squeezed into the unused portion of the FEMAT area, but eventually took over the whole area.

The SEIS team's task was relatively straightforward: Create an SEIS using only the FEMAT writing. The only difference was to change the word "option" to "alternative." What sounded easy was in fact very difficult. The SEIS team was operating on almost the same deadline as FEMAT for their report. The SEIS was to appear less than 2 weeks after completion of the FEMAT report. However, when the

FEMAT team asked for and was granted a 30-day extension to finish their report, the SEIS team was not included. For a week or more there was the problem that the SEIS was to be finished and printed before the FEMAT report was completed because of the court-ordered timeframe! This dilemma was finally overcome and the SEIS team was also granted a short time extension.

During this time, the SEIS team was "saddled" with many last-minute changes to the FEMAT report. While this may not seem important, if the FEMAT material changed, then the SEIS material would also need to be changed. Daily changes and the severe time deadline meant that the SEIS team could not wait until the final version was ready before their writing could begin. It was frustrating to say the least. The draft SEIS was taken to Washington for review in late June, with alternative (option) 9 identified as the preferred alternative on July 1st.

Eventually, the draft SEIS was published at the same time as the FEMAT report was issued, in the first week of July. With the time pressures, as well as printing pressures, agreements were made with the Government Printing Office to have a commercial printing operation standing by, ready to print the SEIS within days of receiving the camera- ready copy. The FEMAT report and maps were printed separately, but all were combined with the SEIS for mailing.

Social Section of the SEIS

As noted above, new information or completely rewritten material was not to be employed in the draft SEIS. This severely limited the team members in their writing of this National Environmental Policy Act (NEPA) document, since much of the FEMAT report was found to be more appropriate as background material rather than EIS material. In order to fit it into the NEPA format, all SEIS team members had to summarize the FEMAT material or refer the reader to the FEMAT report for a more comprehensive explanation. Hundreds of pages of highly scientific information were condensed from the FEMAT report so that the SEIS reader could more easily understand this technical information. The social section of the SEIS was a good example of this effort at condensation and elimination of technical material.

Just in terms of total number of pages, the draft SEIS social section (rural communities and Native American) was only eight pages in length. The social section of the FEMAT report (Chapter 7 and Appendix VII-A-C) was 252 pages. The SEIS social material was only 3 percent of the FEMAT social writeup. This immediately raises the question of whether or not the material that was condensed or left out was important for decisionmakers and the general public. In the mind of this writer: No.

As with almost every assessment or background report, there is a tremendous amount of useful material that if included in an EIS would prove overwhelming to both the decisionmaker and the public. NEPA does not require that every piece of knowledge be presented in the EIS, only that it be referenced and available upon request. Therefore a great deal of latitude is given to authors in how and when they present information. Since the SEIS was so closely tied to the FEMAT report, it was felt that it was not necessary to repeat word-for-word all the material and that the SEIS could refer to the FEMAT document or even sections and pages within it.

One of the major problems with the FEMAT, and thus the SEIS, was that individual rural communities were not identified by name or location. The data from the various social subteams was held as confidential by the FEMAT team (the legal counsel thought this was not legal, and it raised an ethical question for the researchers). The confidentiality was the result of agreements made with the community leaders at the time that they met in Portland. Several of the community experts were afraid of being truthful or even participating in the process if their communities or themselves were identified. A few thought that reprisals could occur against them if the general public found out that their community was rated low or, surprisingly, if rated high. Perceptions by the general public (as well as by banks and other lenders) about how "well" the community was doing or how it might fare under various options was critical to their long-term well-being. Thus FEMAT and the SEIS generalized the community data making it so that only overall trends for the three-state area could be seen rather than a community or even county-level analysis, which most readers were hoping for. In addition, since the community-specific data were not included (even withheld from the official record), there is no possible way to replicate the information or to see if the expected impacts on the communities actually occurred.

Several other problems were buried in both the FEMAT and SEIS reports. Unknown to almost everyone was the problem that not every community in the spotted owl region was evaluated. Communities in heavily urbanized counties were not evaluated. Thus communities in King and Pierce Counties in Washington, and Washington and Multnomah Counties in Oregon, for example, were excluded from the analysis. Also there were communities on which the two different panels of experts had such little knowledge of potential impacts that they were not included. In some cases, almost entire counties were thus excluded from the analysis. The two panels of community experts were not Federal employees, but were under "contract" to pay for their expenses. Some persons felt that this situation made the two panels only marginally legal or even illegal under the Federal Advisory Committee Act (FACA). This would lead to court action in the following months (*Journal of Forestry* 1994). The community evaluation process and product would lead to considerable criticism after publication of the draft SEIS in July 1993.

The SEIS team were returned to their regular work station after the draft was printed, with an understanding that they would be called back to write the final EIS after the response period ended sometime in September. The "off time" lasted only 2 weeks.

Transition to the Final SEIS

During the months that followed publication and distribution of the draft SEIS, there was a considerable amount of public involvement activity. Public hearings were held in all three States with few people agreeing with the draft SEIS, the preferred alternative, or even the FEMAT report on which the SEIS was based. Questions abounded from all sources, from Governors all the way down to timber workers. Especially strong in opposition were other experts who argued with practically every word in the scientific assessment process and in the conclusions (options and alternatives) which followed. The SEIS team called together a special subteam to handle the expected huge amount of public responses to the SEIS. We were not disappointed.

As with previous spotted owl reports and EIS's, the public was very interested in the whole process. Approximately 102,000 cards and letters were sent in response to the SEIS! Another 7,200 responses were received after the official response period ended. Ninety percent of the correspondence was form letters or modified form letters. These form letters came largely from the environmental community. Their criticisms of the SEIS were especially strident. Almost everything in the documents was an affirmation of their contentions and wishes that had existed for more than a decade. Interestingly, the timber industry, which is famous for inundating agencies with form letters about its position, did not use this avenue and instead wrote lengthy legal and expert "witness" letters pointing out the problems in the SEIS from their point of view. Letters from the affected communities and counties and Indian tribes were hard-hitting with their criticisms about the SEIS descriptions of expected impacts on jobs, the future of their rural communities, and subsistence salmon fishing, which has religious meaning.

The many stinging criticisms from across the board reinforced the highly politicized nature of the spotted owl issue. The social process was not immune to criticism, with academics (Gale 1994 and Lee 1994), American Indians (Strong 1994), and many others taking their turn at trying to push the process and decision in their favor or blast it as being unscientific and flawed. Indian tribes were especially concerned about their treaty rights and having a "government-to-government" relationship with the Federal agencies rather than being treated as just another special-interest group. This was fertile ground for legal interpretations, as the tribes had their understandings and the Federal agencies had theirs–and they often did not match.

With the final SEIS, latitude was given to the authors to include new material, if relevant, and to rewrite the earlier FEMAT and SEIS material to correct mistakes and make it easier to understand. An important controversy developed around the term "species viability." Some people read the phrase and believed that every species would eventually become extinct, when in fact the survival chance of most species was felt to be high if any alternative was implemented. After several heated discussions and debates among the biologists and lawyers, the term "species viability" was almost totally eliminated from the final SEIS in order to clarify the understanding and intent of the document. This revision would help in responding to criticisms from Indian tribes regarding salmon fishing and tribal rights.

Besides the usual public comments about tables or numbers that were impossible to locate, there were a substantial number of comments concerning the social section. One of these comments, heard over and over, was that the original FEMAT and the draft SEIS had no information about how communities and families would cope with changing conditions due to a lack of Federal timber. The FEMAT social team, apparently, did not include this type of data because none existed for the large multi-State area they were covering. In many cases, it was difficult to attribute a cause-and-effect relationship between a reduction in Federal timber and possible family and community problems at some time in the future (Clark and Stankey 1994). Since FEMAT did not have this information, then the draft SEIS did not as well.

After considerable discussion by SEIS team members, it was decided to include some limited amount of family and community problem information as background, but not as definite impacts. Thus a section was added entitled "People Coping with Change." This section basically followed the material that Robert G. Lee (the severest social critic) presented in a critique of the 1990 northern spotted owl management plan (Thomas and others 1990). In addition, the Native American section was expanded by several pages (and a map of treaty boundaries) to include a more comprehensive discussion of tribal rights and obligations of the Federal agencies to treat the tribes in a government-to-government way where they are full partners in planning and decisions. Overall, the social section of the final SEIS was expanded to 21 pages, almost a 150-percent increase over the draft SEIS.

The final SEIS was published in February of 1994. Since the final SEIS was signed by the departmental Secretaries, it was exempt from appeals of the decision. Thus, the final SEIS allowed public comment for a 1-month period before becoming final. The Record of Decision (ROD), was signed by the Secretaries of Agriculture and Interior on April 13th and combined with the main document already at the printer on the 15th. The ROD summarized the document;

adopted Alternative 9 of the final SEIS, with some modifications; provided standards and guidelines; and directed the agencies to implement the SEIS. The expected lawsuits were quick in coming, with U.S. District Judge William Dwyer ruling in December of 1994 that the SEIS was legal, thus allowing the agencies to implement the decision. Other suits are pending.

Aftermath of the SEIS for Social Assessments

Fortunately, the FEMAT process and ecosystem management in general recognize that there is a social (human dimension) component to both assessment and management. However, as it stands now, the FEMAT social section is dead. The problem of the FEMAT's social section irreproducibility has been a significant problem that is difficult to ignore. The highly subjective nature of the opinions given by the two expert panels, along with the secrecy of those deliberations and conclusions, make it impossible to duplicate the results except at the most general, multi-State level. It cannot be used by others who would like to use the FEMAT data to "tier" their own watershed assessments or EIS documents. After spending hundreds of thousands of dollars to call together experts from around the country, the data that were collected are practically worthless for future studies. As noted in the FEMAT report, this social assessment "is to facilitate a policy analysis and is not a research project (Thomas and Raphael 1993: VII-5)."

If a similar project is to be conducted in the future, caution should be taken with providing any binding agreements with local experts. Sufficient time should be taken to analyze all affected communities and monitor the results of any Federal actions. In addition, the social assessment should not be carried out in isolation from other disciplines. With the expanding idea of the human dimension of ecosystem management, the social/human dimension "arena" needs to be equal to the biological and physical factors of the ecosystem (Williams 1993). The social research/information needs to be gathered and analyzed with the other social sciences (including economics). In turn, these social scientists need to work closely with the biologists and ecologists, as well as more traditional foresters and engineers, when analyzing watersheds and designing future land disturbing projects (Williams 1994, Williams, [in preparation]).

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Problems and Unanswered Questions in Ecosystem Management: An Economic, Conflict Resolution, Wildlife/Human Interface, and Visitor Management Perspective

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Abstract

Questions about ecosystem management are raised from several social science perspectives. Economic questions include the appropriate social discount rate, the amount of reduced production and increased costs, who will bear these costs, and whether equal access is being substituted for welfare improvement as a social goal. Conflict is likely to arise because several groups are involved and because increased information sharing and participation are required. Collaboration, cooperation, and consultation may reduce this conflict. Conflicts in wildlife management center around differences in the meaning assigned to wildlife, for example, biocentric versus anthropomorphic views. Social psychology can help provide an understanding of social forces that shape these meanings, thereby providing a basis for addressing real or perceived tensions between conflicting views. Several visitor management questions are raised: who pays for visitor management in an ecosystem management world, will old management techniques work, and, if not, what new techniques are needed?

Introduction

The purpose of this panel discussion is to raise questions from several different social science perspectives rather than to suggest answers to problems. We believe this is appropriate because Ecosystem Management (EM) is still evolving as both a concept and a management technique. We hope this panel will provide a unique perspective because all of its members are trained in both forestry and one of the social sciences.

An Economic Perspective

Ecosystem Management is still emerging and so confusion and miscommunication can occur because practitioners and scientists may be talking about different things. This panel will use the following definition of EM in an attempt to avoid this pitfall: EM manages the forest as an ecosystem with maintenance of ecosystem processes and functions as its dominant objective. Goods and services for society are produced to the extent they are compatible with the dominant objective. This definition is based on the thoughts of many different authors but, perhaps, leans toward the Society of American Foresters (SAF) Task Force on Sustaining Long-term Forest Health and Productivity draft report. The literature also contains many extensions, or corollaries, which more fully define EM. Some of these corollaries follow more directly from the definition than others.

Corollaries Directly from the Definition

1. The EM management unit is landscape sized. The SAF Task Force suggests that the management unit may vary between 100,000 and 1,000,000 acres although most authors recognize the need to deal with multiple sizes, ranging from microsite to landscape. A landscape sized unit is necessary because ecosystems function over this large an area.

2. The EM planning horizon is extremely long, centuries versus rotations. A long planning horizon is needed because both positive and negative changes in ecosystems take this long to occur.

3. Biodiversity is fostered because biodiversity strengthens the ecosystem.

Corollaries Less Directly from the Definition

4. Management decisions must err on the side of caution in respect to the ecosystem. We lack full knowledge of how to manage the ecosystem; therefore, we should not take any action that has the potential to do harm until this knowledge is obtained.

5. Management decisions must preserve options for future generations because forest managers have a stewardship responsibility.

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6. EM "... will probably require a restructuring of how we make decisions and how incentives evolve to guide desired behaviors and choices ..." because "Ecosystem management entails human choices [and] ... choices respond to needs, desires, and incentives, ..." (Salwasser 1994).

7. "The full range of forest users must be encouraged to participate actively as equal partners in forest planning decisions" (Brooks and Grant 1992) because many people are affected by management decisions.

A Few Economic Issues

Corollary #2 raises the long-discussed economic issue of the correct social discount rate. The long time horizons in EM would, using standard economic analysis, preclude recognizing the benefits of EM because they occur so far in the future. A much lower social discount rate than is currently used would allow greater recognition of these benefits.

Corollaries # 4 and 5 both seem to imply that management practices must shift away from current practices of emphasizing goods and services production toward ecosystem maintenance. Reduced production will, to an unknown extent, cause (a) higher prices for goods and services currently consumed; and/or (b) substitution of other goods and services which are more costly and/or less desired; and/or (c) decreased employment in industries currently producing these goods and services. The issues then arises as to how much production should be foregone and who should bear the above costs of reduced production. Corollaries # 4 and 5 may also imply "gentler" but more costly management activities with attendant higher costs. The same issues again arise of how much more costly and who will bear the cost.

Another economic issue is that the United States uses the price system to make most of its allocative decisions, despite some serious shortcomings. Corollary # 6 calls for restructuring the way these allocative decisions are made, implying a movement away from the price system, but remains ambiguous concerning which group will decide what are "desired behaviors and choices." A movement away from the price system toward central planning is another economic issue.

Corollary # 7, an "equal partnership" or "one user, one vote" clause, raises a final economic issue. Some notion of improving or optimizing social welfare is a generally accepted economic objective. Equal partnership implies that all uses (or users) make an equal contribution toward social welfare, a proposition that would be highly coincidental if true. If the proposition is not true, then a social objective of equal access or use is being substituted for one of welfare improvement.

Most forest managers take little issue with the corollaries that flow from the definition because they are based on what is currently perceived as "biological truths." Issues are raised by those corollaries that flow less directly from the definition because they tend to be based on a social agenda or value judgements. I believe these issues will have to be addressed before EM can be implemented nationally.

A Conflict Management Perspective

The preceding issues are some of the many potential conflicts in EM. Two major topics will be discussed: (1) sources and characteristics in EM that contribute to conflict and (2) some ideas on working toward managing conflict.

Sources and Characteristics Contributing to Conflict

1. There are several groups involved, many of which may seek to dominate. Several concerned groups can be identified, e.g. scientists, managers, policy makers, and citizens or, alternatively, public agencies and private organizations. Each group will have a different value system and/or different stakes in the outcome of management decisions.

   Regardless of how the groups are divided, power differences, real or perceived, exist, thereby leading to an atmosphere of competition and rising conflict. This has been recognized by Daniels and others (1994) who stated: "Ecosystem management is a tremendous social challenge because implementing ecosystem management will test the ability of many groups to work together and deal with differing goals."

   A persistent and longstanding example of this conflict is interagency conflict. Grumbine (1994) explained "...[the] agency system has contributed to interagency competition through legal mandates, agency history, organizational structure and professional and personal norms." Such factors hinder cooperation across political boundaries. In addition, intra-agency competition occurs as splinter groups occur within agencies. Splinter groups can be identified within the USDA Forest Service (e.g. AFSEEE) and the USDI National Park Service.

   Competition and conflict between agencies will continue because most agency personnel have neither the aptitude nor the motivation to manage conflict and because agency structures tend to be inflexible (Daniels and others 1994). In addition, agency managers tend to avoid controversy and seek outward harmony to minimize problems at their level.

   Another probable point of conflict is that between and within non-agency organizations. Groups and individuals want their ideas/values/beliefs to dominate, and conflict arises as they compete with agencies and

each other for agency land and resources. Consolidation in groups is a danger because "group think" may lead to an incomplete survey of alternatives, inadequate searching, and selective biasing of information (Janis 1982).

2. Increased information sharing and participation required by EM contribute to escalating conflict. Information is power and sharing it requires reducing your own power base. Similarly, increased participation requires increased political access and a change in relationships, another potential for conflict.

   In short, EM requires changes in power and turf; modification of the political matrix; reconciliation of different area scales, timeframes, and vocabularies; and making environmental decisions under extreme uncertainty. Thus, conflict exists at different levels within and between both agencies and nongovernmental organizations and is an inherent but necessary part of EM itself.

Working Toward Conflict Management

A number of approaches to conflict management are available: We advocate the three C's: collaborate, cooperate, and consult. This advice is simple on the surface but complex in light of past interactions, legal mandates, and organizational structures.

1. Collaboration. Amy (1987) identifies three approaches to conflict resolution: management by experts; management by prescription, law, or litigation; and management by collaboration. The first approach has been followed historically in forest management and modified by the second approach in recent decades. The third approach is advocated for the future.

   But how can collaboration be implemented? A first step is open discussions which lead to a set of "operating rules." These discussions must be civil, respectful, and fair. Perhaps they can be based on mutual commitment to sustaining ecosystems and social welfare. A second step is to recreate a common ground, in this case it is EM. EM can be a superordinate goal that is compelling for each group but cannot be achieved by any one group alone. Superordinate goals can be the basis for conflict resolution (Sherif 1966).

2. Cooperation. Daniels and others (1994) suggest six reasons to collaborate. These six reasons are: (a) collaboration is less competitive and views multiple parties as contributors rather than competitors, (b) joint learning and fact finding are the base, (c) value differences are explored creating the potential for joint values to emerge, (d) the focus is on interests rather than positions, (e) responsibility for implementation is allocated across several parties, and (f) the process is ongoing.

   Cooperation can take many forms. Sharing regional data bases, such as in the Chicago Rivers project discussed earlier in the conference, is but one. Interagency committees that really interact and interagency cooperation in gathering public input are others.

3. Consultation. Consultation is an alternative if collaboration and cooperation are unsuccessful. Several methods of consultation are possible such as workshops and third-party intervention. Workshops focus on problem solving. These should include influential persons who affect but do not carry out policy and can be facilitated by trained social scientists. Workshops should review and define problems and attempt to (a) develop and debate a range of alternatives, (b) search for and evaluate solutions, and (c) weigh and choose alternatives.

   Third-party consultation is another method. Here, a third party serves as a noncoercive, nonevaluative facilitator moving the groups toward creative problem solving. The appropriate atmosphere can prepare the ground for consideration and meaningful bargaining, which some see as a necessity to move toward sustainable ecosystems.

Conclusions

Turbulence in human interactions is likely to be a permanent feature of any ecosystem managed for sustainability (Lee 1993). However, conflict can be an indispensable integrating mechanism if viewed positively and managed appropriately. The discussion and inclusion of differing views can lead to synthesis and a better, more creative solution. Productive management of conflict is possible through collaboration, cooperation, and acceptance of consultation. However, "... environmental negotiation should be approached carefully and skeptically ... only the intelligence and vigilance of the participants can insure it's a mutually beneficial process." (Amy 1987).

A Social Psychology/Wildlife Perspective

Social psychology has a strong role to play in the wildlife dimension of EM. The concepts underlying EM–the focus on systems, relationships, processes, and functions–is certainly the direction natural resource management should be heading. However, the label "ecosystem" is discomforting because, within the natural resource profession, it carries with it too narrow a connotation to adequately incorporate the most important contributions of social psychology. The problem is that we take the term to literally mean a nonhuman natural system. We need to

either broaden our understanding of the term or adopt some other label.

This suggestion may come as a surprise because we tend to see "ecosystem" as a broadening concept. The following two examples illustrate what we mean by a broader understanding of ecosystem. The first comes from a book by Conrad Waddington (1978:319-320):

> "The relevance of ecology to human[s] ... is not so much that it provides any basis for judgment, but that it shows the kind of thing the judgment has to be about, namely, a system of interacting activity -different aspects of human personality, interacting with one another and with natural and artificial surroundings ...."

The second example comes from an article in the Journal of Forestry in which Margaret Shannon (1992:24) states that:

> ".... many of our resource conflicts hold us captive because of our myopic focus on things [a log, a tree, a deer, scenic beauty] as if they were 'resources', ... [we need] to move our focus away from tangible 'things' that are part of the resource relationship and toward the resource relationship itself."

These two passages, at first reading, were intriguing, but also were somewhat vague, like a map without a compass. However, after struggling to grasp their meaning, we are beginning to see their direction. They seem to tap a concept that's also emerging in social psychology, one that makes a distinction between information-based perspectives on human nature and meaning-based perspectives. Put as simply as possible, information-based perspectives reflect the idea that meaning is largely a property of the object in question. As Shannon's statement suggests, under this perspective, animals are viewed as things, "real" physical entities with objective, tangible, and stable meaning. In contrast, meaning-based perspectives maintain that meaning does not exist in nature, it is socially constructed, it is subjective, and it is constantly evolving. That is, people endow wildlife with emotionally charged meanings that extend beyond simple objective or physical properties, they interact with these constructed meanings in ways that create highly individualized or culturally bound social realities, and they respond to natural resource controversies on the basis of these constructed realities (Palmer 1991). This is the "system of interacting activity" referred to in Waddington's definition and the "resource relationship" mentioned by Shannon.

How does this relate to wildlife resource management? We will illustrate this by looking at two different social constructions of wildlife. The first is the construction of wildlife most prevalent among natural resource professionals. Increasingly, as a profession we have come to define wildlife, not as classes of animals such as game species which are defined on the basis of their value to humans (i.e instrumental uses such as a source of food or recreation), but as components of a larger interdependent community. This socially constructed meaning leads very nicely to an ethical philosophy that our profession strongly believes should guide human actions toward wildlife and that has been put into words by Aldo Leopold (1966:262) in terms of a land ethic:

> "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

In contrast, a large and growing segment of the public doesn't share this biocentric meaning for wildlife at all. Instead of holding an ecosystem-based construction of meaning which reflects the concept of a community of interdependent, but faceless, members, a large segment of the public creates anthropomorphic constructions of wildlife. That is, they personify wildlife, and attribute human feelings and emotions to animals. This leads to an ethical system which focuses on the welfare of individuals rather than the welfare of communities. And this frightens us as a profession. In fact, we lament and complain about the inaccurate and emotion-filled appeals that animal rights and humane groups have successfully used to sway public opinion in ways we as a profession are not comfortable with.

As a profession though, we still seem to hold on to the outmoded belief that the public is susceptible to these sorts of appeals simply because they lack appropriate information and knowledge about ecosystems. While this may be one component of the issue, the flaw in adopting this as the sole response is our failure to recognize that what is at work here is not so much a sinister campaign of misinformation by extreme radicals operating on a gullible public, but a larger social process. We are entering a postmodern world. A social world in which we not only are increasingly removed from direct contact with wildlife but also are increasingly free to construct and act in accordance with personal, emotional, and symbolic interpretations of the world. A time when animals are being seen, kept, and valued less for their utilitarian functions in society and more for their emotional and symbolic value in our personal lives (Sutherland and Nash 1994).

We cannot adequately address and respond to these larger social issues simply through an information/education campaign. Instead we need to explore the process through which people construct meanings for wildlife. The construction of meaning is not something we can or should ever completely control. However, we can do a better job of understanding the social forces that shape and influence modern relationships to wildlife, particularly those forces that directly involve resource management agencies. For example, natural resource professionals are as "guilty" as

animal rights groups of personifying wildlife. We have Woodsy Owl, Smokey the Bear, and Ranger Rick to name a few. If we believe that ethical systems that reflect anthropomorphic constructions of wildlife are inappropriate then perhaps we need to reevaluate public relation campaigns that promote such meanings.

In conclusion, two major issues concerning social psychology and the wildlife dimension of ecosystem management are raised. The first draws on the ecosystem initiative's focus on systems, processes, and relationships. A parallel orientation is emerging in social psychology. This is represented by meaning-based approaches to studying human behavior. These perspectives look at the system of social forces that influence and shape modern relationships with wildlife. It is this dimension of social psychology that we can, and need to, integrate into the ecosystem initiative.

The second point goes back to the quote by Waddington– it's the suggestion that:

> "the relevance of ecology ... is not so much that it provides any basis for judgment, but that it shows the kind of thing that the judgment has to be about ...."

We need to clearly recognize that while the ethical philosophy represented by Leopold's land ethic fits well with the meaning of wildlife currently prevalent within the natural resource profession, it is, in the end, a moral position. To be successful in future resource conflicts, we need to learn how to deal with the perceived tension between this position and ethical philosophies that are based on the anthropomorphic constructions of wildlife found among a growing segment of the public.

A Recreation Visitor Management Perspective

Ecosystem management, viewed from the social dimension, raises some unanswered questions and potential problems in visitor management. The basic question arises: "How will EM affect recreation resource management of both visitor and resource oriented issues?" At least three subsidiary questions may be identified. Potential answers are beyond the scope of this paper.

1. Who pays for recreation visitor management in an EM world? The preceding definition seems to imply that functionality, sustainability, and landscape ecology will become the primary management objectives. These will replace the current commodity and multiple-use objectives which are obtained by manipulating the forest for these purposes. Will recreation visitor management benefit or lose from this reorientation?

   Two concerns are evident. First, management for timber has generated revenues which, through various avenues and in various degrees, are channeled back to the forest for recreation visitor management. The de-emphasis of timber and other commodity management is likely to reduce the revenue stream. What, then, will be the financial source for recreation management?

   The second concern is one of visibility. The multiple-use concept recognized recreation as a valid and important forest product, although financial support did not always follow in the wake of recognition. However, recognition did allow visibility and it would be unrealistic to believe that recognition did not contribute significantly to the general development of outdoor recreation. EM, with its decreased emphasis on commodities and use and increased emphasis on the ecosystem and its functioning, may reduce this visibility and hence the financial support of recreation visitor management.

2. Will the old ways work? Sophisticated and complex management practices were developed on a commodity approach to recreation management. Will they still be serviceable when a functional approach is taken toward management? For example, the Recreation Opportunity Spectrum (ROS) relies on inventories, classifications, and management perceptions. Inventories establish setting attributes which help define activities yielding specific visitor experiences. Process oriented management, as in EM, implies change over time and limits concerning acceptable change. Will management for ecosystem sustainability hasten the rate at which recreation impacts reach unacceptable limits? Does ROS as a planning system incorporate a functionalist approach to resource management?

3. Is a new way of recreation visitor management needed? If the answer to question #2 is "No," then do we need a new concept of recreation visitor management that is based on a functional approach? Does sustainability mean we must move from a concept of "setting" or "place," e.g. where you recreate, to a concept of "niche," e.g. how you recreate? Must we switch to a perspective of the functionality of recreation systems and how they relate to the large domain of forest ecosystems?

In conclusion, a switch to an EM approach raises several basic questions for recreation visitor management. First, what is the function of recreation within EM? Second, what is the process by which recreation occurs in the forest ecosystem? And, third, how does recreation fit into the sustainability concepts of EM?

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Deep Meaning, Sense of Place, Spatial Scale and Environmental Modeling

The SOS–A Spiritual Opportunity Spectrum: Theory and Implications of Spirit of Place for Ecosystem Management

Lori Crystal and Chuck Harris

Abstract

A new direction for relating geographic location to cultural place and appreciating its role in physical, mental, and spiritual health is central to the human dimension of ecosystems. Ecosystem Management promotes holistic management as a link between social phenomena and geographic space processes for sustaining both natural and social systems. Consequently, it is important to include information about people's attachment to place as a necessary component to understanding the spiritual and therapeutic values associated with natural environments. The proposed Spiritual Opportunity Spectrum offers a systematic assessment and classification strategy for delineating the spiritual value of landscapes, structures, and other features along a spectrum of opportunities for actual and potential spiritual experiences and expressions.

Introduction

Ecosystem Management is the latest response of the U.S.D.A. Forest Service to recent criticisms of its traditional management of the Nation's forests. This management direction, initiated in 1990 with the agency's New Perspectives program and advanced by its Forest Ecosystem Management Assessment process, represents a new approach to land stewardship. It advocates "the use of an ecological approach that blends social, physical, economic, and biological needs and values to assure productive, healthy ecosystems" (Salwasser 1990). Its goal is to maintain biodiversity as well as support joint resource production, recreation opportunities, and rural economies where possible, rather than to concentrate on production of single-value commodities.

The program departs from the agency's past emphasis on commodity extraction, monetary values of resources, and quantitative, linear-programming approaches to management planning that are abstract and nonspatial; a major concern for land management planning has been its lack of geographic specificity and its dependence on reductionist, commodity-based and economically driven models like FORPLAN. Ecosystem Management promotes a more holistic management process for sustaining both natural and social systems, where a key element of the process is greater attention to the role of location–of the meanings and values of particular places as significant factors reflecting the human dimensions of ecosystems and serving to link social phenomena with geographic space. In her focus on these human dimensions, Carr (1994) notes the importance of examining indirect and direct linkages among different human, natural, and physical systems, and she expresses the concern that one deficiency of past approaches has been the failure to tie resource management plans to particular places.

Importantly, it would appear that a central element of ecosystem management is a growing appreciation of the deeper intangible and spiritual values of forests and the importance of considering them in management and planning. Early on in the initiation of the New Perspectives program, its director, Hal Salwasser (1990), emphasized that the wealth of forests "can be measured in economic, ecological, and spiritual terms." Likewise, a 1990 National Research Council report urged increased support for forestry research so that society can "secure the environmental, economic, and spiritual benefits of forests." Most recently, the Chief of the Forest Service, Jack Ward Thomas (speech, 11/93), spoke of the need to consider people in assessing forest ecosystems, saying that the "spiritual and aesthetic values of people also need to be respected, not just the ecosystem alone."

Deeper Human Values and Nature

The concept of "spiritual values" has many nuances of meaning that refer to a complex range of phenomena that need not be restricted to traditional religious terms. For example, these values encompass the psychologically deep human values that simply reflect the ways and extent to which people are attached to natural environments; Tuan (1974, 1976) was among the first social scientists to refer to people's tendency to develop attachments to particular geographic settings as a "sense of place," or "place attachment" (Steele 1981). In the context of psychological research on recreation behavior, Jacob and Schreyer (1980) developed a theory of recreation conflict that suggested the importance of resource-specificity–that is, place dependence–in relation to specific kinds of resources or

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settings for enjoying a leisure pursuit; and Williams, Haggard and Schreyer (1989) have stressed the role of recreation, including recreation settings, in defining one's personal identity. In a similar vein, McIntyre and Pigram (1992) have noted the importance of place for managing recreationists:

> A combination of high centrality, familiarity, and experience [of place] creates a clientele that is critical of management intervention when it interferes with practices that are central to the focus of recreational involvement.

These deep psychological and intangible values represent two basic dimensions of human experience: the processes inherent in human responses to natural areas and objects, and the meanings humans attach to those places and things as a result of their responses. The kinds of deep psychological values involved here include the strong, deep-rooted intellectual and emotional ties people have to particular places (a childhood fishing spot, a favorite ORV area, etc.) and early American landscapes (e.g., Western ranches, Midwestern farms, Eastern fishing villages, etc.). In the case of some places, personal meanings charting one's personal history and developing identity, as reflected in part through lifestyle choices, are paramount. Other landscapes are experienced as culturally based environments defined symbolically by society and reflecting a unique sense of place for certain kinds of natural areas, such as is the case for "wilderness areas;" for these places, more generalized attachments reflect cultural and social meanings as much as, or more than, personal ones.

These values also are ones that make manifest people's most profound, affective psychological and physiological responses to natural settings. These thoughts and feelings are the ones perhaps most commonly associated with spirituality, such as awe, inspiration, reverence, humility, and mystery. In a modification of Schroeder's (1991) definition, "spirituality" denotes the experience of "being related to or in touch with an 'other' that transcends one's individual sense of self and gives meaning to one's life" at the deepest level of the human psyche. Thus, the human values of natural areas can also include the sense of timelessness and feelings of community and connectedness to other people as well as to places and things in nature (e.g., landforms, natural features, other living things). Ultimately, all these values are known or intuited through contemplation, so the call to introspection and reflection on personal meanings elicited by these experiences is also central to them.

"Spirit of place" is the term we use to describe a person's total visceral experience of a place, where "experience" encompasses the sum total of all human responses (physiological, psychological and spiritual) to that place; this term specifically refers to the interaction of human consciousness and the unconsciousness in the further development and on-going recreation of the human spirit.

Davis (1993) conceives of the human spirit as a wide range of experiences and values that include both quantitative and qualitative psychological dimensions of self-transcendence, meaning, spirituality, and one's relationship to the sacred. Spiritual experiences include a variety of diverse cognitions (i.e., both thoughts and feelings) that range from relief and renewal, peace and contentment, a sense of oneness, coherence, appreciation and "specialness," to apprehensions of wonder, rapture, awe and mystical enchantment. According to Stark and Washburn (1977), the perception of the miraculous is the subjective essence of self-realization: it is the root of people's best qualities, finest virtues, and richest experiences, and numerous authors have suggested its importance for self-realization. Spiritual values connote the importance we place on these kinds of perceptions and experiences, and on the things, persons, and places that help create these perceptions and experiences.

Spiritual experience is not necessarily synonymous with religious experience: when people typically think of "religion," the concept they are focusing on is one of a "tradition of group worship" for the members of a faith community "as they apprehend themselves to stand in relation to whatever they consider divine". According to Jung (1960), the "other" that people encounter in spiritual experiences is reflected in instinctive patterns or "archetypes" that guide and give meaning to our interactions with other people and the world. The perception of nature as the "embodiment of perfect balance, beauty, symmetry, and wholeness" (Schroeder 1991, Jung 1960, 1964) is the archetype of the "Self" projected onto natural landscapes: the "Self" of this projection represents movement toward wholeness and a balancing of the different sides of the psyche into a unique, integrated personality, where the holism of balance is the ultimate goal of the individuation process.

The Experience of Nature Through Recreation

A key means for spiritual expressions and experiences is through recreation engagements. The original sense of the word "recreation" refers to the "re-creation" of the human body, mind and spirit through leisure activities. As many outdoor enthusiasts can attest, natural environments are a primary setting for spiritual experiences. Although McDonald and Schreyer (1991) suggest that it is in the "wilderness experience" that "the combination of extreme states of consciousness and spiritual endeavor related to leisure" can be optimized, this "re-creation of the human spirit" is also frequently realized in a wide array of outdoor settings. Psychological associations such as "increased sensory awareness," "shifts in perception," and the "oceanic experience" (Freud), "peak experiences" (Maslow), "archetypal experiences" (Jung), "soul experiences" (Hillman), "transcendent experiences" (Transpersonal psychologists), and "expansion of self" (Greenway 1993)

refer to the full array of spiritual phenomena that bonds all of humankind, no matter where experienced.

Shepard (1967) alludes to these values in terms of the classic Gothic cathedral, which provides a model for representing the "splendor of ontological perfection of the cosmos" [and a] divination of the Creator." It epitomizes the "spectrum of spiritual expressions" that can be conceptualized as spanning an assortment of settings, from culturally based, human-built representations of sacred space (church, temple and synagogue) to nature-based, archetypical sites of momentous spiritual experiences (wilderness, mountain peak and desert), with many variations between. These variations range from the human-built, structurally based opportunities at the developed, urban end of the spectrum (such as the classical Roman Catholic cathedral in the midst of a major city, like St. Patrick's in downtown New York City) to human structures in roaded-natural areas (such as the chapel located in the middle of Rocky Mountain National Park), and they range from human-made culturally based natural areas like Central Park in Manhattan and Oriental rock gardens in Vancouver, BC) to predominantly undeveloped natural areas at the pristine end of the spectrum (such as a wilderness area where the sole sign of humans are its trails).

Shepard (1967), in fact, anticipated this spectrum with his conception of:

> [The] temple and mountain [as] the sacred centers for communication of the core of belief. Here the society enfolds and orients the individual with ceremonies incorporating motion, sound, smell, space [where] silence and emptiness convey divine immanence by their lack of prosaic forms...

In contrast:

> [T]he desert is the environment of revelation, genetically and physiologically alien, sensorially austere, aesthetically abstract, historically inimical...

Scientific Inclusion of Spiritual Experiences in Resource Management

If "Ecosystem Management" refers to the complexities of interrelationships within and amongst natural and social ecological systems, and if people and their behavioral responses to their environment are a part of ecosystems, then the intricacies of human experiences should also be conceived as an important component of the ecosystems in which they live:

> The true wonder of the world is available everywhere, in the minutest parts of our bodies, in the vast expanses of the cosmos, and in the intimate interconnectedness of these and all things...We are part of a finely balanced ecosystem in which inter-dependency goes hand-in-hand with individuation (Schroeder 1993).

Schroeder adds that,

> Certain environments seem to provide "critical habitat" for sustaining certain kinds of experiences [and] like many plant and animal species, fragile experiences that depend on solitude, silence, and beauty are increasingly threatened by expanding development, resource utilization, and crowding (1993).

All these "fragile experiences," which have been referred to by Chenoweth as becoming "endangered experiences" (Schroeder 1993), should not be ignored in or excluded as having little value for resource management decisionmaking. Maslow (1970) advocates blending "good science" with what he terms "re-sacralization" to promote a "sense of the sacred" in everyday life. Because spiritual phenomena are extremely subjective and emanate from the intuitive side of the psyche, quantitative data analysis alone cannot capture the full array of their personal significance. A methodologically integrated human science approach can aid the study of the "deeper psychological essence" of human-nature relationships that is timely and relevant to the development of a new land management ethic (Davis 1993). As Schroeder has observed,

> The present crisis in forest management may in part be due to a failure by the forestry profession to understand and respect the strong spiritual values that many people find associated with natural environments (1991).

Qualities that make particular places unique may be lost or destroyed if people who use the area, especially those who intimately associate a "kinship" with unique settings (Mitchell and others 1991), are not involved in the planning process. The reactions of people who are attached to a "special place" may be particularly sensitive barometers of changes that will eventually affect many users (Mitchell and others 1991, Schreyer and Knopf 1984). Transactive and participative planning approaches that emphasize the need for dialog between planners and citizens throughout the planning process (Friedmann 1973, 1987) can help ensure that the deeper values associated with people's felt perceptions of "spirit of place" (Mitchell and others 1991) are incorporated into public management. As Appleyard (1979) has stated,

> Expression of personal or group identity can be achieved through the connotative character of an environment. This is perhaps the most intangible and forgotten quality of environmental action, but it is most significant, for it affects the visceral quality, the feel of a place.

The Role of Intangible Experiences in Land Management Planning for Leisure and Recreation

According to Driver and Tocher (1970), recreation is a type of human experience that is based on intrinsically rewarding voluntary engagements during non-obligated time. Recreation is characterized by the kinds of outcomes that are realized, and that set of salient outcomes is the recreation experience (Brown 1983). Specific experiences, such as spiritual affiliation, individuation, and a sense of personal identity with a particular place or setting, can be important aspects of the totality of one's recreation experience. Spiritual experiences are generally considered extreme states of consciousness that are interpreted through the values and context of the individual and can be perhaps ascribed to certain leisure experiences and settings. For Maslow (1970, 1968), these experiences are the equivalent of his "peak" experiences; through these experiences, a person can achieve a state of "self-actualization," or a sense of personal fulfillment perceived as a maximum level of human performance (McDonald and Schreyer 1991). Csikszentmihalyi (1975) refers to this experience as a "narrowing of consciousness," or a "giving up of the past and the future," wherein the person becomes egoless, the sense of self is lost through the experience of "flow" (the self is challenged but not stressed by the level of skill required by the performance of an activity), resulting in complete concentration on and involvement in the experience, whereby action and awareness are merged. Flow promotes the "perception of the miraculous that is the subjective essence of self-realization (Stark and Washburn 1977), from which man's highest features and experiences grow," and it is the principal concept underlying one's ability to fully appreciate "living in the moment" and the process of self-discovery (Peck 1978).

Among American Indian cultures, for example, spirituality has long been an integral aspect of "the People's" daily interactions with the functions of life. A striking example is the Chippewa Nation's perspective as recently presented in a draft Memorandum of Understanding (MOU) circulated in the USDA Forest Service; it provides a dramatically different view of national forests than that of traditional Western cultures, illustrating the need to assess the importance the environment plays in affording spiritual experiences across different cultures and environments:

> The forest and waters that make up the Chequamegon National Forest have met the spiritual and physical needs of the Potawatomi, Cree, Winnebego, Dakota (Sioux), and now the Anishinabe (Chippewa or Ojibwe) people for thousands of years... The original people believe all life is related and the woods are filled with consciousness, [where] the earth provided growth and healing, water possessed purity and renewal, and the wind carried music and the breath of life... (Bilyeu 1993).

Eco-psychologists assert that the isolation of people from the natural world in Western technological cultures has created both an ecological and a psychological crisis; these psychologists are chiefly concerned with the healing of the split between the human spirit and the natural world (e.g., Segal 1993). Shepard (1967) argues that our increasing objectification of nature may be a liability of civilization that has progressed with every technological development since the invention of agriculture. He posits that this objectification represents a psychic trauma that has distorted the more balanced relationship between human beings and their natural habitat that he suggests existed in pre-civilized times.

Shepard (1967) also has noted the cultural aspects of spiritual experiences, underscoring their connection with leisure and suggesting that, through spontaneous, playful contemplation, a person can take advantage of the human capacity for being open, responsive, and able to "listen to the essence of things" and recognize the "mysteriousness of the universe."

It is through play that children seek "to make a world in which to find a place to discover a self" (Bettelheim 1987). It is also through this self-discovery process that they often designate a segregated, special place (i.e., often referred to as "base") that is considered a safe place–one similar to the spiritual sanctity associated by adults with the sacredness of place for ritual, homage, and creative contemplation, whether the place is a cathedral, rock garden, mountain shrine, or wilderness. Shepard suggests that,

> The special places of childhood are not [necessarily] sacred but the memory of them is necessary for attaching sacredness to place. The sacred place is associated with events important to the mythos - to legend and the ritual of the people; it consecrates and makes cosmic the territory, which then becomes the center of the world. The building of habitations ritually recreates the growth of the individual, and the temple recreates the universe as a microcosm (1967).

Spiritual experiences in natural settings also provide important opportunities for psychological rehabilitation through personal and cultural growth and healing. Those settings are ones in which people can cultivate a sense of wellness and mental health through the sense of belonging and connection with a larger reality that helps give meaning, purpose and direction to their lives (Schroeder 1992, 1990). For example, physiological measurements of heart rate, blood pressure, and brain waves have shown that relaxation and stress reduction occur when people are viewing natural landscapes (Ulrich 1981), and even brief exposures to natural settings, such as visits to city parks

(Hull 1992), can elicit positive feelings and promote stress-reduction and psychological restoration.

Other studies have found that natural settings and scenic views can be beneficial in health care, reducing the recovery time for surgery patients and individuals with other illnesses and enhancing their healing. Much of the research on the perceived therapeutic benefits of leisure has relied on questionnaires and self-report methods to evaluate the relative importance of leisure activities in particular settings. This research documents that recreation is important not only for growth and development but also restoration through stress mediation (Ulrich and Simons 1986, Ulrich, Dimberg, and Driver 1990). Significantly, one study concluded that "spiritual wellness" is highly correlated to people's levels of leisure satisfaction and aesthetic enjoyment (Ragheb 1989).

Changes in patterns of participation in outdoor recreation environments often can have significant impacts on user satisfaction and change the kinds of recreation opportunities available. Changes are constantly occurring in recreation settings, both "accidentally" (that is, due to managers' failures to take definitive actions that have clearly articulated goals) and because of purposeful decisions whose intent is to give people particular kinds of opportunities. Given these changes, it is critical that resource-management agencies also address the "deeper values" associated with natural environments when they manage for a variety of recreation opportunities, values that include spiritual experiences.

Recreation opportunities have been defined as "options to engage in a specific activity at a specific setting to realize desired experiences" (Driver and others 1987). Studies show that people's preferences for recreational settings are diverse, from sites that are primitive and lack any evidence of human activity to sites that are intensively developed (Manning 1986, Clark and Stankey 1979). By providing an array of diverse opportunities, land managers can ensure that people can find opportunities consistent with their desires and preferences (Clark and Stankey 1979).

The Recreation Opportunity Spectrum (ROS) offers one framework for analyzing these relationships and interactions to increase the effectiveness of management actions (see figure 1, USDA Forest Service 1988). The basic assumption underlying the ROS is that quality in outdoor recreation is best assured through provision of a diverse set of opportunities. A wide range of preferences for recreational opportunities exists among the public and, as Wagar (1966) points out, "quality seems to be a highly personalized matter." The ROS helps clarify the quality issue by providing a framework that calls for the systematic provision of diverse settings for recreation experiences and expressions (Clark and Stankey 1979).

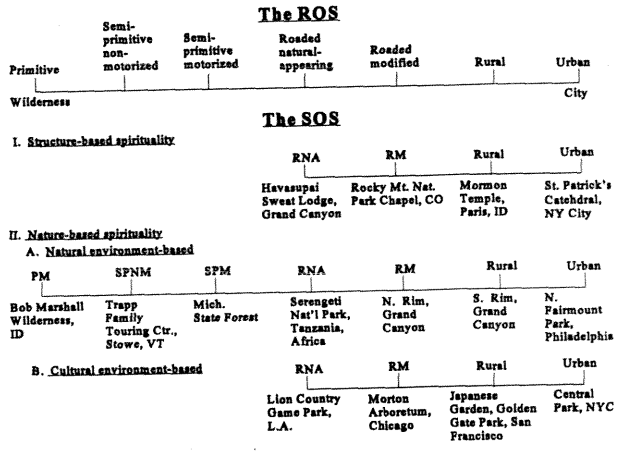

Figure 1–The ROS and SOS Compatibility.

Clark and Stankey (1979) define the recreation setting as the "combination of physical, biological, social, and managerial conditions that give value to a place." A "setting" opportunity includes features provided by nature (vegetation, landscape, topography, scenery), qualities associated with recreational use (levels and types of use), and conditions provided by management (developments, roads, regulations). The ROS can serve as a zoning strategy for delineating certain areas based on a continuum of recreation opportunities characterized by varying amounts of naturalness, solitude and management intervention. It classifies recreation opportunities with a spectrum that includes primitive (PM), semi-primitive non- motorized (SPNM), semi-primitive motorized (SPM), roaded natural-appearing (RNA), rural (R) and urban (U) zones in which different recreation experiences can be realized.

In addition to studies on recreation choice processes that have helped develop classification systems like the ROS (Clark and Stankey 1979, Driver and others 1987, Manfredo and others 1983), much of the research examining how people respond to different types of outdoor environments has focused on statistical modeling to predict landscape quality (Brown and Daniel 1984). Both areas of research focus on functional and visual considerations and describe places in terms of location and appearance (Fishwick and Vining 1992).

In contrast, Relph (1976) argues persuasively that a place is not just "the where of something"; rather, place should be understood and studied as "a meaningful phenomenon." Fishwick and Vining (1992) revealed in their phenomenological analysis of human-environment interactions that the meanings and values associated with preferred recreation sites are apprehended through a combination of setting, landscape, ritual, routine, people, and personal experiences that occur in the context of other places. Incorporating the concepts of setting dependence with sense-of-place could strengthen the ROS framework:

the more a person relies on the setting as a part of his or her experience, the greater the correlation between psychological outcomes and setting attributes (Clark and Stankey 1979, Driver and others 1987, Finley 1990).

Defining Opportunity Factors for the SOS: A Preliminary Proposal

Accordingly, we have proposed the development and implementation of a Spirituality Opportunity Spectrum (SOS) as both a public inventory and communication tool. The SOS can assist in explicitly delineating the spiritual value of landscapes, structures and other features along a spectrum of opportunities for potential spiritual experience and expression. The SOS will also be explored as a method for implementing a human science approach to theory development in which scientists and spiritual seekers collaborate to better understand all the dimensions of resource use in which scientists and spiritual seekers collaborate (Davis 1993). Its goal is to further enhance and expand different individuals' sense of personal identity by means of personal transformations that occur through their experiences in special places.

The purpose of our current research is to further develop a new and broadened conceptual framework for resource management and recreation behavior that extends and complements current theory underlying the ROS. As part of this expanded theory, we would tentatively suggest some ways to conceptualize and operationalize a variety of factors for characterizing how different settings and structures facilitate one's spiritual affiliation with the land. These factors, which are described below, will be further refined with future exploratory research.

The SOS is compatible with the existing Recreation Opportunity Spectrum (ROS) model as implemented by the USDA National Forest Service (at least partially) in its recreation management and planning systems. As figure 1 suggests, the SOS model parallels the spectrum of the ROS, whereby the feelings and meanings associated with spiritual experiences can be realized in a range of settings, from the pristine or "primitive" end to the developed or "urban" end of the spectrum. Two major dimensions of these experiences and the settings associated with them are the extent to which they are dependent on (1) the natural environment (that is, natural parks, forests, wildlands, etc.; we call this type of experience "Nature-Based Spirituality") or (2) human-built environments (that is, human structures like chapels, churches, synagogues, etc.; we call this type of experience "Structure-Based Spirituality").

Structure-based spirituality can be most readily conceptualized as being afforded by settings at the more developed, modified end of the spectrum, as in the case of a cathedral in a major urban area. However, it can also be experienced in the midst of natural areas, as in the case of a small chapel located along a roadside in an otherwise undeveloped area of a national park–thus the extension of the spectrum for "structure-based spirituality" in figure 1 from the developed end of the ROS to the point on the spectrum termed "roaded natural." The locus of the experience, wherever the opportunity is provided, is in a structure created by humans as a sacred space.

Nature-based spirituality refers to spiritual experiences that occur in special places that are natural settings characterized by a strong sense of place and spiritual experiences that are dependent on the qualities and features of nature (i.e., national parks, Chinese rock gardens, city arboretums, undeveloped city parks, etc.). These experiences can be had in both what we have termed "natural-environment based" and "cultural-environment based" settings. The first type of setting is, as the name suggests, based on natural environments, and it spans the entire ROS, from pristine to developed settings–from the most remote wilderness areas in northern Alaska to those urban parks that have been preserved in their natural state in the midst of major cities (like Washington, DC's Rock Creek Park or the northern section of Philadelphia's Fairmount Park).

The second type of setting encompasses nature-based environments that are cultural in terms of being designed, planted, arranged and otherwise developed by people. This type of setting, which spans the ROS from roaded natural to developed settings, could include Oriental rock gardens like those in the middle of Vancouver, BC, or San Francisco's Golden Gate Park, arboretums like the Morton Arboretum in Chicago, or the predominately man-made and planted landscapes of Fredrick Law Olmsted's urban parks such as New York City's Central Park. The common feature of these diverse settings is that they provide opportunities for spiritual experiences (albeit, a highly diverse variety), and their consideration could be a key component in a Benefits-Based Management (BBM) approach for managing recreation resources (and spiritual resources) like those administered by the USDA Forest Service (see, for example, USDA Forest Service 1988).

Four criteria provide a basis for defining the factors of SOS and promoting this management approach. These criteria are that each of the factors should be: 1) empirical and measurable; 2) affected by management actions; 3) related to visitor perceptions and experiences; and 4) represented by a range of perceptions, influences, features, or conditions.

Based on these criteria, we have identified a number of major factors defining SOS: access, other types of land uses, onsite management, visitor impacts, site uniqueness, the cultural and personal symbols associated with natural areas and the meanings assigned to them. Each of these factors influence the opportunities available for spiritual experience in different ways, resulting in varied but genuinely meaningful experiences in the outdoors.

Access

Access is a key factor for recreation opportunities; the type of access to a site or area has a strong influence on use patterns. "Travel corridors" are defined, established travel routes (roads, trails and waterways) where access is ensured. Where travel corridors are nonexistent, physical-biological conditions (such as steep slopes, dense vegetation, and bodies of water) can be critical determinants of access (Clark 1989). Although most access in forested areas is provided by roads constructed for timber harvesting, the type of access (i.e., modified, unmodified) and ease of access (i.e., paved, two-track, unroaded, etc.), and also the amount of use (i.e., heavy traffic, occasional use, infrequent use, etc.), can dramatically affect the ways people travel to an area and their experiences of a certain place of significance. Additionally, the kind of access into a particular area can obviously have a significant influence on the numbers and kinds of people who use it.

In cases where people are seeking an experience of inner peace–perhaps that mystical oneness with the land that can be an outcome of the American Indian's "vision quest" or the white American's "wilderness experience"–they typically will want privacy and a solitude undisturbed by visitor traffic (qualities best obtained from places that have little or difficult access). In contrast, some people enjoy meeting others to feel that special feeling of "being a part of a whole." At the urban, developed end of the spectrum, persons going to a structural-based temple (their church in town) would be accustomed to and expect frequent social contact with others; these frequent encounters would not detract from their spiritual experience like they might for the person going to a "nature-based temple" (like a mountain peak) who desires privacy and solitude to realize a spiritual experience.

Other Types Of Land Uses

A variety of activities are associated with traditional extractive and commercial uses of wildlands (e.g., logging, mining, grazing, outfitting and guiding, etc.) that may or may not be considered compatible with certain spiritual opportunities. An area whose historical uses have included grazing or horse-packing, for example, can foster an appreciation of past ties to the land through the customs and cultures of past settlers.

Depending on the type and extent of the impacts of these uses and the forest visitor's background, they can significantly influence one's spiritual affiliation with a place. For example, timber management can affect spiritual opportunities in a variety of positive and negative ways and at different stages of operation (Clark 1989). The residual roads, logged acreage, and slash left after logging is completed can pose either barriers or opportunities for recreationists. Roads can provide access to an area that was once inaccessible, and this access can be a key influence as discussed above.

The scale and nature of the impacts of land uses may be influential as well. The richness of an experience can be diminished by seeing or even just hearing about impacts of large-scale logging that involves significant acreage or the use of clearcutting in an area of personal significance. Undoubtedly, it is the cumulative effects of the aesthetic impact of clearcutting and its symbolic meaning (the loss of pristine forest) that has such a negative emotional and spiritual impact on people.

Whether an area is managed for "motorized" or "non-motorized" use also influences the kinds of activities that are permitted in an area and thus the experiences had there and the amount of satisfaction a person derives from the experience desired. Differences in the kinds of recreation activities that have people pursue and their influence on the type of experiences other recreationists can be important influences on one's response to a place and the experiences it affords. Jacob and Schreyer's (1980) work on recreation conflicts, particularly in terms of mode of experience, activity style, resource specificity, and lifestyle, provides a good basis for understanding the nature of these influences.

On-site Management

The amount and type of modification of a site, as well as the extent to which its modification is apparent, can affect a person's potential spiritual connection with a place. For example, people who prefer natural features to get away from others and discover new things on their own differ from those who prefer developed areas for convenience, safety, comfort, and social opportunities (Fishwick and Vining 1992), and these differences may be associated with personality types. Likewise, some types of people may prefer the comfort and ease of well-developed travel corridors as compared to other types who prefer to follow their own paths and explore and discover for themselves.

People also can be affected by the amount and type of interpretation offered in an area. Pollock (1989) devised a framework describing appropriate levels of interpretive services for each of the six ROS classes, which range from primitive, unmodified natural environments to substantially altered unnatural environments. Because solitude, closeness to nature, and self-reliance prevail in a primitive setting, he suggests that self-discovery should be dominant there with no interpretive material evident, as compared to a highly modified, urbanized setting with large numbers of diversified users, an intense level of user interaction, and varied opportunities for interpretation.

Similarly, other forms of an on-site management presence, like signs posting regulations or the actual presence of a ranger enforcing those regulations, can promote or constrain a person's experience with a place and attachment to it.

Visitor Impacts

The type, degree, and prevalence of visitor impacts also influence people's association with wildlands and their experiences with them. If an area is used extensively by many people who disregard the land and other people by degrading it, other visitors may also disassociate themselves from the area and do the same. In contrast, users in an area that is used by few people may be more likely to feel a special stewardship and personal alliance to the land, and they may be more likely to "walk softly upon the land."

Related management issues, such as crowding and displacement, also need to be addressed, especially when they involve people who identify with a place because of their past visits to it. For example, Albrecht's (1992) study of the perceptions, expectations, and satisfaction levels of visitors to Grand Canyon National Park reported that "those who had previously visited the park were more likely to be crowded than first-time visitors." In assessing a person's perceived satisfaction levels with crowding, the meanings and values associated with preferred recreation sites may be heavily influenced by a number of characteristics, including the person's gender, age, and ethnic background, as well as a variety of experiential factors such as their past experience with a place (Dustin and McAvoy 1982, Fishwick and Vining 1992, Jacob and Schreyer 1980), their sense of ownership of that place, the degree of their specialization in a recreation activity, and the importance of that activity to them.

All of the factors described thus far have an overall effect on whether or not people can achieve a spiritual affection with "self and other" in developing a special alliance with the land. Ultimately, the crucial aspect of these factors is their influence on a settings capacity for promoting peoples physical, mental, and spiritual health. Also, all of the factors described above are likely to increase in degree and intensity as one moves from the primitive to the developed end of the ROS. For the remaining factors, differences across the spectrum are not so much quantitative as qualitative.

Site Uniqueness

Feelings of awe and magnificence are often associated with areas that have unique, distinctive features and scenic beauty. Visitors to extraordinary places like the Grand Canyon potentially can gain a new and different perspective from which to view the world and, subsequently, their presence, role and significance in it. In particular, national parks with varied, remarkable and incomparable geological features like geysers and hot springs (e.g., Yellowstone) or canyons and waterfalls (e.g., Grand Canyon) are often preserved for their grandeur and revered as "holy ground" by many people who feel a close alliance to the "sacredness" of the "other" (e.g., "Nature" or "the Universe") that is so apparent in these areas. Places that are distinctive often evoke strong positive emotions that promote place attachment and meaning (Green 1993).

Garling (and others 1986) suggests that easily remembered environments have three central characteristics: differentiation, degree of visual access, and complexity of spatial layout. Corresponding with information on public sensitivity and inherent visual quality of the land, the Visual Management System (VMS) was developed by the USDA Forest Service in 1973. The system categorizes landscapes based on similarity in land form types and diversity of various landscape features. Although the purpose of this landscape inventory is to determine visual quality, it also could be modified to provide a useful tool for assessing "distinctive zone classifications" (Green 1993) that identify characteristics for distinguishing spiritual opportunities in natural environments.

As the remaining factors discussed below suggest, the significance that people assign to a place, whether through novelty or familiarity, whether individually or socially, or whether personally or culturally, will be a major influence on the degree to which people with the environments value a place as being irreplaceable and invaluable for spiritual expression and psychological restoration.

Personal Symbolism

Personal investment through the interactions of one's self, as a distinct "personal" identity, with the natural environment, as represented by particular settings, also can create special places. Places become special not only because of their unique features but also because of the unique experiences that are evoked for individuals from their interactions with natural environments. A personal mythology in which place is a critical element evolves through the individual's personal development, wherein certain places become key symbols of particular realizations and transformations that become the mortar holding together the blocks (the happenings, events, and experiences) of that development.

By recognizing the importance of idiosyncratic, spiritual experiences in the establishment of place meaning and significance, public land managers can gain a better understanding and appreciation of the importance of public participation in the establishment of sacred spaces in the landscape. For some people, Schroeder (1991) notes,

> "ancient forests and wilderness are genuinely sacred places, even though they are not associated with any officially recognized religion [whereby], a threat to the existence of wild nature is a threat to the central spiritual value of many people's lives."

Cultural Symbolism

When personal experiences, symbols and meanings are shared by a group and become part of its collective tradition, they can create an array of cultural symbols and meanings that transcend the personal in time and significance. McDonald and Schreyer (1991) point out that human constructions, such as the Sistine chapel, may be a significant place of worship for some, while natural places, such as the Grand Canyon, may catalyze new symbolism and meanings for the spiritual experiences of others. The immensity, diversity, topographic variation, naturalness, and overwhelming grandeur of America's vast natural landscape are values of extreme sensitivity and importance to this Nation, reflecting the emergence of a unique national identity (McCool and Benson 1990).

Implications

From the perspective presented here, amenity resources are conceived as providing a larger, greater good than simply as making places available where people can "play" and "have fun"; these resources are special places having important spiritual values that may be as much work-related as recreational in nature. They can be unique and sometimes irreplaceable resources that connect individuals not only to the natural environment, but also to other people, to the past, and to the traditions of their culture. They are places people care deeply about and from which they derive special meanings in their lives. As such, they are important places for health and healing, that afford important therapeutic benefits. This broader understanding of amenity resources is critical; as Williams (and others 1992) note, "the place perspective reminds managers of what the commodity approach can only hint at: Why people care so passionately about the management of a particular resource." These feelings and attitudes are a key component of people's social well-being that should be more systematically and effectively considered in resource decisionmaking.

The SOS will help provide a systematic, effective assessment of feelings and values. As a classification and zoning strategy for delineating certain areas or landscapes of special concern or meaning at a local, regional and national level (based on a continuum of meanings and attributes), it will explicitly delineate the spiritual value of landscapes, structures and other features along a spectrum of opportunities for actual and potential spiritual experiences and expressions. Research on the SOS also could assist in further developing a theory of personal identity and the expansion of identity through one's association with the land and special places (as with lifestyle choices and recreation specialization). A human science approach that is methodologically integrative could aid the study of the "deeper psychological essence" of human-nature relationships; this study is timely and relevant to recent efforts to operationalize the re-emerging and still-evolving land management ethic.

Perhaps most important, then, is the significance of the SOS for clarifying people's values and feelings, thereby promoting an appreciation of what people of all lifestyles and walks of life share and hold in common. Rather than being divisive, the understanding of deeper human values of resources can help clarify why conflicts over them and their uses are often so intensely emotional and personal, and a clearer understanding of the source of the fiercely held beliefs and feelings of one's fellows can help underscore and mobilize forces that bring people together as well as drive them apart.

Needed Research

Although a person's or group's visceral response to and identification with a place might be difficult to reveal and study, a systematic analysis of people's verbal and written expressions using qualitative research methods is needed to examine the ways in which people's experiences in natural environments evoke a spiritual quality, as well as their perceptions of the influences of both setting and experience on their overall sense of being. Several research objectives and questions can be formulated concerning people's spiritual affiliation with the land, as well as about developing a systematic approach for including people's deeper values in resource management planning based on the SOS.

Future research primarily needs to explore answers to basic questions like the following: How do outdoor environments enhance people's spiritual experiences (i.e., psychologically deep, intensely personal and meaningful experiences) and promote holistic growth? What are appropriate research designs for learning about these phenomena and methods for incorporating them into the ecosystem management framework?

More specific questions could include:

1. Are certain kinds of spiritual experiences associated with particular physical settings in the natural environment?

2. What influences do people perceive outdoor settings have on their overall sense of Being?

3. How do these experiences influence people's lives? To what extent do they have a central, uplifting, therapeutic role in people's lives? Do particular kinds of outdoor environments promote people's spiritual growth and personal development?

4. What qualitative methods might be most appropriate and effective for studying these phenomena?

5. How can resource management agencies operationalize an approach to incorporate the deeper values people assign to natural areas for more effective and efficient decisionmaking, planning and policy for ecosystem management?

Answers to these questions are needed if resource managers are to develop a broader theoretical framework and expand their methods for incorporating data on recreation and other amenity uses of natural areas for more effective, socially sensitive and politically responsive systems for resource inventory and ecosystem management planning.

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Operationalizing Place Attachment: Mapping and Planning for Place Values on National Forests

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Abstract

The place attachment planning and mapping process identifies the spatial intersection of place and resource values, encourages the sharing of stakeholder interests, and provides accurate, accessible information about the consequent social and biological tradeoffs. By identifying the spatial intersection of place and resource values and by providing accurate, accessible information about the consequent social and biological tradeoffs, mapping place attachments incorporates social data into biophysical analyses, helps resource managers evaluate different plans, and includes the public in forest management. The guiding precepts of ecosystem management direct the USDA Forest Service to integrate social and biophysical data. One social variable that is readily added to the Geographic Information System (GIS) and can be useful to forest planners is place attachment. By combining place attachment with hydrology, soils, and similar data, the Forest Service can socialize decisionmaking by basing decisions on prevailing social values for the environment. By identifying and mapping place attachment in national forests, planners can incorporate such data into the dominant ecological framework. Ultimately, in addition to translating and giving form to technical information, the forest planner should develop and test socially acceptable plans, provide the public with opportunities for input, and produce a socially responsible solution to forest planning conflicts. In this paper, we present a survey-based framework that can be used in GIS to achieve these goals.

Introduction

Last September, I attended a National Collaborative Planning Workshop sponsored by the Cooperative Forestry staff of the USDA Forest Service (Forest Service). At the conference, the Acting Director of Cooperative Forestry explained that the National Forest System needed a practical and useful way to measure a "sense of place" which could be included in ongoing planning and management. Place attachment or sense of place describes the affective affinity, connection, or regard people have for a place, area, or locality (Bachelard 1964, Tuan 1974 ,Relph 1976, Altman and Lowe 1992). Because the Forest Service has become more amenable to the sense of place or place attachment concept, a number of theoretical papers have been written on its usefulness in forest management (Shroeder 1992, Williams and others 1992, Mitchell and others 1993, Brandenburg and Carroll 1994). While these authors write about the importance of the place perspective, few have operationalized the concept for use in Forest Service planning efforts.

As I listened to the call for an operational strategy, I recalled the article "Sacred structure of small towns" (Hester 1990). Using a small fishing village (Manteo, NC) as an example, Hester describes how residents dealt with the proposal to use tourism as an economic recovery strategy. Avoiding a top-down approach to development and decisionmaking, community leaders involved residents before development plans were made. Residents identified those special places that could not be changed if they were to remain happy with their community after development. Using this bottom-up approach to planning succeeded in creating a touristic fishing village consistent with the residents' values, stakes, and interests.

In the past, the Forest Service has been criticized for using a top-down planning approach (Wondolleck 1988, Sample 1993, Sirmon and others 1993, Daniels and others 1994). This traditional approach seeks to rationalize the planning process by (1) analyzing the existing situation, (2) determining what changes would be in the best interest of the public, (3) setting objectives, (4) designing a range of alternatives, (5) comparing and evaluating alternatives, (6) developing a plan based on the optimal alternative, and (7) presenting the plan to the public and elected officials. In the traditional Forest Service planning model, planners define problems, set objectives, and determine best interest, and the optimal alternative. Only toward the end is the public involved. Sirmon and others (1993) call this the hierarchical leadership model.

The hierarchical approach provides little opportunity to discuss disagreements about best interests. This limitation is significant because conflicting interests not addressed upfront ultimately derail the planning process. The bottom-up planning approach outlined in this paper addresses conflicting interests upfront so that conflicting interests can be identified and brought to the table before plans are made. Once interest-based positions are understood, the planner can develop plan alternatives that allow for mutual gain or mutual compromise among competing parties. Operationalizing place attachment helps planners incorporate conflict resolution principles into the planning process.

My co-authors and I discussed the possibility of adapting the sacred-structure process to national forest planning. Based on previous work (Hester 1984, 1990; McNally 1987, 1989; Community Development by Design 1990), we felt that developing a survey-based system that can be used

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in GIS to identify and to map place attachment was a useful and achievable goal. By identifying shared values for highly regarded locations, this system could meet the planning needs of the Forest Service. By understanding the relationships between place values and other values, this system could enable planners to minimize conflicts by balancing social, economic, and ecological goals. Our system is in the developmental stage and we are reviewing and refining survey instruments. This paper outlines the proposed process.

Operationalizing Place Attachment

The Four Steps

The discussion of each step outlines the process and identifies what the planner should gain, what roles community members might play, and what techniques might be useful. In step one, the planner surveys user groups and communities. The survey is used to identify special places and develop reliable data on the proportion of people who highly value those locations. In step two, data analysis describes attributes of attachment to special places. This information is digitized in a GIS special-places overlay and presented to the public. Using this visual aid, people can become familiar with the pattern of place attachments and see the multiple uses and values associated with forest management. Allowing the public to comment on this information increases their stake and their commitment to the planning process. In step three, the planner evaluates the conflicts arising from incompatibilities between resource management plans and the publics' attachment to places and develops a range of alternative plans that minimize the conflict and maximize mutual gain between conflicting interests. Plan alternatives are presented in step four. Residents and user groups provide input into the most desirable tradeoffs. Conflict resolution principles are suggested as a basis for resolving enduring planning conflicts.

Step One: Surveying–The planner will need (1) a map of the area under study, (2) an appropriate sample of the communities and/or user groups, and (3) a means of collecting data.

The map should cover the entire planning area. Every forest area should be labeled by all formal and colloquial place names used by the interviewees. Standard Forest Service scoping procedures (U.S. Department of Agriculture Forest Service, 1979) should be used to identify the colloquial site names if necessary.

To systematically define place attachments, the survey must be administered to a representative sample. First, the planner must decide which populations play an important role in the planning unit. Relevant classes of population for the forest manager may include (1) local community members, (2) user groups, and/or (3) interest groups or communities of interest. The planner must develop a collection sampling frame. Developing a sampling frame is a highly technical matter; therefore, planners should contract a statistician to design a sampling frame that represents the groups included in the study.

If scientific accuracy is important, a scientific survey sampling method must be used. If accuracy is not important, convenience sampling provides some additional information. However, planners should understand the tradeoffs of a convenience sample. Convenience surveys do not provide a known probability of error on the representativeness of the study results. Two methods of convenience sampling are: newspaper surveys and handout surveys. The newspaper survey reaches a general audience and opens planning to the public at large. Submit the newspaper survey and map to local papers. Include an address and forest contact person. Establish a drop-off point in town. For specific communities of interest and recreation user groups, the planner may want to hand out surveys at group meetings and ask members to participate in the study.

Planner gain(s):

- data on highly valued places, i.e., special sites;
- data on the kinds of public attachments to special sites;
- colloquial place names.

User role(s):

- to provide first-hand insights into place attachments to forest sites.

Useful technique(s):

- scientific sample (mail or telephone survey method);
- convenience sample.

Step Two: Developing and Analyzing Attribute Files, and Mapping Place Attachment–The first data product the survey provides is a list of sites valued by the population(s) sampled (the percentage of people who reported the site as one of their two most special sites). Based on this information, the planner decides which forest sites to include in a special places overlay. The second product is attribute data for each site. The attribute file contains a descriptive profile of use and nonuse values for each site. In a GIS, the planner files this site attribute information in a relational database tied to the special places overlay. Because this information is linked directly to a site marker, the planner can "click-on" the site marker and review the attribute profile. This profile contains specific data that enables planners to generate and evaluate the effects of management on the special sites.

The attribute data elements describe:

- activities at the site,
- reason(s) for going to the site,
- substitutability of the site,
- perceived unpleasant aspects or activities onsite,
- perceived past threats,
- perceived future threats,
- desired improvements to the site,
- appropriate and inappropriate management activities, practices, and goals for the sites.

Analysis results are used to map the sites identified as most special and the GIS database is used to store attribute data. The map and attached information should be published and circulated among residents and user groups to increase their stake and commitment to the planning process. Contact local newspapers and ask them to assist. First, send the results to the newspapers or hold a press conference to provide residents and planners with information and give residents a means to evaluate plans later in the process. Residents can compare the survey results to plans to see if their attachment to place has been maintained. Second, announce a public hearing where people can share their feelings about issues revealed in the place-mapping process.

Planner gain(s):

- practical data that can be used to generate socially acceptable plan alternatives,
- maps of sites and attachment attributes,
- greater sensitivity to the users,
- an increased sensitivity to the subtleties of the forest.

User role(s):

- to check the overlay and survey results for accuracy.

Useful technique(s):

- newspapers, press conferences, standard public input programs.

Step Three: Developing a Spectrum of Plans–By digitizing place attachment, the human dimensions can be evaluated along with the traditional biophysical data. The place attachment overlay can be compared to overlays of hydrology, soils, threatened and endangered plant and animal habitat; wilderness, roadless, timber production; and other areas. Trends in compatibility and conflict among resource and social data can be evaluated and addressed. Next, the planner compares public place attachments to resource and ecosystem management plans to determine the compatibility between attachment to place and biophysical resource plans.

At a minimum, the Forest Service directs forests to develop the following alternatives for the draft forest plan (36 Code of Federal Regulations (CFR) 219.12 (f)):

1. an alternative that represents the current program (no action);

2. an alternative that emphasizes market opportunities;

3. an alternative that emphasizes nonmarket opportunities;

4. an alternative that emphasizes meeting the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) program outputs assigned by the regional guide;[1]

5. other alternatives necessary to respond to the full range of public issues, management concerns, and resource use and development opportunities; and

6. a preferred agency alternative.[2]

Within this framework, we suggest developing alternatives that maximize the integrity of place values given the constraints imposed by each alternative. For example, if market opportunities are maximized in alternative 2, how can negative impacts to the place values be minimized? In the process of maximizing the integrity of place values, the planner will find areas of conflict between the ecological, economic, and social dimensions of resource management. Once the planner determines the trends in compatibility and conflict, he or she must identify patterns of mutual gain and compromise to include in the plan which will minimize resident and user dissatisfaction.

Just as the forest plan process requires the estimated environmental and economic effects of alternatives, planners should calculate and communicate the costs and benefits of alternatives in terms of impacts on place values.

Planner gain(s):

- an understanding of relationships between management activities and valued sites,
- a narrowing of acceptable alternatives and good ideas about how to solve forest problems,
- insights into how activities or sites might be arranged to solve specific problems,

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[1] The RPA projects long-term resource supply and demand from which short-term actions may be planned.

[2] The alternative which the agency believes will best fulfill its statutory mission and responsibilities, giving consideration to environmental, social, economic, and other factors and disclosed in an environmental impact statement (FSH 1909.15.0).

- an awareness of how conflicting patterns can inspire a better plan,
- specific ways that sites can contribute to solutions,
- trade-off estimates of each plan,
- a spectrum of detailed plans.

User role(s):

- to deal openly in a cooperative spirit with planners to determine if important, detailed social patterns have been unacceptably compromised;
- to correct mistakes;
- to redirect the planner if incompatible values or interpretations of patterns are exposed.

Useful technique(s):

- ID team planning retreat,
- open public meetings.

Step Four: Introducing the Forest to its Communities– At this point, the planner has a unique perspective on the forest, its users, and potential conflicts. The planner should understand the prominent planning conflicts and the positions of competing interest groups, and be able to articulate these conflicts, who has them and why. When shared with residents and user groups, this information serves to introduce the forest to its users, making people aware of their forest and its multiple uses.

The planner should meet with the public to obtain a shared understanding of the specific alternatives and implications of each:

- In the open meeting, be careful not to advocate a given plan but fairly communicate the tradeoffs of each.
- In situations of known conflicted interests between specific user groups, set up meetings with affected groups and get the conflicting interests to explore what they have in common and in conflict.
- Take the role of the facilitator.
- Foster an environment of openness, responsibility, and ownership on the part of competing communities.
- Identify instances of mutual gain or compromise.
- Facilitate an agreement based on patterns of mutual gain or compromise.

Newspaper stories and public meetings can also be used to introduce the forest to the community. These forums give planners an opportunity to present the alternatives, receive people's response to tradeoffs, and work toward areas of mutual gain or compromise. A map of relevant overlays should be presented and discussed. A computer-generated GIS slide show is very helpful. The public meetings show users that their participation is important and encourage residents to participate in future planning activities.

Planner gain(s):

- a well-informed evaluation of the plans by residents,
- informed consent about one plan or well-educated splinter groups,
- resident agreement with the plan and tradeoffs if possible.

User role(s):

- to evaluate the costs and benefits of the alternative plans,
- to publicly discuss the tradeoffs,
- to participate in uncovering the conflicts,
- to help decide the course of future conflict-resolution activities if needed.

Useful technique(s):

- public forum(s),
- press release(s).

Conclusion

Identifying places on national forest lands that are valued by user groups or nearby communities is one important aspect of the human dimension of ecosystem management. One essential class of such places holds high levels of symbolic, even sacred, meaning for the user group or community. While managing for place values has not been a traditional focus of multiple-use management (Williams and others 1992), the guiding precepts of ecosystem management direct the Forest Service to integrate social and biophysical data. Our survey-based system for identifying and mapping place attachments (1) demonstrates how to incorporate social data into primarily biophysical GIS data bases, (2) facilitates planner and public evaluation of forest management alternatives, and (3) helps planners incorporate conflict resolution approaches in planning. The planner determines the trends in compatibility and conflict between place values and the biophysical resource management plans and manages lands in ecologically and socially acceptable ways.

This survey-based system has not been implemented in a forest context but has been successfully used in a community development context. Please contact the Outdoor Recreation and Wilderness Assessment Unit for estimates on assistance and implementation of the study for your forest: C.Overdevest:S29L01A, Outdoor Recreation and Wilderness Assessment Unit, USDA Forest Service, Southern Research Station, 320 Green St., Athens, GA 30602-2044.

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Protecting The New Jersey Pine Barrens: From Whom And For Whom?

Marla Emery

Abstract

In 1978, 1.1 million acres of southern New Jersey were designated the United States' first National Reserve, a land management strategy ostensibly designed to accommodate existing populations and activities while preserving wilderness ecosystems. The legislation establishing this control divided the Pine Barrens into preservation and development areas, reflecting concepts of society-nature relations that define "natural" landscapes and human labor as fundamentally incompatible. While scientists and environmentalists largely ignored or denied the role of local livelihood practices in shaping the ecosystem, local relations of production and regional politics influenced the choice of human activities that would be permitted within the Reserve. This braid of forces inevitably led to the undermining of Piney livelihoods and culture and possibly to long-term ecosystem change.

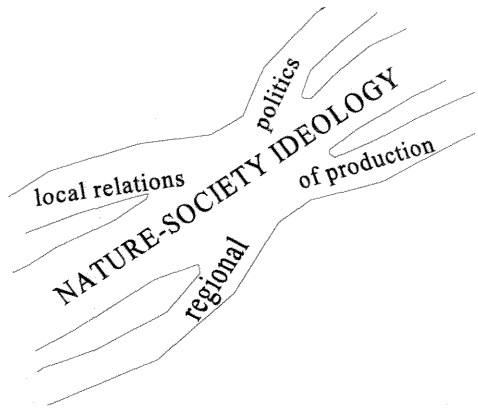

Figure 1–A preservation politics braid.

Introduction–Paradox and the Political Braid

In 1978, 1.1 million acres of southern New Jersey were designated the United States' first National Reserve. This new land management strategy was ostensibly designed to accommodate existing human activities in the area while excluding development and urbanization. In practice, however, Reserve regulations have prohibited many of the traditional livelihood practices of the local poor and middle class. They have simultaneously allowed large-scale berry farming, timber harvesting, and extractive mining to continue while development intensified around the Reserve perimeter. The apparently paradoxical nature of this result can be seen as a case study of what West calls "domination through power-sharing or formal cooptation," whereby a natural resource bureaucracy shares formal control and responsibility with local power structures (1994).

The paper examines the politics and social impact of the land management strategy devised to protect the New Jersey Pine Barrens. Its implications extend far beyond New Jersey, however. Concern about the effects of global environmental change on forest ecosystems has led environmental scientists to call for the creation of extensive reserve systems (Davis 1992). The Pine Barrens example serves as a cautionary tale about the potential effects of even socially enlightened preservation schemes. It also suggests that in some instances humans are vital ecosystem components and their removal from the landscape can lead to loss of valued ecosystem characteristics.

I propose the image of a braided stream as a structural device for the analysis (fig. 1). The main channel is an ideology of nature-society relations that is cut deeply into Western thinking. Twisting about this center are local relations of production and regional politics. Viewed as a whole, these three strands offer some explanation of the apparently paradoxical results of Pine Barrens protection efforts.

Some situating and defining are required to place the analysis in perspective.

What's in a Name?

In assuming control of the Pine Barrens, the State changed the area's official name to "Pinelands." Although I found no explicit discussion of this name change, a National Park Service report says,

> "A viewer can appreciate that the region's name is a misnomer, for the land is anything but barren... The term barren originated with the early farmers of the region who could not grow their usual crops in the sandy soil (1978)."

Thus, the change may have been intended to counteract what natural scientists considered to be a mistaken historical notion about the area–a notion that stood in stark contrast to their contentions of exceptional biological diversity and richness. Another justification may have been the desire to distinguish it from other pine barrens ecosystems such as the one on nearby Long Island. Whatever the reasons, the effort was unsuccessful. "Pine Barrens" is still the common

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appellation, even among scientists who conduct research in the area. In this paper, I refer to the place as the "Pine Barrens," reserving "Pinelands" for the names of official organizations and legislation.

The Pineys

A second definitional task is the identification and description of the local population, referred to as the Pineys. Some sense of this term is critical since it is the local residents, the people who were deeply rooted in the land by culture and livelihood strategies, who were ultimately locked out. One researcher reported that the definition of "Piney" proved elusive during 3 years of field work but she concluded that "Pineyness" was based on geographical location at various stages in life, with birthplace being of greatest significance followed by ancestry, age, occupation, economic status, and family ties. At its most basic, she contends, it boils down to an affective sense of "being" in the pines (Rubinstein 1983). This definition is perhaps vague but it does help parse out people whose families have been in the area for generations, some of whom are anxious to get away from what they consider a backwards area and others who want to preserve a direct connection to the land as a central part of their lives. It likewise can accommodate relative newcomers who want that direct connection and distinguish them from people who have come because it was a relatively inexpensive, safe place to live in proximity to Atlantic City or along the Boston-Washington corridor.

Humans as Ecosystem Components

The New Jersey Pine Barrens are located halfway between New York City and Washington D.C. and just over 30 miles east of Philadelphia. They are an anomaly in the midst of the mid-Atlantic's most densely populated area. Within the legal boundaries are 1.1 million acres of forests, wetlands, and undeveloped coastline. Topographic relief is low; soils have high sand and gravel content, are generally acidic, and the water table is high (Governor's Pinelands Review Committee 1979).

Because of their "droughty" acidic soil, the Pine Barrens were spared the early fate of most eastern forests–permanent clearing for agriculture. People have, however, been modifying the Pine Barrens ecosystem for thousands of years (Wacker 1979). Native Americans conducted fire drives to flush deer for hunts, increase visibility, and make foot travel easier. European settlers also burned the Pine Barrens, often accidentally but also intentionally. They used regular small fires to open up grazing areas and improve the yield and quality of wild blueberries. Charcoal production was a local occupation into the mid-20th century.

In the 19th century, unintentional fires were often set by sparks from trains and local ironworks, glass manufacturers, and paper mills. The cumulative effect of this burning was to perpetuate the pine-dominated ecosystem in a region that would otherwise be dominated by oak.

The Pine Barrens have also experienced extensive lumbering since the 18th century. Intensive cutting of pine, Atlantic white cedar, and oak lead to a reduction in the average size of Pine Barrens trees as well as periodic concern about the eradication of white cedar (Lathrop 1994).

Pine Barrens water courses have also been altered by humans. In the 18th century, rivers and streams were dammed to provide power for local mills. More extensive damming occurred in the mid-19th Century when commercial cranberry cultivation began. These activities produced bogs and standing bodies of water where they had not previously existed.

While the physical and biological characteristics provided the parameters for the Pine Barrens' ecosystem, humans clearly played a major role in creating the landscape that the Pinelands National Reserve was designed to protect. Were it not for a small population that had lived off the land, the Pine Barrens would not have looked as they did.

The Reserve Strategy

In the late 1970's, as housing and industrial development seemed poised to invade the Pine Barrens, New Jersey environmentalists asked the U.S. National Park Service to consider preserving the Pine Barrens and recommend a strategy for doing so. A 1978 Park Service report declared the area to be environmentally unique and well worth saving. It also recognized that there was a local population and culture imbedded in the land and recommended the creation of an entirely new Park Service category–Reserve–specifically to accommodate the existing human presence–the Pineys–in the landscape.

The Reserve scheme proposed to accomplish this by dividing the Pine Barrens into Preservation and Protection Areas (fig. 2) with development areas designated outside the Reserve perimeter. Within Preservation Areas, ecosystem values would be paramount and only those human activities that did not endanger ecosystem values would be permitted. Within the Protection Areas, human use values and ecosystem values would be balanced. And therein lay the roots of paradox–someone would have to decide which human activities were compatible with the goal of preserving which ecosystem values. Those someones were the members of the Governor's Pinelands Review Committee, many of whom were large landowners or municipal officials in the area. Others represented the State of New Jersey and north Jersey environmental interests (Collins 1988).

In practice, the Reserve strategy did NOT accommodate the existing human presence–the Pineys–because of the way the "compatible" human activities and ecosystem values were

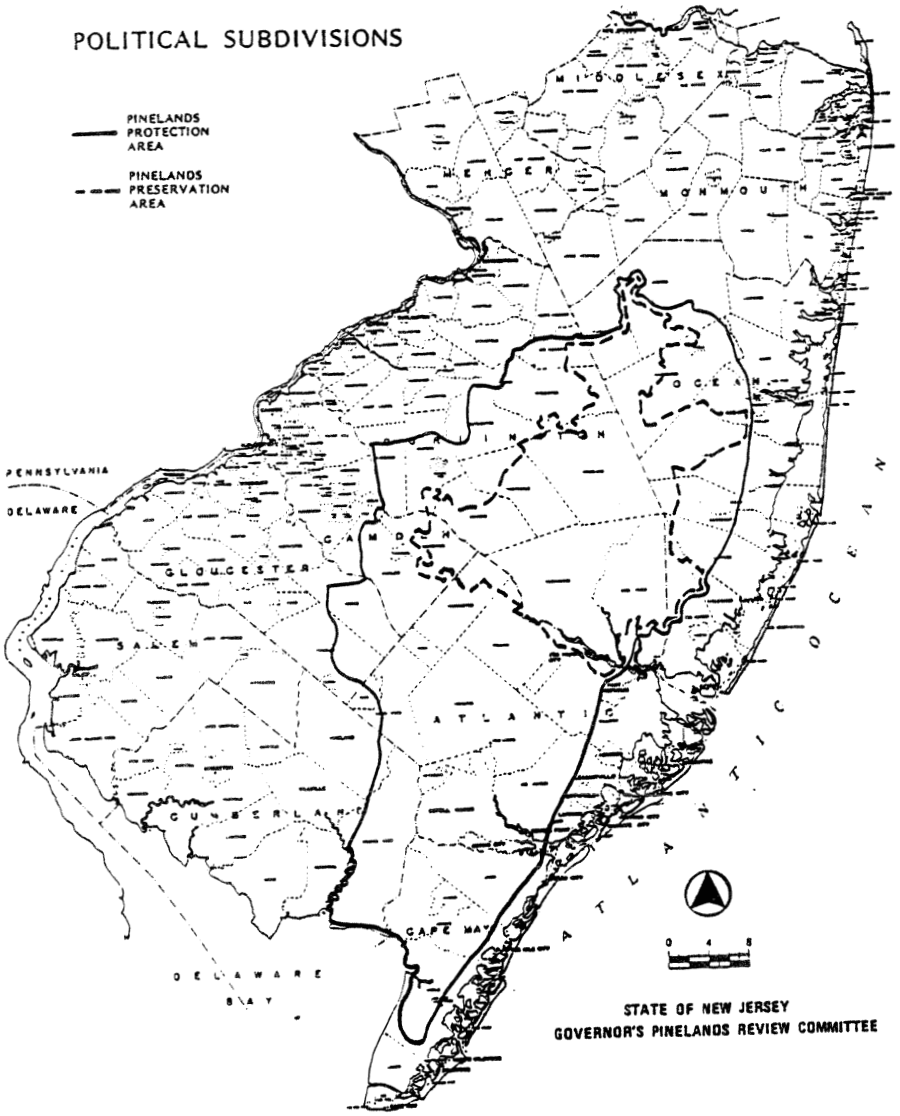

Figure 2–Political subdivisions of the New Jersey Pinelands Reserve (from Governor's Pinelands Review Committee).

defined. The braid of nature-society ideology, local relations of production, and regional politics explain why Pineys were locked out by a land management scheme that was ostensibly designed to preserve their place in the ecosystem.

Nature-Society Ideology

While much has been written about nature-society/nature-culture relations, Roderick Neumann's study of the creation of Serengeti National Park in Tanzania (1994) is particularly helpful in illuminating the paradox of Pine Barrens preservation. Neumann theorizes that,

> "Intrinsic to elite European ideologies of society-nature relations was a way of seeing the land which split the world spatially into two spheres–land that was for practical (productive) observations and practices and land that was for aesthetic (consumptive) observations and practices. An important aesthetic feature of landscapes of consumption... is the absence of any evidence of human labor."

Thus, although scientists had acknowledged the historic role of humans in the formation of the ecosystem, they engaged in very strained rhetoric to "remove" them from the landscape as in this quotation from two consecutive paragraphs written by a botanist:

> "Human activities in the past and in the present are mirrored in today's Pine Barrens ecosystems...None of the characteristics appears dependent on human disturbance; all developed and are maintained by natural causes" (Forman 1979).

Local Relations of Production

In fact, not all human activities were deemed to be incompatible with ecosystem preservation. Those that were excluded and those that stayed correspond precisely with the results that would be expected from a cooperative domination regime (West 1994). Hunting, fishing, trapping, and gathering–traditionally part of the diverse livelihood strategies of the poor and middle class–were banned from Preservation Areas. On the other hand, berry farming was deemed to be not only "compatible" but actually defined as a part of the "natural" environment. It is perhaps not a coincidence that cranberry and blueberry farmers were the largest private land owners in the area. As the single largest landowner, the State of New Jersey derived substantial revenue from its Pine Barrens timber harvest (Zampella 1988). Not surprisingly, the committee tasked with identifying compatible land uses said "There is no doubt that lumbering can be compatible with the preservation and protection of the Pinelands." (Governor's Pinelands Review Committee 1979).

That same committee also declared that "it may be possible through careful planning and regulation...to permit the operation of extractive industries in spite of their apparent degree of incompatibility" (ibid.). With these words the committee declared that open-pit sand and gravel mining could stay on in the Pine Barrens.

Regional Politics

New Jersey has a definite North and a definite South. The North has old agricultural money and new industrial money. It has that elite educational jewel Princeton University and the less glamorous but still formidable Rutgers University. Northern voters have historically tended to elect Democrats and emphasize State-level control. South Jersey, on the other hand, was left with very little capital by the demise of 19th century industry. It has no major universities and tends to elect Republicans who work to protect traditional "home rule" by municipal government (Russell 1988).

Thus, it is not surprising that Pine Barrens preservation efforts were spearheaded by North Jerseyans. They called on Princeton scholars to provide the rhetoric of Pine Barrens preservation and Rutgers scientists to produce the "hard" evidence. They also activated their ties to state and national environmental organizations. South Jersey simply did not have comparable mouthpieces or political connections. The disparities in political clout were so conspicuous that local residents suspected that Northerners wanted to turn the Pine Barrens into a playground and municipal officials sometimes complained that "the Princeton mafia" wanted to take over (Rubinstein 1983).

Conclusion–Dual Irony

An examination of the surrounding ecoregion makes it clear that human beings have played a crucial role in making the Pine Barrens what they are–a predominantly pine forest in the midst of the Eastern Broadleaf Forest Province (Bailey and others 1994). The regular burning conducted by humans in the area has perpetuated a "pineland" that would otherwise be "oaklands." Satellite photographs taken during the last decade show, in fact, that oaks are beginning to crowd out pines in key locations within the Reserve (Luque 1994). Thus, the exclusion of traditional Piney activities may actually lead to loss of pine-covered land.

The Piney presence has been more immediately altered. It would be neither fair nor accurate to imply that the architects of Pine Barrens preservation set out to obliterate Piney culture. In fact, it would be false to imply that it has disappeared. As recently as October 1993 the New York Times ran an article on the persistence of Piney culture in spite of both development and land use regulation (Romano 1993). But regulations do make it harder for residents to carry on traditional activities and endanger both their livelihoods and their culture. Whether intentional or not, this undermining of Piney culture was the inevitable product of the prevailing nature-society ideology, local relations of production, and regional politics.

The Reserve scheme was intended to protect two values: (1) the Pine Barrens ecosystem, and (2) the activities and culture of the local population. In a dual irony with important implications for future preservation efforts and ecosystem management, it may have accomplished neither.

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Evaluating Biodiversity Of Land Units: Scale, Diversity Types, And Stakes

Louise M. Tritton and Gary L. Wade

Abstract

This paper describes a broad, integrated approach to managing land units for biodiversity with respect to ecological and social dimensions. To assist land managers in evaluating the biodiversity of particular land units, we identify some of the ecological (functional, attribute) dimensions and some of the social (inherent, subsistence, utilitarian, spiritual, ecosystem integrity) dimensions of diversity. The components of diversity are presented in the context of both lower and higher levels of spatial scale.

Introduction

Managers of many public land areas are charged with preserving and enhancing biodiversity (Anonymous 1990, Endangered Species Act of 1973, National Forest Management Act of 1976, Mann and Plummer 1993, Reid et al. 1993). Typically this objective is implemented by locating and protecting certain (rare) species of plants and animals, with some attention given to the habitats that support them on a particular tract of land. Emphasis is on the biological aspects of managing for biodiversity. How the social dimensions, such as management of neighboring properties, economic and social stability of local communities, and changing regional patterns of land use affect biodiversity, if addressed at all, are treated as separate or opposing concerns (housing vs. plants; jobs vs. owls). Consequently, efforts to manage biodiversity are often characterized by fragmentation and conflict (Iyengar 1994; Kuhlmann 1990).

The purpose of this paper is to describe a broader, more integrated approach to managing for biodiversity with respect to ecological and social dimensions. We begin with a general discussion of biodiversity as a management objective, and then identify some of the ecological and social dimensions of managing for biodiversity. Throughout this discussion, we illustrate how spatial scale can be used as an integrating principle. We present a checklist of some questions that managers can ask to achieve this broad evaluation of biodiversity.

Biodiversity as a Management Objective

Implementing the general objective of managing for biodiversity on a specific national forest, natural area, or local town land, raises the question: What is biodiversity? The terms diversity and biodiversity have similar meanings, but different connotations. In general, the term diversity is used to describe the varieties of organisms and their habitats. Most often it refers to species diversity–the numbers of species of plants, animals, or microbes. But other units of diversity may be recognized at other scales. For example, diversity among individuals in a population of oaks may refer to the genotypic range of the timing of spring bud break. Diversity of ecosystem types may refer to a mosaic of old fields, suburban neighborhoods, and forests across the landscape of several towns and counties. At each scale, diversity takes on a slightly different meaning because the units (e.g. genotypes, species, and ecosystems) are different. Thus, the precise meaning of diversity depends in part on scale.

We define biodiversity as the diversity at one scale evaluated in the context of the greater whole of which it is a part. Management for biodiversity requires evaluating the components of local diversity in the context of a hierarchical scale at both lower and higher levels. The evaluators of biodiversity of a specific land area must choose units and scales that are meaningful to them.

Scale and Ecological Dimensions of Biodiversity

To assist land managers in evaluating the biodiversity of particular land units at different scales, we have developed an approach (fig. 1) based on the USDA Forest Service National Hierarchical Framework of Ecological Units or ECOMAP (1993). ECOMAP outlines a set of spatial scale divisions including: ecoregions (10,000 to 1,000,000 square miles), subregions (10 to 1,000 square miles), landscapes (100 to 1,000 acres), land units, such as small watersheds (10 to 100 acres), and organisms (species and genes). Each of these units corresponds roughly to a level of decisionmaking for natural resource management. Although we focus on evaluation of individual land units, ecological units also can be evaluated at other scales.

The vertical bars in figure 1 illustrate some of the different types of diversity and the scales at which each can be evaluated meaningfully. Functional diversities are the functions of land units at other levels of organization. An example of the functional diversity of a land unit at the genetic scale might be its role as habitat for populations with unique or uncommon alleles conferring disease resistance or tolerance to particular environmental stresses.

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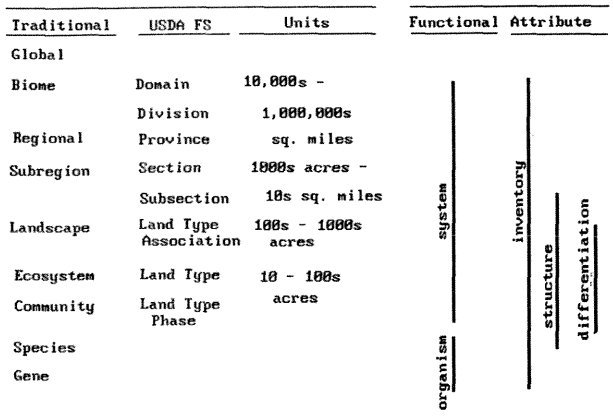

Figure 1–The relationships of common types of ecological diversity to scale. USDA FS is the scale adopted by the USDA Forest Service and other Federal agencies.

At the species level, the function of a land unit may include its role as nesting habitat for particular bird species. Supporting the role of birds as consumers of gypsy moth caterpillars may be the function of the land unit at the landscape level. A cattail marsh may remove phosphorus or other materials from water moving through it. This function may affect nutrient cycling at the province (regional) scale. If the marsh is a stopover point in waterfowl migrations, it has a functional role at the division or domain (continental or global) level. Thus, functional diversity may include many types of functions. However, only certain functions may be relevant to the management of a particular land unit.

Attribute diversities are characteristics or properties of the species, land units, or landscape. The attributes typically assigned to land units include: inventory diversity–the number of species, land type phases, or land type associations present; structural diversity–the structures, forms, or layers present within the land unit, contributed by living and dead plant materials (e.g. canopy layers or snags), or the physical environment (e.g. cliffs); and differentiation diversity–the degree of differentiation between adjacent environments or communities. Attribute diversities, in general, and inventory diversities, in particular, are widely used ecological measures of biodiversity.

Another ecological dimension of biodiversity is the change of a land unit through time. Examples of changes endogenous to plant and animal communities are: old fields that become young forests, sand dunes that are colonized by grasses and sedges, and soils exposed by receding glaciers that develop communities of lichens and mosses. Changes on farmlands may be determined by crop rotations or conversions to suburban landscapes. In all situations, both the potential for change and the rate of change may affect management for biodiversity.

It may not be necessary or desirable to describe all of the types of diversity in all land areas. However, the approach illustrated in figure 1 can aid in identifying the possibilities of biological measures of diversity at different scales.

Scale and Social Dimensions of Biodiversity

So far, we have outlined only the ecological types of diversity. For every one of these ecological types, there are people who believe it is important, value it, and advocate it (fig. 2). These are the stakeholders of biodiversity–individuals, communities, public and private agencies, and action groups that have different stakes in managing land areas for biodiversity. Stake, as used here, refers to a value which is the basis for commitment to, or interest and involvement in the management of land areas for biodiversity (Decker and others 1991). These values provide the context within which decisions about the scale and type of biodiversity have social meaning. As with the different types of biodiversity, stakes and stakeholders may be associated with different scales. Stakes may overlap and may be shared by different groups of stakeholders. The evaluators of biodiversity must identify the stakes and stakeholders that are most pertinent to a particular land area. Some examples of stakes and stakeholders follow.

People who have a stake in the inherent value of species believe that all species have the right to exist regardless of their value to humans. Stakeholders of inherent values are "rights" groups and others taking legal or moralist positions. From a practical standpoint, managing a land area for the inherent value of the diversity of species might require tallying inventory diversity, such as the number of species present on a site in a given year, and using the list as the standard against which changes are measured over a 25- or 50-year period. This kind of management is likely to be most successful on a small scale (community or ecosystem) where it is feasible to make such inventories.

Utilitarian value refers to the uses that humans associate with diversity. Stakeholders are often industries. Their interests may be short- or long-term depending on the resource, which is typically one that is traded in the market place. Examples of managing land areas for utilitarian values are: timber and game at the species level, water at the ecosystem level, and recreation or scenic vistas at the landscape level. Biodiversity of land areas managed for utilitarian values is typically evaluated using inventories of these "forest products."

Subsistence values come from "making a living" within an ecological unit. Examples of stakeholders are families living in rural forested areas who make part of their livelihood by producing maple syrup or logging and selling firewood. Other activities, such as fishing, hunting, trapping, and harvesting of mushrooms, may indicate subsistence values when practiced by local residents.

Spiritual values reflect a deep feeling of connectedness with species, habitats, and landscapes. They are important to individuals who experience the presence of divinity and renewal of the human spirit in landscapes or wildlands. Stakeholders of spiritual values may be individuals or tribal and religious groups.

Finally, ecosystem integrity is associated with the knowledge that ecological processes and relationships are the basis for sustained existence of both human and other life forms. Examples of these ecological processes are disease resistance in food crops at the genetic scale, fish spawning in mountain streams at the landscape scale, and atmospheric cycling of carbon dioxide and oxygen at the biome scale. Stakeholders of ecosystem integrity include groups that promote "limits to (human) growth," ecologists and others concerned with so-called "carrying capacities" of ecosystems and habitats.

Figure 2 can aid managers in identifying not only what types of diversity to measure at different scales, but also which social groups or stakeholders are likely to be concerned with their actions and why. Based on this approach, we have developed a checklist of some questions managers may use to identify both the ecological and social dimensions of biodiversity of a land unit at different scales.

- What and how many species are present and what is their significance at higher levels of the hierarchy?
- What land type phases (habitats or successional seres) are present and what is their significance at higher levels of the hierarchy?
- What structure is present and how unique is it at higher levels of scale?
- What differentiation is present in genotypes of particular species?
- How much differentiation (species composition and dominance) is there between communities or land units (land type phases or land types)?
- How does local differentiation compare to that at higher levels of scale?
- Who has utilitarian, subsistence, spiritual, and other stakes (and what are they) in managing for biodiversity of a particular land unit?
- Who benefits/does not benefit from management of a particular land unit for biodiversity?
- Who has jurisdiction over management of a particular land unit?
- What social and biological forces are likely to change the structure and functions of a particular land unit and at what rate?

In addition to stakes, our approach can be used to address other social dimensions of management for biodiversity. For example, figure 2 illustrates jurisdictions for managing at different scales. An arboretum may manage different genetic varieties of a particular tree species, whereas the USDA Forest Service manages public lands at the species, land unit, and landscape scales. Few single organizations have the legal authority or jurisdiction to manage diversity at a regional scale. Management for biodiversity on a regional or higher scale must shift to cooperative efforts among private landowners, and between private landowners and public and private agencies, as recommended by the Northern Forest Lands Council (1994). At the scale of the biome (domain), biodiversity may be managed by treaties and cooperative efforts between nations.

Summary

We have focused on spatial scale as an integrating principle of managing for biodiversity. Our approach is based on the assumption that both the biological measures of diversity and the stakeholder issues can be organized according to scale. By using the same divisions of scale, we create a common frame of reference for linking types of diversity to stakes and stakeholder issues. Also, the diversity of a specific land area is related to its larger ecological and social contexts.

There are several benefits to managing for biodiversity based on the approach presented here. A scale hierarchy helps to organize the breadth and complexity of diversities and their relationships to one another. It does so by specifying a larger context for each level under consideration. Finally, it enables assessment of the cumulative effects on biodiversity of management actions under consideration. A planned

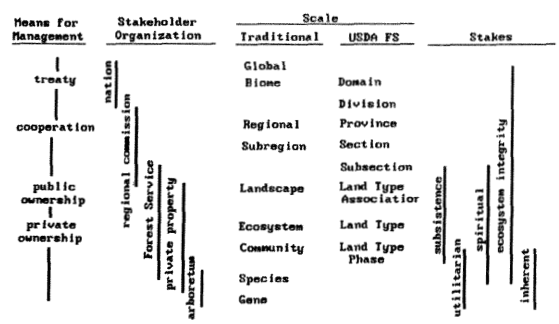

Figure 2–The relationship of social stakes, stakeholder organizations, and means for management to scale.

course of action might have significant or no net impact on biodiversity at larger scales. However, the cumulative effects of many similar actions in similar land units across a landscape may have significant effects on aggregate biodiversity or on stakeholders.

Conclusion

The goal of the integrated approach is to reduce fragmentation and conflict often associated with managing for biodiversity. Rather than treating the biological and social dimensions separately, we demonstrate how the ecological types of diversity can be related to social diversities. Both can be organized around spatial scale. Using this approach, managers can devise practical measures of diversity that are relevant to stakeholder goals for the biodiversity of a particular land unit.

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Spatial and Temporal Scales of Economic Analysis for Ecosystem Management

Amy L. Horne and Richard W. Haynes

Abstract

Economic processes do not fall neatly into spatial and temporal hierarchies as do ecologic ecologic processes; economic analyses are most useful when conducted at broader scales and should not be limited to spatial and temporal dimensions. The "public good" nature of some ecosystem outputs creates problems causing simultaneous assessments of supply and demand in a hierarchical manner to be incorrect. A valuable contribution of a spatial hierarchy is to identify what ecosystem outputs an ecoregion or subregion is best suited to produce.

Introduction

This paper examines whether an analytical process for ecosystem management involving a series of spatial and temporal scales is useful or relevant from the perspective of economics. To date, most of the discussion about such hierarchical frameworks has focused on their application to biological and physical aspects of ecosystems. The inference is that the same approach would be useful to apply to economic and social systems. We critically examine that assumption using principles of economic theory and economic behavior, and identify both ways in which such a hierarchical approach is useful and ways in which it is incorrect to use for economic analysis.

Avers and others (1993) described a process for developing a national hierarchy of ecological units. The objectives of this hierarchy were to improve planning efforts of land management agencies through systematic classification and mapping of geographic areas, achieve consistent ecosystem management across regions and ownership boundaries, evaluate inherent capabilities of land and water resources, and assess management effects. Their concept is that scales are nested, with each scale being distinguished by distinctive issues, and finer scales representing areas of increasingly uniform ecological potential. Our discussion grows out of our investigation of this question of scale within the context of the Interior Columbia River Basin Ecosystem Management Project.

The Interior Columbia River Basin Ecosystem Management Project

The Interior Columbia River Basin Ecosystem Management Project (CRB project) is the combined effort of the USDA Forest Service and the Bureau of Land Management to develop a scientifically sound strategy for ecosystem management of lands they administer throughout the study area (fig. 1). This project is an outgrowth of an accumulation of issues concerning management of these lands–including forest health, pressures to establish old-growth forest reserves, and the critical status of anadromous fish species throughout the Columbia River Basin (Quigley 1994). The Administration considered including these issues in the FEMAT[1] process, but opted instead to initiate a separate process for Federal lands in the Columbia River Basin east of the crest of the Cascade Mountains and upstream form the Bonneville dam.

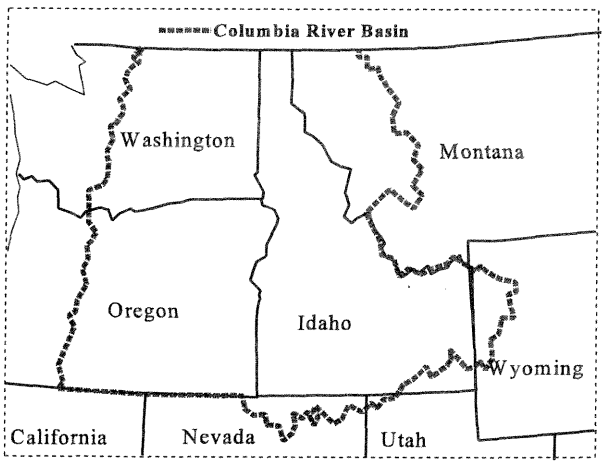

Figure 1–Areas in the Interior Columbia River Basin Ecosystem Management Project.

The concept of using a series of spatial and temporal scales in assessments for ecosystem management has been evolving rapidly since the completion of FEMAT. In FEMAT, scales were dealt with inconsistently by the different staff areas. The boundary of the FEMAT assessment area was defined by a single factor–the range of the Northern spotted owl–not by more general ecological factors such as geology, hydrology, or climate. The Aquatic and Terrestrial teams defined similar smaller provinces within the owl range using biological and

Research Foresters, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

[1] Forest Ecosystem Management Assessment Team. 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. U.S. Government Printing Office, Washington, DC.

physical characteristics. The Economic team identified subregions based solely on forest products industries and also differentiated economic processes between Federal and non-Federal lands. It was the only group to discuss implications at scales larger than the range of the Northern spotted owl–at the State, regional, national, and international levels. The Social team focused on a single scale–rural communities–and did not explicitly consider any temporal dynamics. The Aquatics and Terrestrial teams projected the probability of species viability 100 years hence. The Economics team was the only one to treat time explicitly, showing dynamic trends in relative impacts to the year 2040.

The CRB project is treating spatial and temporal scales more explicitly than in FEMAT for several reasons. One is that the USDA Forest Service has since adopted a national hierarchical framework for defining ecological units (table 1) (Avers and others 1993). Another is the addition of a fifth discipline to the assessment effort, landscape ecology, to which explicit treatment of spatial and temporal scales is integral. And finally, in the aftermath of FEMAT many scientists recognized the need to identify a common set of spatial and temporal scales in order to integrate the results of the separate disciplinary assessments into a coherent story.

In the following sections we examine whether conducting economic analyses in a hierarchy of spatial and temporal scales can improve the decisionmaking process resulting from the CRB project. We conclude with general comments about the utility of a hierarchical framework of economic analyses for ecosystem management and issues relating to the use of hierarchical frameworks in integrated planning efforts.

Economic Analyses for the CRB Project

The CRB project is composed of two types of teams. The Science Integration Team (SIT) consists of scientists charged with conducting a scientific assessment to inform decision-makers about the context within which they will be setting policy. They are also charged with conducting a scientific evaluation of the Environmental Impact Statement (EIS) alternatives developed by the two EIS teams.

The EIS teams are composed of managers charged with using information developed by the SIT along with other managerial and political considerations to develop alternatives for consideration in a National Environmental Policy Act process. The Upper Columbia River Basin EIS team deals with the Idaho and Montana portions of the CRB while the Eastside EIS deals with the Oregon and Washington portions.

The division of the scientific and managerial role stems from two needs. In order for different interest groups to trust the outcomes of this process the data and analytical procedures used need to be free of bias–hence the role for scientists. On the other hand, decisions need to be clearly made by managers–not scientists, who lack the skills and insight into political realities faced by managers. This discussion focuses on the economic analyses faced by the scientists–those associated with the assessment and an evaluation of the alternatives–not with development of an EIS. The objectives of an economic assessment are to identify and characterize economic factors relating to efficiency and equity, describe how trends in economic factors may shape the future in which policies will be played out, and identify economic factors that need to be addressed through additional planning and implementation

Table 1–USDA Forest Service national hierarchy of ecological units (Avers 1993)

Planning and analysis scale	Ecological unit	Purpose, objectives, and general use	General size range
Ecoregion:			
Global	Domain	Broach applicability for modeling and sampling.	1,000,000s to 10,000s of square miles.
Continental	Division	Strategic planning and assessment.	
Regional	Province	International planning.	
Subregion	Section Subsection	Strategic, multiforest, statewide and multiagency analysis and assessment.	1,000s to 10s of square miles.
Landscape	Landtype association	Forest or areawide planning, and watershed analysis.	1,000s to 100s of acres.
Land Unit	Landtype Landtype phase	Project and management area planning and analysis.	100s to less than 10 acres.

processes (Quigley 1994). Because the assessment is done before EIS alternatives have been developed, it will not include the benefit-cost comparisons more typically found in EISs although it will display the data required to make the comparisons.

The evaluation of alternatives occurs after managers have identified a range of alternatives, and will contain the more familiar economic analysis of benefits and costs of the alternatives. The economists have been asked to discuss whether each alternative is economically sustainable with respect to timber, grazing, fishing, and rural economies. They are also charged with identifying the levels of economic costs, investment, and use that are required to achieve predicted outcomes.

The Economic Assessment

The economic component of an ecoregion assessment revolves around two concepts: efficiency and equity. *Economic efficiency* is concerned with avoiding unnecessary waste of scarce resources (Hyman 1973). An outcome is more efficient if it produces more "outputs"[2] from a given set of resources than another one. To the extent that the well-being of humans is a function of the amounts of outputs they enjoy, more efficient outcomes are likely to increase well-being. In the context of the CRB project, economic efficiency can be used to identify the kind and amount of ecosystem outputs society wants from its public lands in this ecoregion.

Equity has to do with how ecosystem outputs are distributed among individuals within society. Here economics can describe the distributional consequences of a series of policies; it can provide additional information to help decisionmakers decide which distributional outcome is better, such as the initial wealth of groups affected by a change in policy. Economics cannot however identify the best distributional outcome, or rank different distributions in order of preference. The choice of a distribution pattern is a political matter properly left to decisionmakers.

Regarding the CRB project, economists will be able to measure and describe outcomes of different alternatives in terms of efficiency and equity, but they will not be able to rank alternatives. This is because the efficiency of alternatives can be compared only if they involve the same distribution of wealth and income (Just and others 1982). Given the magnitude of the land area and issues being dealt with in the project, it is likely each alternative will have different distributional effects.

Both of these concepts–efficiency and equity–involve a comparison of two or more options. The economic assessment will, by identifying and characterizing factors relating to efficiency and equity, lay the analytical foundation and develop analytical procedures for the subsequent evaluation.

The efficiency criterion of governmental activities stipulates that:

> collective choices concerning the level of outputs of public services should be made by that subset of the population who bears the costs of supply and enjoys the benefits of consumption (Hyman 1973).

An economic assessment for ecosystem management can thus set the context for decisionmaking by identifying in spatial and temporal terms the people who enjoy the benefits and bear the costs of ecosystem goods, services, and conditions provided by Federal lands within the interior Columbia River Basin.

Who Enjoys the Benefits and Bears the Costs

Identifying who benefits from outputs of ecosystems in the CRB, as stipulated by the efficiency criterion, is a process of discovering what demands exist and the value[3] of those demands. A characterization of demands needs to accurately portray all the values that people in society hold for ecosystems within the CRB. This does not necessarily mean that all people hold the same values for these ecosystems; only that no sources of value are missed (Field 1994).

Economists have developed a typology of values that helps with the task of developing a comprehensive list of values to include in the assessment (table 2). These can be subdivided into use-values–those having to do with direct and current use of outputs provided by ecosystems, and nonuse-values–those not related to direct or immediate use. Use-values tend to be associated with traditional outputs of forest and range management: timber harvesting, cattle grazing, elk hunting, recreating. Nonuse-values tend to be those which have assumed increasing importance in the public debate about management of public lands, in part because they are newly understood and in part because their supply is becoming increasingly scarce: option value pertains to an

[2] We use "outputs" quite broadly to refer to the whole host of ecosystem goods, services, and conditions people want from public lands. Examples include opportunities to hike, hunt, and fish; the natural capacity of ecosystems to cleanse water or buffer effects of floods or fires; cattle grazing; beautiful vistas; and harvestable timber.

[3] In economics, "value" is measured in terms of trade-offs and is therefore relative. It has to do with how much an individual or society is willing to give up in order to have something else and is not necessarily measured in terms of dollars.

Table 2–A Typology of Values for Economic Assessment

Use-values: the value of the resources to the public from current and direct use of the services provided by the natural resources:	Examples
Consumptive Uses	Hunting Fishing Harvesting timber
Non-consumptive Uses	Hiking Viewing scenic vistas Wildlife viewing
Nonuse-values: the value of the resources to the public apart from active use:	
Option value: the value to an individual of knowing the natural resource is available for use in the future	Knowing the Okefenokee Swamp is there. Might canoe across it someday.
Existence value: the value of knowing that the resource exists, even when the likelihood of ever seeing it is small	Knowing elephants run free in Africa.
Bequest value: the value of knowing that future generations will be able to use the resources	Knowing your grandchildren can have a valuable fly-fishing experience.
Stewardship value: the value of maintaining the health of the environment for the continued use of all biota	Knowing that bald eagles, and the ecological systems on which they depend, are healthy.

individual wanting to preserve the option to experience an ecosystem output sometime in the future; existence value refers to the value associated with the fact than an ecosystem output simply exists; bequest value has to do with the desire to pass certain ecosystem outputs along to future generations; stewardship value is the desire to maintain ecosystem health for all living things (Field 1994).

Many people benefit from outputs of ecosystems in the CRB. Timber and beef produced in the study area are traded in national and international markets. Some people who recreate in the CRB are residents, some live adjacent to the CRB, some travel from great distances. People holding non-use values for the study area can live anywhere; they need never travel to it to enjoy knowing that the ecosystems are healthy, support spawning salmon, and will continue to do so through the lives of their grandchildren. The spatial unit that encompasses the majority of people currently enjoying most of the benefits from the CRB is the United States.

Identifying who bears the costs of a new management direction is in many ways the mirror image of identifying who benefits. Costs are defined as foregone alternatives (Hyman 1973). Thus they include not only direct resource costs–increased prices of market goods or increased government expenditures–but also external costs such as lost opportunities to enjoy nonmarket benefits from public lands in the CRB. As with the analysis of benefits, the population who bears the costs of changes in ecosystem outputs is that of the United States. In the temporal dimension, costs to future generations in terms of lost opportunities also need to be included in the analysis, particularly since a central tenet of ecosystem management is to maintain the options of future generations to enjoy ecosystem goods, services, and conditions (Bormann and others 1993).

The Role of Government

The role of government to provide ecosystem outputs depends on whether private markets will produce socially efficient levels to meet demands. Economic theory suggests private markets behave efficiently *if* it is not possible to enjoy a benefit without paying a price. If it is possible to enjoy a benefit without paying a price, however, external benefits are said to exist: left alone, market production of a benefit will fall short of what is economically efficient. In the most extreme case called a *public good*, the benefit of a good provided for one person is available for all people regardless of where they live.

According to the efficiency criterion, government action may be justified to correct market failure[4] whenever external benefits exist–depending on the costs of the action (Zerbe and Dively 1994). If the externality[5] is a good for which the costs to exclude someone from enjoying its benefits are high, the Federal Government is the appropriate level to provide it (Hyman 1973).

Looking at the list of values in table 2 with exclusion costs in mind, the problem for developing a strategy of ecosystem management for the public lands in the CRB becomes clear. Ecosystem outputs include both those for which exclusion costs are low and markets behave relatively efficiently–such as timber–and those for which exclusion costs are quite high and consequently there is market failure–such as maintaining an option to enjoy a wilderness experience sometime in the future. Indeed, all nonuse values for an ecoregion exhibit characteristics of public goods. The only way people desiring such goods can ensure they are provided is through collective action. Indeed, according to economic theory, government is an appropriate institution to provide these outputs to society.

The "public good" nature of some ecosystem outputs underscores the need for caution in using a hierarchical approach for assessing spatial components of demand. For these goods, the market fails to produce efficient results for society because no market-clearing price exists. A jurisdiction smaller than the whole country that generates benefits enjoyed by people outside that jurisdiction will tend not to consider these external benefits when deciding how much of these benefits to provide. Their tendency will be to produce a quantity that is inefficient from the perspective of the broader society (Hyman 1973). Thus, if the assessment examines only the values held by people living within the Columbia River Basin, it risks encouraging managers to develop policies that are no better at resolving controversy or reaching societywide consensus than ones we already have.

Because of spatial discontinuities between the people holding values for the Columbia River Basin and the areas capable of supplying those values, conducting simultaneous assessments of supply and demand in a hierarchical manner is incorrect (fig. 2). Conducting assessments narrowly in space or time tends to increase externalities and will bias decisionmakers toward inefficient policies. The areas from which an ecosystem output is demanded often do not

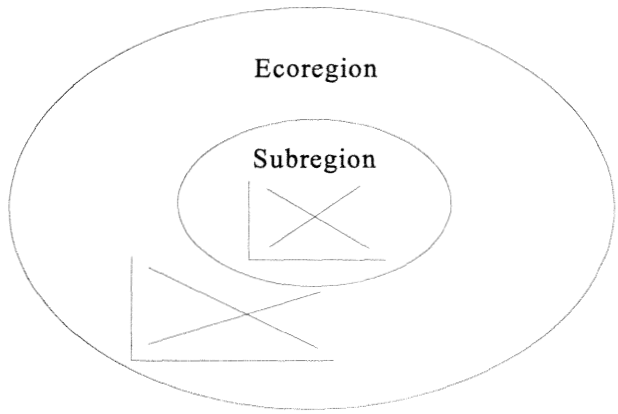

Figure 2–Conducting economic analyses in a nested hierarchy is incorrect.

correspond to the areas which supply that output. However, a hierarchical framework can improve economic efficiency of eventual policies if it is used to identify relative importance of ecoregion and subregions in supplying nationally held values. By combining predictions for future demands with estimates of future production of ecosystem outputs, it is possible to suggest to decision makers the most efficient use of an ecoregion and its subregions for the future. Since the ultimate issue is how can the Forest Service and BLM manage their lands to produce the ecosystem outputs society wants, being specific about where and when benefits can be provided adds critical information.

At the broadest scale we want to discover what ecosystem outputs the Columbia River Basin can supply more efficiently than any other region (fig. 3). Taking the list of values people hold for the interior Columbia River Basin, we can identify whether and at what cost other ecoregions can meet those demands. For some types of outputs–such as timber–many other ecoregions can produce the supply. For other types of outputs–such as large tracts of undisturbed wilderness–few alternatives exist elsewhere. By comparing the values that can be supplied by the Columbia River Basin with those that can be supplied by other ecoregions, we can get a sense of the best use of the study area. We can also break the ecoregion into subregions, and locate the parts of the Basin most efficient at meeting the various demands held for the region (fig. 4). This exercise can reveal where the production of a variety of values creates conflict, and where it is possible to meet multiple objectives simultaneously. It can also help determine the relative importance of different parts of the region, and will lead toward developing management objectives that take advantage of the best an area has to offer.

The assessment is dependent on the analyses of the biologists to know when various ecosystem outputs will be produced. Particular attention should be paid to the

[4] "Market failure" exists when independent behavior in a competitive market system.

[5] An "externality" results when, as the consequence of a transaction, an individual not party to the transaction either enjoys a benefit or experiences harm.

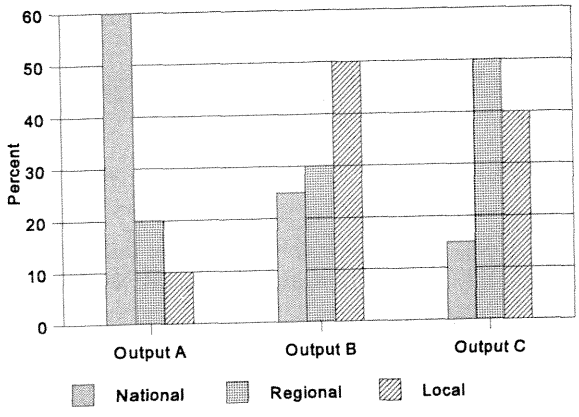

Figure 3–Showing relative preference at different spatial scales is useful.

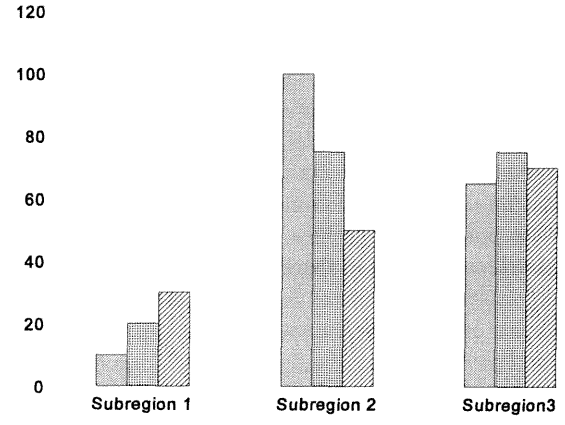

Figure 4–Subregions can have different relative importances.

allocation of inputs that have irreversible consequences, i.e. using them one way makes it impossible for future generations to enjoy certain benefits. It is necessary to know the rates at which biophysical processes occur in order to determine what time scales are appropriate for judging sustainability–both biological and economic.

Discussion and Conclusion

Our conclusion about the use of a hierarchical framework for economic analysis of ecosystem management is that, although such an approach can provide useful information, economic processes do not fit as neatly into a spatial hierarchy as ecologic processes and the analyses should not be limited to hierarchical approaches. In general, economic analyses are most useful and powerful when conducted at higher scales of analysis.

One of the contributions a hierarchical approach can make is to identify what ecosystem outputs an ecoregion or subregion is best suited to produce. Such an approach may result in developing more durable policies, ones that are more closely aligned with the interests of various constituencies.

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Historical Environmental Modeling: An Interdisciplinary Approach

Thomas S. Keter

Abstract

During the last decade research has been conducted documenting the historic and prehistoric environment of the North Fork of the Eel River Basin in northwestern California. Using an interdisciplinary approach, this research has produced a temporal or diachronic environmental model chronicling historical human land-use activities as well as natural processes and events that have shaped the region's ecosystem. The information gained from this research has proven useful not only to archaeologists and historians but also to those in a number of other disciplines including ecology, biology, forestry, and land management planning, by providing useful environmental data and insights on the historical dynamics of the North Fork ecosystem.

Introduction

Recently, the USDA Forest Service has begun to shift towards a new paradigm for the management of National Forest System lands. This new model calls for an ecosystems approach in the way that national forest lands are to be managed in the future. I believe that the historic and cultural perspective provided by heritage resource specialists can be valuable in helping to develop a deeper understanding of the past environmental trends and trajectories needed for implementation of a successful ecosystems management program.

The purpose of this paper is to show how human land-use activities over the last century and a half have affected the environment of one small corner of northern California. I have integrated interviews, historical records, and data provided by Forest Service land management planners, silviculturalists, foresters, wildlife and fisheries biologists, botanists, hydrologists, and other natural resource disciplines, as well as field survey data, to produce an historical environmental model for the North Fork region. This paper presents a brief summary of my research (Keter 1994a) documenting how the radical shift in land-use activities from the prehistoric era to those of the historic period have affected nearly every aspect of the local ecosystem.

The North Fork of the Eel River Region

Most of the countryside comprising the North Fork of the Eel River Basin is located within the boundaries of the Six Rivers National Forest. It is precisely due to the lack of major development (especially roads and timber harvest units) that this region was selected for research. The basin drains an area of approximately 240 square miles and the North Fork is a major tributary of the Eel River. Elevation ranges from approximately 1,000 feet at the confluence of the North Fork with the main Eel River to about 5,000 feet in the northwestern part of the basin near Round Mountain and in the southeastern portion of the basin near Castle Peak.

The climate is Mediterranean with cool wet winters and warm (hot at lower elevations), dry summers. Snow above 3,500 feet is common in the winter and sometimes falls at lower elevations but rarely remains for more than a few days. Many of the smaller tributaries become dry by early summer. By late summer, water flow in the North Fork of the Eel River is low to nonexistent.

During the ethnographic period the region was inhabited by the Athabascan speaking Wailaki and Lassik. With the beginning of the historic era in 1854, when the first Euro-Americans entered the region, a radical change in human land-use practices took place. These changes created new forces which affected in fundamental ways the complex web of relationships established over centuries between the plants and animals and the prehistoric peoples of the region. For this reason, the terrestrial and aquatic ecosystems of the North Fork region are very different today than they were at the beginning of the historic era.

The Historic Role of Fire in the North Fork Basin

Fire has been a factor influencing the environment of the North Fork Basin for thousands of years–long before humans first entered the region. The introduction of anthropogenic fire during the prehistoric period, therefore, took place within a region where many plant species were already adapted to periodic burning.

Aboriginal burning in the North Fork region was a primary factor in determining forest composition during the prehistoric period (Keter 1994a). As a result of periodic burning, the Oregon oak vegetation association, which in this region is the seral (intermediate) stage of vegetative succession, dominated much of the basin. In effect, anthropogenic burning suppressed the climax stage of growth, succession to a Douglas-fir forest, from taking place. The oak woodlands were the richest vegetation

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association in desirable plant resources for humans and certain wildlife species (especially deer). The subsequent lack of burning since the beginning of the historic period has encouraged the growth of Douglas-fir in areas which were previously oak woodlands.

Henry Lewis (1983:75-85) discusses the current burning practices of the aborigines of Australia and notes that burning is utilized to improve habitat and to maintain diversity. It is not, he points out, a fire management program, but rather it is a hunting-gathering management program (Lewis 1983:79). It appears, using ethnographic analogy, that burning was used within the North Fork Basin for a similar reason. By discouraging the establishment of Douglas-fir (suppressing the climax stage of growth) and maintaining the oak savanna and oak woodland vegetation associations, the environment was "managed" to promote species habitat and diversity. By consciously manipulating their environment, local groups maximized the availability of the food resources that they utilized for their subsistence.

The Effects of Historic Land-use Activities on Plant Communities of the North Fork Basin

Land-use activities during the historic era have affected virtually every aspect of the local ecosystem. Perhaps the most dramatic change has been in the distribution of vegetation associations found in the basin. Even-aged stands of relatively young Douglas-fir (*Psuedotsuga menziesii*) have overgrown the Oregon oak (*Quercus garryana*) and black oak (*Quercus kelloggi*) which make up the oak woodland species. Within the even-aged stands of younger Douglas-fir, one invariably finds several mature trees. These trees have large lower radiating branches: evidence they grew in a more open environment with little intra-species competition. After cessation of aboriginal burning, these trees were the seed source for today's even-aged stands. The oaks provided the shade which conserved the moisture content of the top layer of soil–the critical factor for seedling generation in this area (Barbour and Major 1977:367), allowing the Douglas-fir seedlings to become established. Once the Douglas-fir grew above the oak canopy and shaded them out, the oaks began to die. These dead and dying oaks are still visible under the Douglas-fir canopy. In addition, within many of the pole-sized stands of Douglas-fir, one can see a few mature ponderosa pine (*Pinus ponderosa*). These trees are not shade tolerant and cannot become established under a dense canopy. They provide additional evidence that a particular area was more open prior to the historic era.

To insure that the succession of Douglas-fir occurred within the oak woodland areas since 1865 (when the last native peoples were removed from the region) and that other unknown factors (such as a change in climate) did not incite conifer invasion sometime prior to this date, timber stand age data compiled by Forest Service silviculturalists were examined. Figure 1 clearly demonstrates that the

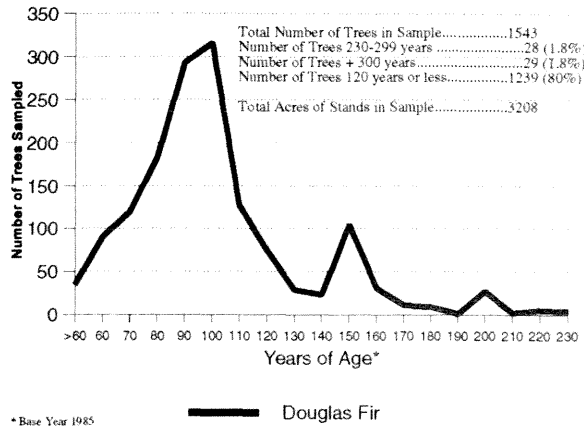


Figure 1–Age distribution of Douglas-fir.

majority of Douglas-fir stands have become established since 1865 (trees were selected for coring in order to determine the average age of a timber harvest unit).

Of all the stands examined, 80 percent were 120 years of age or less (the baseline date is 1985). It was, in fact, impossible to find any stands of Douglas-fir displaying old-growth characteristics within the research area. Old-growth forests are defined as stands containing a wide range of sizes and ages, a multilayered canopy, substantial woody debris in the form of standing snags, and logs decomposing on the ground (Bruebaker 1991:18). Some even-aged mature stands exceeding 200 years of age were noted. It is likely that establishment of these mature stands was opportunistic and resulted from chance burning patterns (trees taking hold in areas of topographical shading, for example).

At this time, field surveys on vegetation distribution have classified approximately 23,000 acres within the basin (the vegetation study area is about 95,000 acres). Figure 2 clearly indicates that significant changes to the extent and distribution of the oak woodlands and Douglas-fir forests has occurred during the last 130 years (for a detailed explanation of the mapping methodology and classification of timber types see Keter 1994a). There has been over a 400-percent increase in the areal extent of Douglas-fir and a corresponding and dramatic 85-percent reduction in the extent of the oak woodlands vegetation type. The slight reductions (less than 2 percent) in the grasslands and brushlands vegetation types are primarily the result of rapid depletion of soil moisture content before Douglas-fir seedlings could become established (soil types also play a role in some areas).

Changes ecosystem of the basin. For example, the reduction in the extent of the oak woodlands has reduced the habitat available for dependent animal populations including deer. Moreover, the increase in the distribution of Douglas-fir has also affected the hydrologic process and ultimately the habitat for anadromous fish. It can be

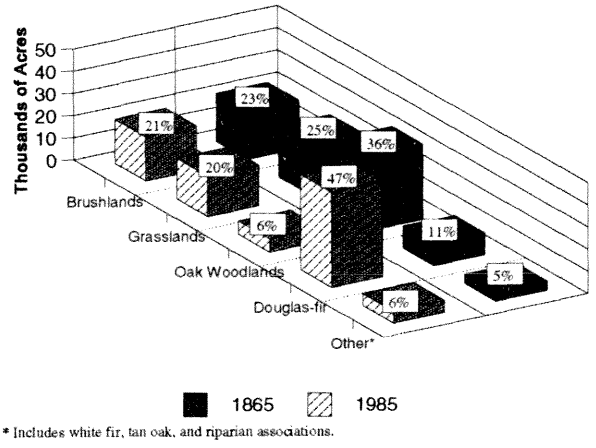


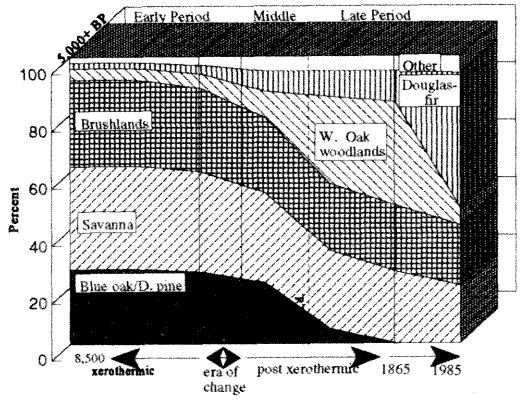
Figure 2–Vegetation distribution projected for entire study area.

concluded from the research related to vegetation associations that the Indian people of this region inhabited an environment very different from that which exits today.

[Refer to fig. 3 for a diachronic model of historic vegetation distributions. This heuristic model of changes in vegetation communities over time is based on paleoclimatic and pollen data as well as the data presented in this section. See Keter 1994a for an overview of the prehistoric environment.]

Historic Era Impacts to the Grasslands of the North Fork Basin

While the areal extent and distribution of tree species has changed greatly during the last century, some of the most dramatic changes to have occurred within the basin are in the composition of the grass and forb species associated with the grasslands and the oak woodlands. The introduction of exotic grasses rapidly and almost completely replaced the native grass species of the North Fork Basin. This change resulted not only from the fact that exotic species migrated or were brought into the region by farmers and ranchers (most often inadvertently), but also because of the changes in land-use practices from those of hunter and gatherer groups to those of the historic period, including intensive livestock grazing, introduction of feral pigs, and homesteading related activities. (For an overview of the succession from native to non-native grasses see Keter 1994a.)



This graph is a heuristic model. This timeline is not to scale. It represents a hypothetical model of vegetation trajectories for the Xerothermic and Post Xerothermic Periods. Data for 1865 and 1965 are based on North Fork vegetation studies.

Figure 3–Diachronic model of vegetation associations.

The grasses and herbaceous plants native to the North Fork basin provided important food resources for both human and wildlife populations during the prehistoric era. Local aboriginal groups also had some effect on species composition of the grasslands through such land-use practices as seed gathering and seasonal burning. Therefore, it is likely that prehistoric land-use practices had to some extent altered the species composition of the grasslands from what might be considered a "pristine" (no human influence) environment. This conclusion supports the view that aboriginal groups had a significant influence on their environment and the ecological processes that were taking place within their territories. Through time, however, it is likely that a dynamic equilibrium had been achieved and the species mix of the grasslands vegetation association was relatively stable. During the prehistoric period, it is likely that the dominating grasses were perennial bunch grasses including species of *Danthonia, Stipa, Melica, Poa,* and *Festuca* (see Keter 1994a).

By the mid 1870's, when the number of cattle and sheep in this region peaked, introduced species of grasses were beginning to compete with and displace native perennial and annual grasses. By the turn of the century, the grasslands of the North Fork region were dominated by nonnative annual grasses (see Davy 1902). Today, as Burcham (1981:173) points out, in some areas of California (including the North Fork region), "it is possible to work on range surveys for several days at a time without recording a single native perennial herb." This replacement of native forbs and grasses occurred so suddenly and completely that there is little documentation of the grassland vegetation associations prior to the historic period (Heady 1977:493).

Overgrazing and the resulting deterioration of the rangelands provided favorable conditions for the domination of the grasslands by nonnative species, especially annuals. In addition, the successful invasion of grasses, predominately of European origin, required that the species be preadapted to the local environmental conditions of the new region (Jackson 1985:349). Many of the introduced species came from areas with a Mediterranean climate similar to California's. Over the centuries, these grasses had adapted in regions heavily grazed by livestock (Burcham 1981:77).

It is clear that within the North Fork Basin, establishment and domination of the introduced species of grasses are related most directly with the introduction of livestock and the subsequent overgrazing of the rangelands (Keter 1994a, 1994b).

The Effects of Historic Land-use Activities on Wildlife

At the beginning of the historic period, Euro-Americans entering the north coast ranges often commented on the abundant wildlife they encountered including extensive herds of deer and elk (Carranco and Beard 1981:157, 167). The wildlife species inhabiting the North Fork region provided significant subsistence resources for the aboriginal inhabitants. While there were numerous species of mammals, birds, reptiles, insects, and other kinds of terrestrial animal life that supplied a part of the subsistence resources utilized by the local native population, the most important of these resources was the large deer population. For that reason, this brief overview is limited to discussing impacts to the deer population during the historic period (data on other animal species including their potential availability during the prehistoric period, habitat needs, and historic impacts are presented in Keter 1994a).

The large numbers of deer inhabiting the North Fork region were the first natural resource to be exploited during the historic era–initially by hide hunters and later by homesteaders and ranchers. In 1914, John Gray, Forest Service Ranger on the Mad River Ranger District, attempted to determine the number of deer killed by early settlers and hide hunters in the area. This data is presented in table 1.

Table 1–Major deer kills on Mad River Ranger District in the late 1800s (after Rahm 1943:4-7)

Hunters	Year	Deer
Jim Wilburn and Indian Hunters*	1854-1895	20,000
Billy Bankhead	1855-1895	5,000
John Duncan	1860-1890	6,000
Farmer Johnson	1875-1890	4,000
Steve Flemming	1855-1890	7,000
Pierce Asbill	1854-1890	10,000
Frank Asbill	1854-1890	10,000
Ben Blockenburger and Ind. Hunters	1860-1880	10,000
Jim Simmons	1865-1890	8,000
Dave Willburn	1874-1895	2,000
30 other settlers combined**	1880-1895	45,000
Total		127,000

* Some hunters employed Indian hunters using bows and arrows.

** Estimate of 30 settlers who killed 100 deer each for 15 years.

The estimated population of the Ruth deer herd in 1983 was 17,700. The highest estimate since records have been kept beginning in 1960 was about 31,000 in 1964 and 1965 (Burton n.d.:9). The North Fork Basin comprises over 20 percent of the area defined for the Ruth deer herd. Therefore, the estimated deer population for the North Fork Basin in 1983 would have been approximately 3,500. Using the figures in table 1 (and the formula used by the California Department of Fish and Game to estimate deer populations), it is estimated that the deer population in 1865 within the North Fork Basin would have totaled approximately 20,000. (See Keter 1994a for a more indepth evaluation of habitat and methodology used to estimate deer populations.)

In this region of the coast ranges, deer feed mostly on oak acorns in the fall and early winter, gradually switching to grasses and forbs as acorns and browse become depleted. During late spring, use of savannas decreases as grasses and forms mature and dry out (Whitaker 1965:71). Deer continue to forage for forms and grasses under the oaks where vegetation remains green for a somewhat longer time (Whitaker 1965:10).

Oak woodlands productivity as deer habitat is at least four times higher than conifer forests (Anderson 1974:27). This supports the hypothesis that the carrying capacity for deer in the basin was much greater in the past. Habitat loss (approximately 85 percent for the oak woodlands vegetation type) during the historic period has had a significant and negative impact on the deer population within the North Fork Basin. While other factors including hide, subsistence, and sport hunting and possibly the introduction of diseases such as blue tongue may have affected the total population, it is primarily loss of habitat that has kept the deer population from rebounding to its formerly large numbers.

With greatly reduced numbers of deer and other mammals and the extinction of some species like the grizzly bear, it is difficult from today's perspective to comprehend the abundance of wildlife which enriched the daily lives of the native peoples of this region. Clearly the negative effects on wildlife over the last century, including the huge declines in the populations of nearly every species and the destruction of their habitats, are the result of human activities in the region and cannot be blamed on climatic change or other factors within the environment occurring independent of human influences.

The Effects of Historic Land-use Activities on the Streams and Aquatic Resources of the North Fork Basin

Land-use practices during the historic period have not only affected the terrestrial environment of the North Fork Basin but they have also greatly affected the river and streams

making up the aquatic environment. For this reason, today, the North Fork of the Eel River and its tributaries are very different streams than those which the aboriginal peoples depended upon for a large portion of their subsistence resources.

The following discussion briefly outlines the kinds of impacts which have occurred to the stream systems of the basin during the historic period and how these impacts, when considered cumulatively, have affected anadromous (steelhead trout and chinook salmon) and resident fish populations.

Riparian vegetation found along the North Fork and its tributaries includes big leaf maple (*Acer marcophylum*), red alder (*Alnus ruba*), and willow (*Salix* spp.). Other tree species including white oak, black oak, live oak (*Quercus agrifolia*), and Douglas-fir growing along the river in some locations also help to provide stream cover. Grass and forb species growing within the riparian zone are an important habitat for insects which are a major food resource for fish.

During the early part of the historic era (1870's-1890's) livestock populations were much higher than those of today (Keter 1994b: 23-25). For example, at one time the Fenton ranch on the lower part of the North Fork had 30,000 sheep, (Keter 1994b: 16). The overgrazing of rangelands resulted in a number of adverse impacts to the stream channels and associated riparian zones.

Various studies have documented the negative effects of overgrazing on anadromous fish habitat. These negative impacts to the aquatic environment by livestock as well as feral pigs included (see also Armour and others 1991:7):

- Disturbance of the riparian vegetation along stream courses
- Increased soil erosion from hoofed animals trailing, and otherwise disturbing, the highly erodible Franciscan Formation soils on steep mountainous slopes
- Collapse of overhanging banks and other stream course disturbance due to trampling
- Increased pollution from animal waste
- Increased erosion from damage to plant cover by overgrazing
- Rooting and other soil disturbance (by feral pigs)

Interview data (Interviews 445,448) indicate that, despite the impacts from historic land-use practices, the fishery of the North Fork, although greatly reduced from historic levels, was still relatively productive until the 1964 flood. In that year, a catastrophic event, the "Christmas Week Flood" occurred, resulting in severe damage to the North Fork of the Eel River and its tributaries. Heavy snows followed by warm and heavy rainfall caused flooding and numerous landslides throughout the north coast ranges. The damage to fish habitat was severe and resulted in almost destroying anadromous fish populations in the North Fork drainage. A study for the California Department of Water Resources (Brown and Ritter 1971:25) noted that erosion from the storm "was most severe in the eastern section of the Eel River basin where the North and Middle Forks of the Eel River were fed by runoff from the steep westward facing slopes." The result of this destructive flood was that the already declining fishery was, in one catastrophic event, nearly decimated. One consultant noted that, "1963 was the last good year [for fish] and streams were closed in 1965-66."

The adverse and cumulative impacts outlined in this section have resulted in significant reductions for both anadromous and resident fish populations through:

- Loss of habitat for reproduction
- Reduction of the terrestrial food supply affecting the aquatic food chain
- Reduction of aquatic resources (insects) low on the food chain
- Loss of summer habitat due to increased water temperature and decreased flow rates
- Loss of summer habitat by aggradation of deep holes
- Loss of water quality
- Nutrient rich runoff (animal waste) causing oxygen depletion in slow moving water and encouraging algae growth
- Sport and especially commercial ocean fishing reducing the breeding population

When the cumulative effects from historic land-use practices are combined with the flood event, it is clear that the aquatic habitat of the North Fork and its tributaries has been altered dramatically since the beginning of the historic period. It is likely that loss of critical spawning habitat, increased summer water temperatures, and low water flow rates are major contributing factors in the general decline of the anadromous fishery of the North Fork. Today, the North Fork stream system contains very few anadromous fish (some summer steelhead, but chinook are considered extinct). It seems likely that, with the recent increase in logging and road building on private and public lands within the basin, stream degradation will continue, or, at the very least, modern land-use activities will hinder the recovery of stream channels and improvement of fish habitat which are needed if anadromous fish are to again inhabit the North Fork of the Eel in any great numbers.

The Hydrologic Cycle

Historic land-use practices have also had an influence on fish habitat by affecting the hydrologic cycle of the basin. Long-time residents of the area interviewed for this study agreed that the streams within the basin used to run at higher water levels in the summer 40 to 60 years ago than they do today. They also noted that many of the springs in the region have dried up or have greatly reduced flows during the summer dry season (even allowing for the current drought). Numerous homesteads have been recorded within the basin, and many do not have evidence of an active perennial spring or other water source on or adjacent to the claim (see, for example, CA-TRI-1202/H, CA-TRI-991/H, and F.S.# 05-10-54-266). Long-time residents indicate that all of the homesteads in this area had at least a small spring. As one consultant (Interview 448) noted, "a homestead had to have a spring on it or you couldn't live there."

The most significant factor affecting the hydrologic cycle and ground water within the basin was the change in the distribution of vegetation associations documented earlier in this study. The increase in the extent of Douglas-fir forests, the corresponding loss of the oak-woodland vegetation type, and the increase in the density of brush and understory species throughout much of the region has resulted in an increased loss of ground water through interception and evapotranspiration (for a discussion of this subject see Lull 1964:6.17-6.23). This reduction in flow rates during the historic period has significant implications for interpretation of the prehistoric record. Predictive models related to site location, as well as site function, must take into account the recent changes to the hydrological cycle of the basin.

Conclusions

After studying the biological and cultural history of the North Fork region for nearly a decade, I have concluded that there have been significant changes to the environment over the last century and a half. Nearly every part of the ecosystem has in some way been affected by the change in land-use activities which have occurred since the beginning of the historic era. If we are to make informed choices and recommendations on management of the ecosystems found on our national forests, it will be necessary to understand the past biological and cultural processes that have shaped the environment.

In a survey (Hamburg and Standford 1986:169-171) of papers presented in the periodical *Ecology,* it was found that only 26 percent of these papers made any direct reference to previous land-use patterns on the locations studied. As the authors (Hamburg and Standford 1986:169) of this survey point out: "Knowledge of the historical patterns of anthropogenic disturbance is critical to an understanding of the patterns (or lack thereof) and processes of ecological systems."

I believe that a holistic multidisciplinary approach to ecosystems management is needed and that anthropology and its subdisciplines must be a part of this new approach. After 10 years of studying both the past cultures and environment of the North Fork of the Eel River region, I have come to appreciate the interconnectedness of humanity and nature. By looking closely at one small river basin in northern California, I have learned that you cannot separate human influences on the environment from other ecological processes.

Interviews

On file at Heritage Resources Department, Six Rivers National Forest, Eureka, CA.

Portions of this paper are summarized from Environmental History and Cultural Ecology of the North Fork of the Eel River Basin, now in press. A version of this paper was presented to the Society for American Archaeology in 1993.

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Knowledge, Values, and Attitudes toward Ecosystem Management

Public Knowledge, Attitudes, and Support of Ecosystem Management

Michael A. Tarrant, Christine Overdevest, Alan D. Bright, H. Ken Cordell, and Don English

Abstract

This study examined ways of generating more favorable attitudes toward, and intentions to support, the USDA Forest Service policy of ecosystem management (EM). Five hundred rural residents of the Chattooga River Basin participated in a telephone survey. Four pro-EM messages (containing combinations of high versus low personal relevance and high versus low argument strength) and two control groups (no message and Forest Service message) were compared. Results show that (1) generally residents have very low knowledge of EM and (2) messages containing strong arguments were the most effective, while the Forest Service message was the least effective, in generating favorable attitudes and promoting intentions to support EM.

Introduction

The current political climate requires that public land management agencies assess public opinion when introducing new policies. Ecosystem Management (EM), an ecological approach to land management that is being promoted by the USDA Forest Service as well as other public agencies, is one of these recent policies. One of the problems in understanding public attitudes for policies such as EM is that few people, outside of the agencies, are sufficiently knowledgeable about the issue to possess well formed opinions. Not only can a lack of knowledge transcend into a lack of support for a given policy, but publics holding incorrect attitudes can have a detrimental effect on the decisionmaking process. This study examines the effect of providing information (a pro-attitudinal message in support of EM) on attitude change and intention to support EM. Attitude change refers to a change in direction (e.g., from positive to negative) and/or change in magnitude (from slightly positive to extremely positive) of the attitudinal position (Fishbein and Ajzen 1975). When attitude change occurs as a direct result of exposure to external information, it is commonly referred to as persuasion. Behavioral intention refers to the individual's willingness to support a particular issue, in this case, the Forest Service policy of EM.

The conceptual background for the study is rooted in persuasive communication theory. Recent persuasion research has addressed various situational and individual variables that either motivate or enable recipients to elaborate on message information. Message elaboration refers to the amount of issue-relevant thinking that occurs when people process the information contained in a message. We examine the role of (a) personal relevance (a variable that has been found to motivate issue-relevant thinking) and (b) argument strength (a factor hypothesized to produce more extreme attitudes) on attitude change and behavioral intention. In addition, we investigate current knowledge of EM. Issue-relevant knowledge is a variable that has been found to affect one's ability to elaborate upon information contained in a message.

Methods

Subjects

Eight hundred and five rural resident households in the Chattooga River Basin (CRB) were randomly chosen to participate in a telephone survey. The CRB includes 120,000 acres of national forest which cross the boundaries of three States: Georgia, North Carolina, and South Carolina. Telephone area codes and prefixes for the region were determined from telephone directories. The remaining four digits were selected using the random digit dialing method. Subjects were chosen based on two criteria: age (18 years or older) and the individual living in the household with the most recent birthday. All participants in the study were randomly assigned to one of six groups: a high personal relevance message containing strong arguments about EM, a high personal relevance message containing weak arguments about EM, a low personal relevance message containing strong arguments about EM, a low personal relevant message containing weak arguments about EM, no message, and a Forest Service message about EM. The "no message" group (in which subjects received no information about EM) and the "Forest Service message" group (in which respondents were given a message on EM developed by the former Chief of the Forest Service, Dale Robertson) were used as control groups for tests of objectives #2 - #4.

Measurement of variables

Personal relevance of EM–High personal relevance was induced using a message in which subjects were informed

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that a Forest Service policy of EM will be implemented in their local area (the Chattooga River Basin). Recipients of the low personal relevance message were informed that the EM policy was to be administered in the Pacific Northwest region of the United States.

Knowledge of EM–Knowledge was measured using six questions developed from Forest Service literature on EM (e.g., U.S. Department of Agriculture Forest Service, 1993a, 1993b, 1993c, 1993d, 1993e) (see table 1). Each question had a "true," "false," and "don't know" response scale. Subject knowledge of EM was measured prior to administration of the message.

Argument strength–Strong and weak arguments were developed using a five-phase modification of the "thought-listing procedure" (Cacioppo and Petty 1981, Cacioppo, Harkins and Petty 1981). From an initial list of 16 arguments in support of EM, four strong and four weak arguments were developed. The four strong arguments read: "EM is aimed at improving the long-term health and conservation of our National Forests," "EM ensures the preservation of threatened and endangered species," "EM will improve the habitat for fish and wildlife," and "EM means that the National Forests will be preserved for future generation." The four weak arguments were: "EM is aimed at reducing the conflict between loggers and environmentalists," "EM will increase tourism opportunities for local communities," "EM will promote the cultural heritage of the National Forests," and "EM will lead to short-term reductions in timber harvesting on National Forests."

Table 1.– Percentage of respondents who correctly answered the issue-relevant knowledge items

Item	Correct response	Percent correct
EM will eliminate all clearcuts in national forests	False	34
Clearcutting is a harvest method in which all trees are removed from the site at the same time	True	67
EM will be implemented only on areas that have been severely damaged by timber harvesting	False	28
Species such as the northern spotted owl and the red-cockaded woodpecker are indicators of the long-term health of the forest	True	53
EM will attempt to return lands back to their original (pre-Columbian) condition	False	17
Under EM, mining and grazing will no longer be permitted on national forests	False	26

Behavioral intention–Behavioral intention was measured by asking respondents to indicate "How likely or unlikely is it that you will support EM?" A seven-point scale anchored from "extremely likely" to "extremely unlikely" was used.

Attitudes and attitude change–Two different measures of attitude were developed. First, attitudes were measured using six modal salient beliefs previously determined from an elicitation study. These were that EM will (a) improve the quality of recreation opportunities on national forests, (b) reduce the amount of timber harvesting on national forests, (c) help conserve natural resources on national forests, (d) help preserve threatened and endangered species on national forests, (e) reduce the number of timber-related jobs on national forests, and (f) increase the cost of timber on national forests. For each belief the outcome was rated on a seven-point "extremely agree" to "extremely disagree" scale. In addition, each outcome was evaluated on a seven-point "extremely good" to "extremely bad" scale. Scores on each belief and its corresponding evaluation were multiplied to arrive at a total of six belief x evaluation scores. These scores were then summed to arrive at an "overall" attitude score.

The second method of measuring attitude used a single item "general" attitude measure. Subjects were asked: "Do you think that your supporting EM is good or bad?" The item was anchored on a seven-point scale from "extremely good" to "extremely bad." Since the six groups were randomly selected prior to administration of the message, attitude change was measured as the difference in attitudinal responses between the groups.

Results

Five hundred and two interviews were completed, 29 were partially completed, and 274 people refused to participate in the survey. This yielded a response rate of 62.4 percent. Two outliers were removed from the study. These subjects had responded with a distinct pattern of extreme values to all the attitudinal and behavioral questions on the survey.

To the extent that the items used to measure knowledge of EM are indeed representative of the Forest Service policy of EM, the results shown in table 1 suggest that the public has a very low understanding of EM. With the exception of the questions on clearcutting and wildlife species, only one-third (or less) of the respondents correctly answered each item. The mean correct score for the six items together was 2.2. Random selection of the three responses (true, false, don't know) would yield a mean correct score of 2.0.

Table 2 shows mean scores (and sample size) for the attitude change, attitude strength, knowledge, and behavioral intention variables by the six message types. Sample sizes were relatively even across the groups (ranging from $\underline{n} = 73$ to $\underline{n} = 88$). Messages containing strong arguments produced the most favorable attitudes toward, and intention to support, EM. Generally, as argument strength and/or personal relevance decreased, attitudes became more unfavorable and behavioral intentions lowered. One-way analysis of variance showed significantly lower mean attitude change scores for the no message control group than other groups. In addition, recipients of the strong argument/high personal relevance message were significantly more likely to support EM ($\bar{y} = 1.52$) than subjects who received either the Forest Service message ($\bar{y} = .98$) or no message ($\bar{y} = 1.01$). There were no significant differences between the groups on knowledge scores, suggesting that prior to receiving the message the six groups were equally knowledgeable of EM.

Conclusions

Applied implications of this study focus on how managers may use these findings in developing an information program about a particular natural resource issue. In providing the general public with information about natural resource strategies such as EM, it is paramount that managers fully understand their target audience. For example, are they dealing with an audience for whom the EM issue is highly relevant or is it a relatively unimportant issue for the public? Is the audience generally knowledgeable about what EM entails or is it a foreign issue to the public? Knowing the answers to these questions will help managers understand the effect of an information campaign on the attitudes and behaviors of their target audience. Our results suggest the need for a public communication and education program on land management issues prior to involving these individuals in the decisionmaking process.

In addition to understanding the nature of their audience, it is also important to understand the nature of the information disseminated to the audience. Perceptions of the strength of arguments contained within the message will influence the effects of the information program. The arguments put forth by managers must appear to be strong arguments, not only to the managers themselves, but to the audience who is to receive that information. Our results suggest the Forest Service-generated message on EM is ineffective in producing favorable attitudes toward, and increasing support for, EM. Indeed, subjects provided with no information about EM (no-message control group) produced (a) stronger attitude-behavior relationships and (b) a higher behavioral intention mean score, than the Forest Service message. Clearly other approaches using persuasive communication strategies need to be examined.

Finally, it is reasonable to expect that a goal of any information campaign is to have enduring effects on the attitudes and behaviors of the public for which that campaign is targeted. To do so, the public should be encouraged to elaborate on that information and be influenced in the way intended by the information. Thus, managers should develop information that (a) provides strong arguments for the strategy being proposed, (b) emphasizes how the particular management issue is relevant to the target audience, and (c) provides additional information to those people who are already highly knowledgeable about the issue.

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Table 2.– Mean scores on attitude change, knowledge, and behavioral intention by message type.

	Mean score by message type					
	High rel./ Strong arg. ($\underline{n}$=85)	Low rel./ Strong arg. ($\underline{n}$=85)	High rel./ Weak arg. ($\underline{n}$=85)	Low rel./ Weak arg. ($\underline{n}$=73)	FS message ($\underline{n}$=88)	No message ($\underline{n}$=74)
Overall attitude[1]	14.21[b]	14.14[b]	12.60[b]	11.16[b]	12.00[b]	6.58[a]
General attitude[2]	1.52[b]	1.48[b]	1.39[b]	1.17[a,b]	1.17[a,b]	0.98[a]
Prior knowledge[3]	2.23	2.24	2.08	2.46	2.15	2.17
Behavior intention[2]	1.52[a]	1.41[a,b]	1.25[a,b]	1.23[a,b]	0.98[a]	1.01[a]

Alphabetical superscripts denote significant differences between group means (p=0.05)

Possible range of scores: (-54 to +54)[1], (-3 to +3)[2], (1.0 to 6.0)[3].

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Identifying Attitudes, Perceptions, and Underlying Forest Interests Regarding Ecosystem Management in the Southern United States

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Abstract

A 1994 13-page survey concerning attitudes, perceptions, and underlying forest interests regarding ecosystem management was mailed to 1500 respondents in 9 midsouth States. Recipient groups included forest stewardship landowners, elected public officials, natural resource professionals in The Wildlife Society and the Society of American Foresters, and readers of Urban Forests magazine. The findings identify attitudes and preferences concerning key aspects of ecosystem management such as benefits and reasons for owning forest land, property rights issues, distinctions between private and public land applications, and preferences for channels of communication to receive additional information on prioritized ecosystem management topics. Demographic information of respondents such as race, education, and size of acreage ownership is also included. Study results note distinction between preferences in the South and elsewhere and challenge a common assumption that ecosystem management will have uniform priorities and guidelines across diverse regions of the United States.

Introduction

The American public is becoming increasingly aggressive in expressing concern over the uses of both public and private forest lands. Whereas 20 years ago people were content to allow natural resource professionals to make key land use decisions, now affected publics voice criticism and challenge activities that previously were accepted as sound, environmentally safe practices. Forest landowners and managers are being called upon to utilize property in an environmentally responsible manner that maintains and protects biodiversity, forest health, endangered species, wetlands, and water quality. At the same time public officials are being urged to support policies requiring landowners to manage woodlands in a manner that guarantees a healthy forest ecosystem. Better understanding of forest ecosystem management concepts and issues – in both the biological and human dimensions arenas – is critical. Without clarity of the concepts, a spiraling web of misinformation could muddle communications between natural resource professionals, the clientele of forest users and landowners, and public policy makers.

In addition to these vital constituents affecting forest ecosystem management decisions, educators also need this information. Assessing the level of knowledge, attitudes, and perceptions of target audiences is critical for effective planning and directives. As surely as biological requirements of ecosystems vary by region, sociological and psychological differences among segments of the public in an area also exist. Scientists often focus upon identifying and determining differences in land, flora, and fauna between diverse regions, such as the Everglades and the Great Smoky Mountains. Yet the variations among human needs and perceptions among populations, certainly as different among regions, have not been fully investigated. Determining levels of awareness and educational needs of the public as well as the most appropriate delivery systems for technology transfer are necessary first steps in successful forest ecosystem management educational processes. This paper recounts selected preliminary results of a mail survey conducted to measure demographic characteristics, forest attitudinal preferences, and environmental and economic concerns about ecosystem management of selected citizen groups in the southern United States.

Methodology

The study reported in this paper was part of a cooperative effort between Clemson University, Utah State University, and Purdue University, all supported by funding from the USDA Cooperative Extension Service. For the Clemson segment of the study, a pretest was mailed to over 100 people in June 1994. After modifications of the pretest, the 13-page Clemson survey was implemented in August - November 1994 following Dillman's Total Design Method (Dillman 1978, 1991) and other accepted survey techniques (Rossi, Wright and Anderson 1983). Two complete surveys and two sets of reminder cards were mailed. The Clemson recipients included 1,500 people in 9 midsouth States: South Carolina, North Carolina, Georgia, Virginia, Alabama, Mississippi, Florida, Tennessee, and Kentucky. Five constituent groups who received the survey included readers of the periodical Urban Forests (250), natural resource professionals who are members of the Society of American Foresters (250) and The Wildlife Society (250), elected public officials (250), and private landowners participating in Forest Stewardship plans (500). There was

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equal representation randomly selected among the constituent group respondents from the nine states sampled.

Preliminary Results and Summaries of Selected Survey Answers

Responses from the mailings were uniformly distributed, with identification through zip code listings for the community where a person lives falling between 9.4 (Alabama) and 12.7 (Kentucky) for return surveys received. As of November 25, 1994, effective response rates for constituent groups were as follows: Group 1: readers of Urban Forests magazine - 64 percent; Group 2: Society of American Forester members - 77 percent; Group 3: The Wildlife Society members - 84 percent; Group 4: elected public officials - 30 percent; Group 5: Forest Stewardship landowners - 74 percent. A 2-page shortened form of the original 13-page survey was mailed to constituents in Group 1 only to test for nonresponse bias, as a group response rate of 65 percent was assumed to be representative of the sample population (Dillman 1978, Nabi and others. 1983). An additional 10 percent of the 250 members of Group 1 responded to the shortened form, bringing total response and follow up combined to an acceptable 74 percent (Dolsen and Machlis 1991, Hammitt and McDonald 1982). As the response rate was significantly below 70 percent for elected public officials (who were members of the State congresses with natural resource committee appointments), no attempt was made to measure nonresponse bias for the unacceptable range, as responses would have needed to reach at least 50 percent, and preferably 65 percent, to be representative (Dolsen and Machlis 1991). Instead, results for Group 4 will be used as descriptive data only and were not included in combined results. Results reported in this paper reflect the combined responses of Groups 1, 2, 3, and 5. Overall response rate of all groups combined was 66 percent; the response rate for the following summarized data for groups 1,2,3, and 5 combined was 74 percent. What follows are preliminary summary results of selected survey questions. Results from further analyses currently in progress will be made available to readers who are interested.

Demographics

Respondents were predominantly middle-aged highly educated white males, with sex being 85 percent male, race being 98 percent white, and nearly 80 percent indicating that they had completed at least a 4-year college degree. Clearly, instead of the "general" public, these respondents reflect demographics of membership responding to surveys within natural resource organizations such as The Wildlife Society. A study of The Wildlife Society membership recently revealed survey responses that were 81.4 percent male with a mean age of 40.9, for example (Decker and others 1994). The most commonly occurring age category for the Clemson survey was the decade in age of the 40's. In addition to being highly educated, these respondents indicated that nearly half had completed at least one college course in forestry biology and/or forestry, with close to one-third having obtained a B.S. or advanced degree in forestry. Rather than being indicative of a cross-spectrum of society then, these survey respondents reflect many with training in natural resources.

Demographic questions also included items identifying income and religious affiliation. Over half the respondents listed total household income before taxes as equal or greater than $50,000. Well over half were protestants who attended religious services at least two or three times a month, although the most common category of church attendance reported was "every week." We understood that questions regarding income levels and religious affiliation were sensitive in nature to recipients; however, we decided to include them because past studies of attitudes towards use of forests or other ecosystem components have examined connections to income or religion (Kellert 1976, 1980; Bliss and Nepal 1994; Haymond 1990).

When asked "Where do you now get your information about managing your wooded land?" the most frequent responses were (1) advice from specialists at colleges or State forestry offices, and (2) Extension Service brochures or leaflets. Least popular sources were radio/television and library books. When asked "Which of the following educational methods or materials would you prefer to use for learning more about your forested land?" the most frequent responses were (1) one-on-one, on-site technical assistance from a forester and (2) brochures, booklets, fact sheets. Least preferred were computer bulletin boards and videotapes of conferences. This indicates that educators should place a greater priority on producing more concise, scientifically sound technology transfer brochures, booklets, and fact sheets. Providing opportunities for landowners to interact with State Extension Service specialists is also suggested in these results.

Land Use Preferences

Nearly half the respondents owned 100-999 acres of land, while 83 percent reported owning somewhere between 10 and 999 acres. The vast majority do not allow the general public to use their property for recreational purposes, but they were fairly evenly divided on allowing special groups (such as hikers or hunting clubs) to use their land. Of the 41 percent who felt they had lost property rights, the most common reasons reported were (1) laws protecting endangered species, (2) increased trespass by recreationists, and (3) laws protecting air-water quality. Of 16 categories of benefits derived from their forested land, the 5 most preferred answers were (1) wildlife appreciation, (2) scenic enjoyment, (3) observing flowers/trees, (4) personal hunting, and (5) firewood for home use. When rating the

importance of reasons for owning forested land, high positive values were given for (1) providing wildlife habitat, (2) preserving natural beauty, and (3) source of investment income while lowest priorities were recorded for (1) gathering fruits, nuts, or mushrooms, (2) hunting lease income, and (3) grazing income.

Concerning management decisions of public forest land being divided between professionals and public opinion, over 80 percent selected this response over three others: "Public forest managers should listen to public opinion, but conflicts should usually be resolved in favor of professional judgment." One might conclude that this is the collective view of professional scientists "preaching to the choir" of their own colleagues; however, an important note here is that the responses reflect the thinking of surveys mailed to more private landowners and private individuals (750) than natural resource professionals (500). Concerning management decisions on private lands, over half of the respondents selected one answer over three others: "Private landowners should be able to do whatever they want with their land unless their activities have a demonstrated harmful impact on environments or resources on lands they do not own." In contrast, only 2 percent selected "Private landowners should be able to do whatever they want with their land, even if it hurts the environment." The contrast in the figures indicates that people of the midsouth express a high priority on maintaining the integrity of the land.

Ecosystem Management Perceptions

The clear majority of survey respondents answered that they recognized and understood the term *ecosystem management* in two separate questions, but only a minority (19 percent) stated that they are applying it on their own land. The survey tapped 14 different possibilities of what ecosystem management is and allowed respondents to agree or disagree on a 5-part Likert scale with answers. Some answers that respondents clearly agreed with include the following, listed in priority ranking as the five most positive:

1. Ecosystem management helps us think about forests as a whole instead of thinking about single resources (90 percent answering "agree" or "strongly agree").

2. Ecosystem management will enhance the long-term health of forest ecosystems (75 percent answering "agree" or "strongly agree").

3. Ecosystem management lets us protect endangered species while continuing to harvest goods (74 percent answering "agree" or "strongly agree").

4. Ecosystem management is really what responsible forest owners have been doing all along (56 percent answering "agree" or "strongly agree").

5. Ecosystem management is a way to give public values and perceptions more weight in management decisions (51 percent answering "agree" or "strongly agree").

Answers that respondents most vehemently opposed include the following, listed in priority ranking as the five most negative:

1. Ecosystem management is a concept developed for forests in the Northwest and doesn't make sense here (81 percent answering "disagree" or "strongly disagree").

2. Ecosystem management is a misguided attempt to reduce public complaints without any scientific basis (73 percent answering "disagree" or "strongly disagree").

3. Ecosystem management requires all landowners to manage their lands in the same way (70 percent answering "disagree" or "strongly disagree").

4. Ecosystem management is being used as an excuse to log areas previously unopened to timber harvests (68 percent answering "disagree" or "strongly disagree").

5. Ecosystem management is a useful idea for public land, but probably not for private land (65 percent answering "disagree" or "strongly disagree").

In addition to those answers that respondents favored positively and negatively, there were also answers more evenly distributed across the Likert scale, including "Ecosystem management puts ecological objectives ahead of the needs of landowners"; and "Ecosystem management will protect property rights in the long run by making forestry more acceptable to the public."

These responses indicate that ecosystem management has some boundaries as to what it is or is not intended to do– at least for this region, for these people, and at this point in time. They have indicated that they see it as an issue for public and private lands, for all regions, for the long-term health of interrelated and interdependent parts of the forests. They reject the ideas that it is being utilized to reduce public complaints, add acreage to logging operations, or require landowners to manage all lands similarly. And they identify what is uncertain to them about the practice: Will it protect or erode property rights? Will it make forestry practices more acceptable or put ecological objectives above the needs of landowners? Will it incorporate the logical results of the latest scientific advances in forestry? These respondents clearly reflect that they do not know those answers yet. Upon examining these most difficult questions carefully, the answers reflect prudent and sagacious responses, because it requires people to predict how ecosystem management will be applied or accepted in future contexts.

When asked to indicate a level of agreement regarding the appropriateness of using ecosystem management principles on public (State or Federal) land, 86 percent responded favorably (either appropriate, appropriate and beneficial, or extremely beneficial). The same question for private lands reflected clear distinctions, with a smaller number (66 percent) responding in the same favorable categories. Another question asked if there were any aspects of ecosystem management that respondents felt they did not know well enough to implement effectively. The most frequent answers were (1) legal guidelines/ restrictions and (2) economic incentives; these were checked two or three times more often than any other of the seven remaining categories.

A final area of focus was in application of ecosystem management principles. Respondents were asked to determine how appropriate they think it would be to apply each principle listed in table 1 to America's forests in general or to managing their own land. Categories appear in priority order using the combined figures for Likert-scale answers "appropriate" and "highly appropriate."

These respondents distinguish acceptability of these concepts in ways that could facilitate better planning for future initiatives. For instance, doing more to incorporate public opinion is reflected in these figures as an unpopular idea in the midsouth. In fact, this category is the one area that received a majority of unfavorable responses for application on private land (51 percent) and the highest percentage of unfavorable responses on public land (31 percent). This could indicate that respondents feel managers and landowners are already doing enough. It could also indicate that the current method of involving public discourse in decisions is creating negative reactions. Or it could signal a preference for less control of management decisions being in the hands of people at emotionally charged public discussions. Whatever the case, this area would benefit from further investigation to determine the source of low acceptance levels.

Table 1–Responses to application of ecosystem management principles.

	Percent American Forest	Percent Private Lands
a. Managers should consider longer time frames, beyond the next season or rotation.	81	82
b. Managers should keep close watch on their activities, adapting practices quickly if unexpected impacts occur.	85	75
c. Managers should carefully consider how each tract fits into larger ecosystems.	83	65
d. Public and private landowners should plan activities jointly because ecosystems and wildlife cross property boundaries.	71	75
e. Activities should promote processes and connections in ecosystems as well as single species.	73	63
f. Costs of management to society should not exceed the total benefit to society.	43	55
g. Managers should focus first on the condition of the land, and second on flow of resources from the land.	47	46
h. Managers should consider public opinion more fully in natural resource decisions.	36	19

Conclusions

The current climate on a national level concerning implementation of ecosystem management principles has been one of confusion. It has created documents like the Forest Ecosystem Management Assessment Team (FEMAT) report, which spends over 1,000 pages explaining it (FEMAT 1993), and a title for a major journal article posing the issue as a question itself: "What *is* ecosystem management?" (Grumbine 1994) The editor of the Journal of Forestry recently noted the changing nature of attitudes regarding ecosystem management with an astutely perceptive editorial title, "Ecosystem Management: An Evolving Process" (Staebler 1994). Part of the problem in defining or implementing ecosystem management could arise from managers attempting to devise broad-ranged, all-encompassing definitions and systems for application to groups of people and geographic/biological locales which are in reality quite varied. Streamlining definitions, concepts, and preferences on a national or global scale may not be feasible.

For instance, the FEMAT document includes 38 pages of information regarding the ramifications of fungi, lichen, and bryophyte (mosses, liverworts, and hornworts) management (FEMAT 1993). In the midouth, these survey results indicate that among to the important reasons for owning forest land, the mention of the presence of mushrooms on the land received the most negative rating of any possible response. This does not mean that the presence of fungi, lichens, and bryophytes are less essential cogs in the ecosystem dynamics in the midsouth than they are in the West. Rather, it suggests that these survey respondents do not place as high a value on the presence of mushrooms

on the land as more aesthetically pleasing forms of wildlife. Logically this may be due to fewer stands of older timber in the midsouth than in the West. To attempt to incorporate fungi management across the midsouth then, with existing attitudes and preferences, could be ill-advised and poorly received without a shift occurring in current thinking.

As a second example, consider the issue of legal guidelines, restrictions, and regulations. In the midsouth, people who answered they felt they had lost property noted this primary reason: "Laws protecting endangered species." For residents of both Utah and Indiana who answered the same question for the Utah State and Purdue portion of this study, the highest priority answer was different, "Increased trespass by recreationists" (Brunson, 1994). Legal restrictions, particularly those mandated on a Federal level, have a long-standing history of being begrudgingly accepted or bitterly rejected in the South, where the State of Alabama, for instance, still posts its State motto on large signs at welcome center rest stops: "We dare defend our rights." Questions and concerns about laws, guidelines, and legal restrictions received strong reactions in many other areas of survey answers; it was the number one aspect of ecosystem management respondents did not know enough about to consider implementing in the midsouth, in Utah, and in Indiana.

Rather than ecosystem management attitudes and perceptions being a ball of confusion, respondents in this survey reflected clear priorities in answering selected questions on pertinent aspects. These survey results only reflect the mindset of a particular people in one time and region; however, the collection of these people, drawn from landowners, natural resource professionals, and the urban forest readership, should represent a highly significant proportion of opinion leaders influencing public policy. Social scientists indicate that group data such as these have high predictive value (Fishbein 1967). Incorporating such data into public policy and natural resource management decisions could be a key to successful future programming and direction.

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Creating a Knowledge Base for Management of Southern Bottomland Hardwood Ecosystems

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Abstract

We describe an interdisciplinary approach to forecasting potential impacts of even-aged and uneven-aged silvicultural treatments upon bottomland hardwood ecosystems in the Southern United States. Our approach involves identifying scientists with expertise in key disciplines; utilizing the Delphi technique to develop consensus among these scientists on important system processes and functions, and to estimate mean values for management effects on same; and synthesizing results in conceptual models of key ecological, physical, and social relationships. These models will provide conceptual support for long term field research on management of these ecosystems underway at four sites in the South.

Key words: Ecosystem management, adaptive management, bottomland hardwoods, Delphi, silviculture.

Introduction

Two-thirds of the annual losses of wetlands in the conterminous United States occur in forested wetlands, primarily in the South (Wilen and Frayer 1990). There are almost 31 million acres of forested wetlands in the South, comprising less than one-third of the forested wetlands occurring prior to European settlement. While the loss of wetlands continues, the rate of loss has slowed. Nevertheless, only 5 million acres of forested wetlands remain of an estimated 21 to 23 million acres in the Mississippi River floodplain (Turner and others 1981; The Nature Conservancy 1992), and the loss of forested wetlands in other parts of the South is just as striking (Tansey and Cost, 1990). Most of the forested wetlands in the South occur in the floodplains of rivers within a broad coastal plain stretching from Texas to Virginia.

In 1991, the National Research Council (NRC) called for an active and ambitious restoration program which offsets further wetland losses and contributes to an overall increase of 10 million acres by the year 2010 (NRC 1991). A first step in any restoration effort is to identify the key functions of undisturbed wetland sites. These reference sites must be identified and monitored in order to develop criteria for measuring the "success" of restoration projects.

Although we have a conceptual understanding of these wetland ecosystems, our present knowledge is fragmented and lacks sufficient detail for managing them on an ecosystem basis. Our lack of knowledge also makes it difficult to monitor forest health or to restore degraded wetlands. While we are increasingly aware of how important these wetlands are, and of their dramatic rate of disappearance, we have little scientific information that quantitatively describes their important biological, chemical, and physical functions. Mitigation and restoration efforts, and the development of sustainable silvicultural techniques are stymied by this lack of knowledge.

To improve our ability to manage and restore bottomland hardwood forest ecosystems, which are one component of the forested wetlands in the South, an interdisciplinary team of researchers from several Federal agencies and universities (Interagency Forested Wetlands Initiative) are cooperating in an integrated regional study of the structure and function of bottomland hardwood forests in river bottoms in the Atlantic and Gulf Coastal Plains. This wetland type was singled out for study because it makes up over half (16 million acres) of the remaining southern forested wetlands, is a significant forest resource (McWilliams and Faulkner 1991) that adds considerably to regional landscape diversity, and provides habitat for plants and wildlife (Wharton and others 1981), particularly sensitive neotropical migratory birds and other fauna.

Objectives

The overall objective of the Bottomland Hardwood Ecosystem Management Project (the Forest Service portion of the Interagency Forested Wetlands Initiative) is to obtain a quantitative understanding of the structure and functions of bottomland hardwood ecosystems (Harms and Stanturf 1994). Specifically, the objectives are (1) to quantify their physical, chemical and biological functions, and (2) to document and evaluate the effects of silvicultural manipulation on key functional capacities. The project is being conducted in two phases: Phase I, now underway, addresses the first objective by selecting four representative systems and measuring functions over a 4-year calibration

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period. During Phase II, silvicultural treatments will be imposed to directly examine the effects of stand manipulation on wetland functions and ecological processes.

Because of our fragmented and incomplete understanding of these ecosystems, we could not define at the outset the specific silvicultural treatments that would appropriately compare even-aged versus uneven-aged management, nor did we have an adequate understanding of the key ecological processes that needed to be monitored in order to evaluate the effects of manipulation. Given this uncertainty, we undertook an adaptive management approach to develop the knowledge base needed to assess alternative management strategies. This paper describes our efforts to define cause and effect relationships among natural processes operating in bottomland hardwood ecosystems and describes how management activities directly and indirectly affect natural processes at multiple scales in these dynamic systems. A second goal of this adaptive management component is to develop a consensus among bottomland hardwood experts on all factors that should be evaluated in comparing the two management systems.

Methodology

We have chosen the Delphi method as a means to rapidly accumulate existing expertise on the structure, functions, and management of bottomland hardwood ecosystems. The Delphi technique is a form of structured communication between knowledgeable individuals designed to capture and distill their collective expertise in order to apply it to solving complex problems (Linstone and Turoff 1975). It was initially developed by RAND Corporation in the early 1950's in order to evaluate a national security issue, specifically, the question "How many A-bombs of the type that destroyed Hiroshima would it take to cut the US gross national product by 75 percent?" (Moore 1987). Because of the initial intention to use this as a forecasting tool, the technique was named for the Oracles at Delphi, Greece, who could predict future events (Moore 1987).

The first nonmilitary application of the Delphi technique, published in 1963 by Olaf Helmer and E. S. Quade (1963), suggested using the technique for predicting and planning development economics. The first large-scale Delphi study was the "Report of a Long-Range Forecasting Study" by T.J. Gordon and Olaf Helmer, published by RAND in 1964. This study was used to forecast potential scientific and technological events over a 10 to 50 year span. These two studies extended awareness of the Delphi method beyond the defense community (Linstone and Turoff 1975).

Since that time, researchers in a variety of disciplines have used Delphi applications. In the field of education it has been used to develop course syllabi and develop innovative teaching techniques (Alabama Dept. of Education 1974). Delphi has been used in planning, allocation of research and development resources, forecasting trends, community planning, and political policy development (Eschenbach and Geistauts 1986); and as an evaluation tool for such social problems as drug abuse, child abuse, and violent crime (Holeman 1978, Stephens and Tafoya 1985). The method is useful for risk assessment and economic, environmental, and social impact assessment (Robinson 1991, Clouser 1986). It is becoming widely used for marketing research (Dull 1988).

Within the natural resources field, the method has been used to develop basic information and prediction models for resolution of resource problems in the Great Lakes area (Ludlow 1975); to develop habitat suitability index curves for wildlife (Crance 1987); in recreation planning on USDA Forest Service lands (Schneider and others 1993); to evaluate elk habitat quality (Schuster and others 1985); and to evaluate stewardship attitudes and activities on private forest land (Egan and others 1993).

What is Delphi?

Essentially, Delphi consists of a series of questionnaires administered to knowledgeable individuals, and designed to build and refine a body of consensual knowledge on a topic of interest (fig. 1). The initial questionnaire elicits a general assessment of the topic which is refined in subsequent

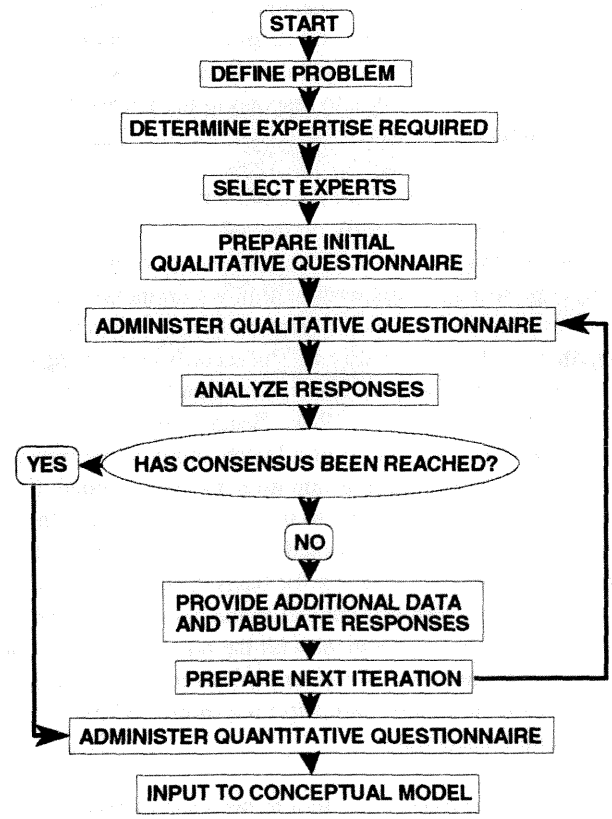

Figure 1–Flow chart, Delphi application (after Tersine and Riggs 1976).

questionnaires. Each iteration seeks to clarify areas of agreement and disagreement, and the process continues until a satisfactory group consensus is reached. Throughout these questionnaires, participants discuss issues, document or justify their assessments, and are given an opportunity to reassess earlier positions in light of feedback from other participants.

The Delphi technique resembles the nominal group technique, but does not require a face-to-face meeting (Delbecq and others 1975). The anonymity of survey panel members and their responses is thus preserved, thereby preventing any one member of the panel from unduly influencing the responses of other panel members (Lindeman 1975). Multiple iterations, statistical analysis of panel responses, and controlled feedback of responses to panel members further differentiate Delphi from other techniques. Panel members communicate with each other in a limited, goal-centered manner through statistical summaries and a minority report (Lindeman 1975).

Strauss and Zeigler (1975) differentiate several types of Delphi by research goals. The *numeric* Delphi is used to specify a single or a minimum range of numeric estimates or forecasts, for example, the size of the world population in the year 2005. The *policy* Delphi defines a range of answers or alternatives to a current or anticipated problem, such as acceptable silvicultural practices on USDA Forest Service land. The *historic* Delphi has been infrequently used to explore issues that fostered a specific decision or policy in the past (Strauss and Zeigler 1975). Delbecq and others (1975) note that Delphi is a decision-making tool which is easily "modified to respond to the needs of the individual decision-makers."

Among the attributes of the Delphi method is that it maintains attention directly on the selected issue and avoids the sidetracking which may occur in group meetings. Delphi provides a framework within which individuals from diverse backgrounds or remote locations can work together on the same problem. The records concerning the study can be precisely documented, as all the responses are written (Enzer and others 1971). Because anonymity of the participants is a key factor of a Delphi study, three typical problems encountered in group meetings are avoided: (1) participants are less subject to the *halo effect*, where the opinion of one highly respected participant influences the opinions of others strictly on the basis of that respect, (2) participants are also less subject to the *bandwagon effect* which encourages agreement with the majority (Tersine and Riggs 1975), and (3) a situation is in place that encourages a *consensus* rather than *majority rule* (minority opinion is given and considered).

Delphi was developed as a tool to decrease the uncertainty regarding events and processes, not to eliminate it. The predictions and estimations made even in a *numerical* Delphi are *subjective*, based on the opinions and knowledge of the participants. Delphi results are the collective educated guess of knowledgeable persons.

Using Delphi in Ecosystem Management Research

Delphi appears to be well suited as a preliminary step in long-term ecosystem management research such as ours. Our understanding of the structure and functions of bottomland hardwood forests is fragmented and far from complete. While considerable expertise on various components of these systems exists, it is largely disciplinary, local, and has yet to be systematically integrated. Understanding of impacts of alternative silvicultural practices on these systems is similarly limited. Through the use of Delphi we hope to collect existing expertise and apply it to our study objectives.

Participant Selection

A Study Team of university and Forest Service researchers was formed in 1994 to instigate this research. A regional conference on bottomland hardwood forests held in Stoneville, MS served to identify both the key topics in managing this resource and the scientists currently working in the field (Stanturf 1994). Starting with the presenters at the Stoneville conference, Study Team members began to identify potential candidates for the Delphi panel.

Panelists will be individuals with widely recognized expertise in one of the following four areas relating to Bottomland Hardwood Ecosystems (BLHE):

(1) silviculture/ecology
(2) wildlife/biodiversity
(3) hydrology/soils
(4) management/social aspects/economics

These experts will be identified through networking, a sociological method designed to elucidate community power structure (Domhoff 1978). The Study Team will use their knowledge to construct an initial list of experts, striving to obtain as broad a range of expertise and professional affiliation as possible. Potential panelists will receive a letter explaining the study and requesting names of additional experts. From these responses the team will contact a second round of potential panelists consisting of any newly identified experts. This process will be repeated until no new experts are identified. The team will then contact all identified experts to invite them to participate in the Delphi study. We envision using a combination of mail, email, and FAX communications to administer the questionnaires.

Qualitative Delphi

While the data instrument in Delphi is called a questionnaire, it does not resemble a typical survey research questionnaire. The initial questionnaire might

consist of an open-ended question. For example, we might ask, "What factors should be considered in evaluating even-aged versus uneven-aged management of bottomland hardwood ecosystems?" Another alternative would be to ask the experts to list the attributes or criteria they would use to compare even-aged versus uneven-aged management in terms of commodity and noncommodity values.

Alternatively, they could be given a list of attributes and asked for their additions, deletions, or organizational modifications. Responses to the initial questionnaire will be collected and summarized by the Study Team. These summaries will be used to construct the next iteration of the questionnaire. This second iteration will be used to clarify ideas brought out in the initial questionnaire. This process of controlled feedback and iteration will continue until a satisfactory degree of consensus among panelists is achieved on key questions. This collective consensus will contribute to development of a conceptual model of cause-and-effect relationships for natural processes.

Quantitative Delphi

A second phase of the Delphi study will be conducted to predict mean values for effects of management actions on important processes or functions. Experts will be asked to first identify the most important processes or functions that are affected by management. This will be done using a Likert scale from most affected to least affected. Panelists will be asked to justify all "high-impact potential" ratings and to suggest measures by which effects can be evaluated. Controlled feedback and iteration will again be used to obtain convergence on ratings and measures.

During this phase of the study, site-specific attributes of bottomland hardwood ecosystems will become important for obtaining consensus. This is because of the variety of possible interpretations of such ecosystems. For example, regeneration success following even-aged treatments will be judged differently if one expert pictures a cypress tupelo swamp while another pictures a red oak-sweetgum stand in an occasionally flooded second terrace. Case studies will be used to alleviate this problem. These case studies will reflect the actual Interagency Wetlands Initiative study sites in terms of such factors as hydroperiod, community composition and structure, and landscape. Panelists will be directed to base their evaluations on these site types whenever a general "wetlands" response is not appropriate.

Synthesis

The synthesis stage of the Delphi effort will be instrumental in developing a biologically based computer simulation model of ecosystem behavior that can be used to analyze the response of bottomland hardwood ecosystems to disturbance. The overall Ecosystem Management project will provide three kinds of information necessary to develop the simulation model. First, process-oriented research will quantify plant-environment relationships. Second, research on ecosystem structure and function will provide the framework and sideboards necessary for the model. Third, response-to-disturbance research in phase 2 of the study will allow us to quantify the effects of disturbance or management activities on important wetland functions.

Because the information needed to develop this detailed quantitative model is lacking, the Delphi study is developing a conceptual model during the initial qualitative phase and parameterization will occur during the subsequent quantitative phase. A first draft conceptual model, produced using STELLA II, is shown in figure 2 (High Performance Systems, Inc. 1994). In this model, the rectangles represent stocks, things which accumulate and/or are depleted. The open arrows represent a flow into or out of a stock, and the circles represent converters, receptacles for specifying the logic that will regulate the volume of the flow. Figure 2 illustrates the general relationships between hydrologic, edaphic, and biologic factors. Ultimately, we hope to incorporate potentially significant social relationships within the model, including, for example, aesthetic, economic, and recreational values.

In the Qualitative Delphi phase, we will expand and refine this model. During the quantitative phase the stocks and flows in the model will be quantified using information available in the literature, provided by experts, or estimated during the field component of the Ecosystem Management study. The outcome of this model will help define cause and effect relationships between natural processes operating in bottomland hardwood ecosystems and will also be used to estimate how different management activities directly and indirectly influence natural processes. Tree vegetation is the primary target of most management activities in these systems. It is also a major biological component of the

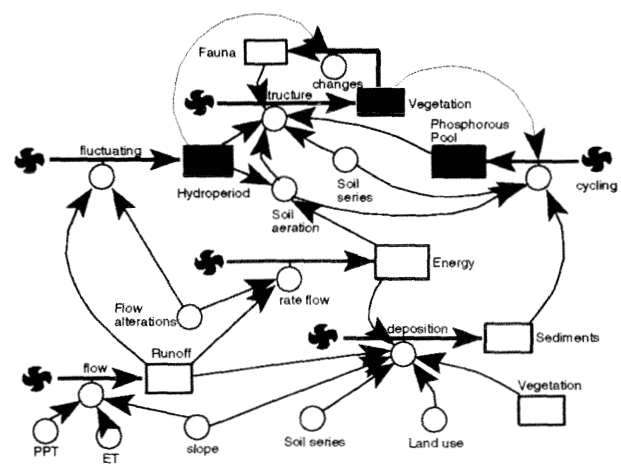

Figure 2–Diagram of forested wetland ecosystem simulation model produced using STELLA II. (High Performance Systems, Inc. 1994).

ecosystem, influencing in one way or another most aspects of ecosystem structure and function. The ability to predict the functional response of forested wetlands to different harvesting methods is central to developing useful guidelines for management. Several harvesting scenarios will be contrasted in the synthesis stage of the Delphi study and outcomes will be used in identification of the best harvesting techniques to be used as treatments in the field experiment (phase 2) planned for the Ecosystem Management study.

Summary

Bottomland hardwood ecosystems are complex and incompletely understood. Their significance as sources of ecological, social, and economic goods and services has increased as their areal extent has declined. Our over-arching objective is to advance understanding of how these systems work and how they may be sustainably managed to produce these goods and services. Collecting and synthesizing existing knowledge on bottomland hardwood ecosystems and their management is a first step toward this objective.

Acknowledgments

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Identifying Changes in Forest Values: A Computerized Content Analysis

Zhi Xu, David N. Bengston, and David Fan

Abstract

Based on our classification system which identifies four fundamental forest values, value dictionaries were developed and three text databases were built to represent three groups of interest: public, forestry professional, and environmentalist. An integrated coding approach was developed and used to ensure the accuracy, validity, and reliability of the findings. Finally, statistical models were employed to examine the trends and analyze the results. The implications of the approach used and the findings were also discussed.

Introduction

Changes in social values related to natural resources and the environment have been taking place in the United States and in other nations in recent decades, especially in the past decade. Managing the national forests in ways that are responsive to changing public values is the core problem faced by the USDA Forest Service. It is increasingly recognized that the values people hold regarding forest ecosystems are an important part of the social underpinning of ecosystem management, the emerging paradigm of forest management. As concepts of what is good or desirable about forest ecosystems, values play a critical role in identifying ecosystem management goals, setting the context for decisionmaking, and guiding our choices.

A more systematic understanding of recent changes in forest values is needed to develop resource management approaches that are responsive to changing forest values and to anticipate the future evolution of forest values. A number of recent studies have analyzed forest and related value systems at a particular point in time (e.g., Steel and others 1994, Holler 1990, Brown and Harris 1993). But little research on forest values–or environmental values in general–has examined how they have changed over time. This is due in part to the limited number of approaches available to analyze the evolution of abstract concepts such as values.

Forest Values

There are many different ways to classify forest values. For example, Rolston and Coufal (1991) identified 10 categories of forest values, Henning (1987) distinguished 13 categories of wilderness values, and Driver and others (1987) distinguished 34 categories of wilderness benefits and values. In this study, we distinguish four distinct and mutually exclusive ways in which people value forests and forest ecosystems: economic, life support, aesthetic, and moral value. (See Bengston (1994b) for a more detailed discussion of this values classification system.) These four categories of forest values are the basis of the content analysis described in the following sections.

Economic or, more broadly, utilitarian value is a type of instrumental value. The economic value of a forest ecosystem stems from its utility for achieving human ends, where the ultimate end or goal is maximizing preference-satisfaction. Maximizing pleasure or happiness was the ultimate goal of classical utilitarians. But contemporary utilitarianism and mainstream economics focus on the goal of maximizing preference-satisfaction (Sagoff 1988, Wenz 1988). The economic conception of the value of nature focuses on the usefulness of nature as expressed in individual preferences or an aggregation of individual preferences.

Life support value is another broad concept of what is instrumentally good about forest ecosystems. For people who hold this value, life-supporting environmental functions or services are good because human well-being depends on these functions and services. Unlike economic value, a simple aggregation of people's preferences for these benefits is an inadequate measure of the importance of life support value. Many people are unaware of the life-supporting benefits that ecosystems provide, so aggregating preferences or willingness to pay for life-supporting environmental services will not produce a meaningful measure of their importance. The benefits exist whether or not we are aware of the role of forest ecosystems in providing them. Life support values of the environment are as essential to all economic activity and to life itself as the foundation of a building is to its structural integrity. The perception of life support value requires an observer or valuer who understands why the foundation is essential, someone with some level of understanding of how ecosystems work and the life supporting services they provide. Pinchot succinctly expressed the life support value of the environment as follows: "Without natural resources life itself is impossible" (Pinchot 1987:505).

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Many people value forests noninstrumentally, in ways that go beyond their contribution to self-interested goals. Aesthetic value is a type of noninstrumental value in which beauty is the concept of what is good. Sagoff (1991) notes that nature may be valued as an object of knowledge and perception, which he defines as aesthetic value. According to this view, the basis of the aesthetic value of forests is not in the benefits that people receive from them, but in naturally occurring qualities of forests themselves. The perception of aesthetic value, however, requires an informed and discriminating observer or valuer. Aesthetic value has historically had and continues to have profound impacts on public land policy and management.

Finally, moral value is also a type of noninstrumental value. We value an object morally when we regard it with love, affection, reverence, and respect (Sagoff 1991). This is what Aldo Leopold had in mind when he wrote:

> "It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, I of course mean something far broader than mere economic value." (Leopold 1966:261)

Spiritual value is a type of moral value. Environmental psychologists and philosophers have studied the spiritual value of forests and trees. One environmental psychologist defines spiritual as:

> "... the experience of being related to or in touch with an 'other' that transcends one's individual sense of self and gives meaning to one's life at a deeper than intellectual level." (Schroeder 1992:25)

Our classification of distinctly different values does not deny the interweaving of values. For example, a house can both provide basic shelter and be gratifying to the eye of its beholder. An advertisement can serve both a commercial and an aesthetic interest. Similarly, forests are always valued in multiple ways simultaneously. The fact that forest values are intimately interwoven does not contradict the view that each forest value has a distinct motivation that is relevant to public forest policy.

Content Analysis

Content analysis is a research technique for making valid inferences from text by systematically identifying and analyzing meaningful expressions (words, phrases, clauses, sentences, and paragraphs) within text. It has been used by social scientists for many purposes, ranging from determining the psychological state of individuals to analyzing cultural patterns of groups, institutions, or societies over time (Weber 1990). Compared with other social science techniques for generating and analyzing data, content analysis has several advantages. First, a major advantage is the ability to analyze trends over long periods of time. Surveys and case studies have produced many insights into current forest values, but they are unable to shed light on the evolution of values, nor do they provide a basis for projecting these trends into the future.

Second, content analysis is unobtrusive in the sense that neither the sender nor the receiver of messages contained in the text being analyzed is aware that it is being analyzed. Thus, unlike surveys and interviews, there is no danger that the act of measurement itself will influence the expression of values. Third, unlike the historical approach, content analysis permits the statistical testing of hypotheses related to change in environmental values. (This in no way reduces the important contributions of qualitative research on environmental values. Our perspective is that qualitative research complements and informs quantitative research approaches.) Finally, Namenwirth and Weber (1987:26) note that:

> "For studying the long-term dynamics of culture, quantitative indicators based on text are important tools... they often reveal aspects of culture change not easily detected by other methods."

This study uses computerized content analysis to empirically analyze changes in forest values in the United States from 1982 through 1993. The basic idea of content analysis is that the large number of meaningful expressions contained in a piece of text are classified into content categories of interest. This requires the development of a procedure for classifying text designed to achieve the objectives of a particular study. The procedure is the heart of any content analysis. In this study, an integrated coding approach is developed to identify and extract expressions of forest values related to public forests in the databases of text representing the views of three groups: the general public, natural resource professionals, and mainstream environmentalists. The value system of each group is quantitatively summarized, and changes in value systems–or the relative importance of forest values–is tracked over time.

Method

Figure 1 outlines the procedure that was developed and used in this study. It consists of three stages. In the first stage, a classification system is developed which identifies four broad categories of forest values: economic, life support, aesthetic, and moral values. Based on this value classification system, three databases of text were built to represent three groups of interest, and forest value dictionaries were developed. In the second stage, based on the dictionaries and databases built in the first stage, an integrated coding process was performed by both a computer and a human coder to ensure the accuracy, validity and reliability of the results. Finally, statistical

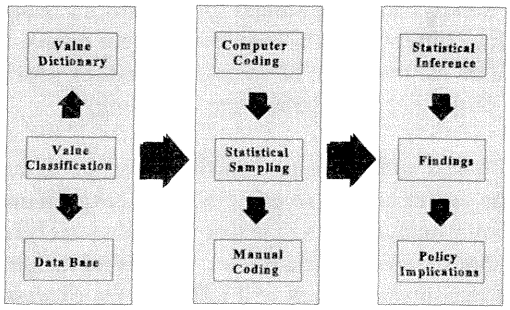

Figure 1–Overall procedure for content analysis of forest values.

models were employed to examine the trends and analyze the results. The implications of the findings to forest policy and management were also discussed.

Data

Databases of text that focuses on the national forests were developed for three populations of interest: (1) the general public, (2) forestry professionals, and (3) environmentalists. The content of newspaper articles was used as an indicator of public forest values. "Newspaper articles can be relatively good indicators of generally held views and interests" (Kellert 1985:20). Our experience examining hundreds of news media articles dealing with the national forests confirms Kellert's view. News media stories were obtained from the NEXIS electronic database. Stories included in our database were located using the search command "national forest." For the period 1982 to 1993, NEXIS was found to contain more than 15,000 stories that included the phrase "national forest," and out of this total population we randomly retrieved 2,000 stories for inclusion in our database.

In order to minimize the inclusion of irrelevant text, only text within 100 words of the words "national forest"–50 words on either sides–were downloaded. This greatly reduced the amount of irrelevant text that would have been retrieved from stories that mention the national forests only in passing, and helps ensure that the measured expressions of value are linked to national forests as opposed to other ownerships or land types. Experience with a large number of electronic text retrievals on a wide range of topics has shown that text outside of a 50- or 100-word window around the search words is often not relevant to the topic of interest. The general public database consists of 5.5 megabytes of text.

The values of forestry professionals were represented in a second database consisting of two components: (1) the complete text of keynote and general session papers presented at the Society of American Foresters national conventions from 1982 through 1993, and (2) the complete text of articles in the Journal of Forestry which dealt specifically with national forests over the same period. The final database representing the views of forestry professionals consists of 415 articles and 6.7 megabytes of text.

Similarly, a database to represent the perspective and values of mainstream environmentalists was constructed by scanning in the complete text of articles dealing specifically with the national forests in magazines published by three major forest-related environmental groups: The National Wildlife Federation's magazine National Wildlife, the Sierra Club's magazine Sierra, and The Wilderness Society's Wilderness. The National Wildlife Federation was the largest U.S. forest-related environmental organization in 1993, with 6,200,000 members (Hendee and Pitstick 1994). The Sierra Club and The Wilderness Society were also among the largest forest-related environmental groups, with 650,000 and 310,000 members respectively in 1993. Taken together, text from the magazines published by these three groups should provide a good cross-section of the beliefs and values held by mainstream environmentalists. This database contains the full text of 238 articles and 3.1 megabytes of text.

Value Dictionaries

The objective that guided the development of our content analysis procedure was to produce a set of reliable and valid indicators of the expression of the four broad categories of forest values. The first step is to define the basic unit of text to be classified. Individual words and phrases, sentences, paragraphs, and whole texts may be used as the unit of text for analysis. Choice of an appropriate unit of text depends on the specific research questions of interest. In this study, we have chosen to use individual words and phrases as the basic indicator to extract the expressions of values. This approach is most appropriate given the interweaving of forest values. For example, the hypothetical sentence "Production of goods and services does not preclude maintaining the natural beauty of forests," would be classified as an expression of economic value (as indicated by the phrase "goods and services") and an expression of aesthetic value (as indicated by the word "beauty"). By classifying individual words and phrases rather than larger units of text, our content analysis procedure is able to more accurately account for multiple expressions of forest values.

The next step is the development of lists of words and phrases–called dictionaries–associated with each of the content categories. Dictionaries serve as indicators of the

concepts of interest–forest values are abstract concepts not capable of being directly observed. The dictionaries enable us to indirectly observe and quantify expressions of forest values. Development of the forest value dictionaries involved an iterative process. The iterative process that we used is similar to what Fan (1988: xvii) refers to as the method of successive filtrations.

> "From biochemistry, I learned that the study of complicated materials frequently benefits from a series of purification steps, each one removing extraneous components to yield progressively more homogeneous preparations enriched in relevant materials. This logic led to the strategy of successive 'filtrations' during the text analyses."

Initial dictionaries were developed for each value category by examining forestry-related texts that clearly express a particular type of value. Each of these initial value dictionaries were then sent to subject matter specialists for review and refinement. The subject matter specialists were asked to comment on the dictionaries and offer suggestions for additional words and phrases expressing forest values within their areas of expertise.

The most important reason for refining the value dictionaries is to ensure their validity. Using three databases of text on the national forests (described in the above section), computer-generated key-word-in-context (KWIC) lists were examined to determine which of the words and phrases contained in the draft value dictionaries were accurate indicators of the expression of the four values. Words and phrases that were found to be used ambiguously or incorrectly were dropped from the dictionary. For example, the word "spirit" was originally included in the moral value dictionary. But examination of the use of this word in context revealed that it was used correctly–that is, expressing the moral or spiritual value of forests–only about 16 percent of the time. Incorrect usage included phrases such as "a spirit of compromise" and "a cooperative spirit." The word spirit was therefore dropped from the moral value dictionary.

The process of refining the dictionaries by applying them to a large sample of text, assessing the accuracy of coding in context, and revising the dictionaries as needed was repeated until a satisfactory level of validity was achieved. We defined a "satisfactory level" as correct usage 80 percent of the time or greater–a rule of thumb that is sometimes used in content analysis of this type. This iterative approach restricts the value dictionaries to those words and phrases that are valid indicators of the particular type of value in at least 80 percent of the uses, and ensures a high level of validity of the analysis.

It is worth noting that the words and phrases in the value dictionaries are neither values nor value expressions. They are indicators of possible value expressions. Through the value dictionaries, we can extract a piece of text called a Key-Word-In-Context (KWIC). It is these KWICs that encompass value expressions and which we can assess later in terms of validity, reliability and accuracy.

Integrated Coding

No matter how much effort is put into refining the dictionaries, ambiguity, inaccuracy and implicit meanings cannot be avoided in computer coding. Computer programs have limitations in dealing with the complex structure of language, although some programs can deal with these problems at the expense of losing other advantages such as speed and accuracy. In addition to concerns about validity in content analysis, the reliability or consistency of text classification is a concern when multiple human coders are used (e.g., Kellert 1985). Despite a well-conceived set of coding rules and careful training of human coders, people inevitably introduce variability in how they interpret and apply category definitions or other coding rules. However, the computer always applies the coding rules consistently and can process a large amount of text in a very short time. This will increase the accuracy, reliability, and validity of the coded results because of the large samples and consistency. Human coding has higher accuracy and validity in terms of each unit of text analyzed. But it is limited when a large amount of text needs to be coded and multiple coders are involved. In addition, small samples also reduce the reliability of the results. Therefore, in a real sense, computer and human coding processes are complementary. In this study, we combined both computer and human coding processes to avoid problems such as ambiguity, inaccuracy, and coder reliability and increase accuracy, validity, and reliability by taking advantage of both human and computer coding (fig. 2).

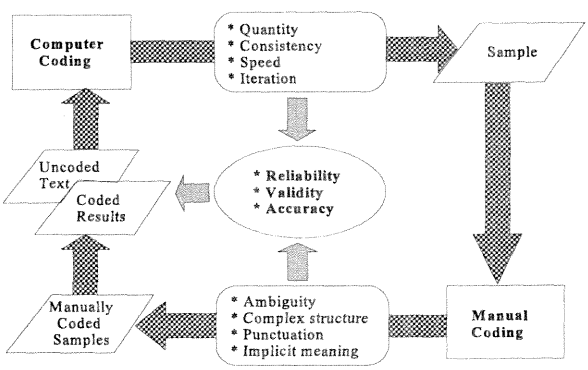

Figure 2–Computer and manual coding of text: integrated approach.

In this integrated coding process, we used INFOTREN (A content analysis computer application developed by David Fan at the University of Minnesota) and our value dictionaries to code text of our databases. Random samples were drawn from the computer-coded text. KWICs which contain the value expressions were examined and evaluated in terms of validity. This human coding was carried out by one of the authors (Bengston) to avoid the reliability problems that typically arise with multiple human coders. Table 1 gives the statistics for the human coded results (Confidence Interval = 0.95). Based on the results of human coding, the statistics of computer coding were corrected to ensure accuracy, validity, and reliability.

Statistical Models

Statistical models were used to examine the results of the integrated coding process. A generalized logit model was used to test hypotheses concerning differences in forest value systems between the three groups and to test for a shift in forest value systems over time. Forest values were the response, and groups and time period were the explanatory variables. The model can be expressed as:

$$\log\left(\frac{\pi_{j/hi}}{\pi_{J/hi}}\right) = \alpha_j + \beta^g_{hj} + \beta^t_{ij}$$

where:

$\pi_{j/hi}$ = probability of value j expressed by group h in time period i

α = intercept

β^g = parameter for groups (public/news media, forestry professionals, environmentalists)

β^t = parameter for time period (where the following four time periods were used: 1982-84, 1985-87, 1988-90, 1991-93)

J = baseline category for calculating logits (moral value)

To further identify the changing trends of forest values over time, we use a linear probability model to examine the trends in proportions of forest values expressed by the three groups over time. Cochran-Armitage proportion trend tests (Agresti 1990) were carried out to determine the statistical significance of the trends. The value trend model can be expressed as:

$$\hat{\pi}_{j|i} = p_j + b(t_i - \bar{t})$$

where:

$\hat{\pi}_{j|i}$ = probability of value j in time period i (i = 1, 2,..., 12; j = 1, 2, 3, 4)

P^j = sample proportion of value j in observation period

b = estimated coefficient

t_i = time period i

$\bar{t}$ = average time period

Table 1–Samples and results of human coding (Confidence Interval = 95 percent)

Sources	Population (N)	Sample (n)	Sample (Percent)	Valid (Percent)	Valid (n)
Public / News media:					
Economic	3075	238	7.74	78	2403
Life support	1227	68	5.54	99	1209
Aesthetic	473	119	25.16	92	433
Moral/spiritual	166	63	37.95	92	153
Environmentalists:					
Economic	2052	357	17.40	25	512
Life support	1264	72	5.70	99	1246
Aesthetic	385	102	26.49	92	355
Moral/spiritual	222	103	46.40	87	194
Forestry Professionals:					
Economic	8248	259	3.14	92	7611
Life support	3060	125	4.08	94	2864
Aesthetic	419	147	35.08	82	345
Moral/spiritual	280	112	40.00	88	245
Total	20871	1765	8.46	88	17570

We tested the hypothesis that the slope b of the value trend model is zero. The statistic z^2, based on df = 1, tests for a linear trend in the proportions (Agresti 1990):

$$z^2 = \left(\frac{b^2}{p_j(1-p_j)} \right) \sum n_{i\bullet} (t_i - \bar{t})^2$$

where:

$n_{i\bullet}$ = total value frequency in period I.

If the model is rejected, there is significant evidence to indicate linear trends in the proportions of forest values expressed over time. The sign of b indicates the direction of trends: a positive sign represents an upward trend and a negative sign represents a downward trend.

Results

Figure 3a-d summarizes the forest value time trends for all three groups. These figures show changes over time in the relative frequency of expression of forest values. The trends shown in these figures have been smoothed using 3-year moving averages to reduce fluctuations due to short-term issues and to better reveal the underlying, long-term trends. The end points of each of the time trends (1982 and 1993) are not shown in the figures due to calculation of the 3-year moving averages.

We used a generalized logit model to examine group effects and time effects through the hypotheses $b^g = 0$ (i.e., no difference between groups) and $b^t = 0$ (i.e., no difference between time periods). G^2 tests (likelihood-ratio chi-squared tests) were performed to examine these hypotheses. The results indicated significant differences between groups ($G^2 = 1239.33$, df = 6, P-value < 0.001) and time periods ($G^2 = 185.38$, df = 9 and P-value < 0.001).

In addition to testing these general hypotheses, we also examined the individual trends for each value and group using Cochran-Armitage proportion trend tests. The results are shown in table 2. For economic value, this test provides strong evidence of a downward trend for forestry professionals and environmentalists (P-values < 0.001), but does not show much evidence of a trend for the public/news media over the entire 12-year period. When only the past 6 years are tested, however, the test suggests a recent downturn in relative frequency of expression of this value for the public/news media (P-value < 0.001). Figure 3b shows the trends in relative frequency of expression of life support value. These trends are almost a mirror image of the economic trends. The trends for environmentalists and forestry professionals are upward and fairly dramatic. The public/news media, on the other hand, seems to be lagging behind the other groups, with no discernible trend until the upturn in the expression of life support value in

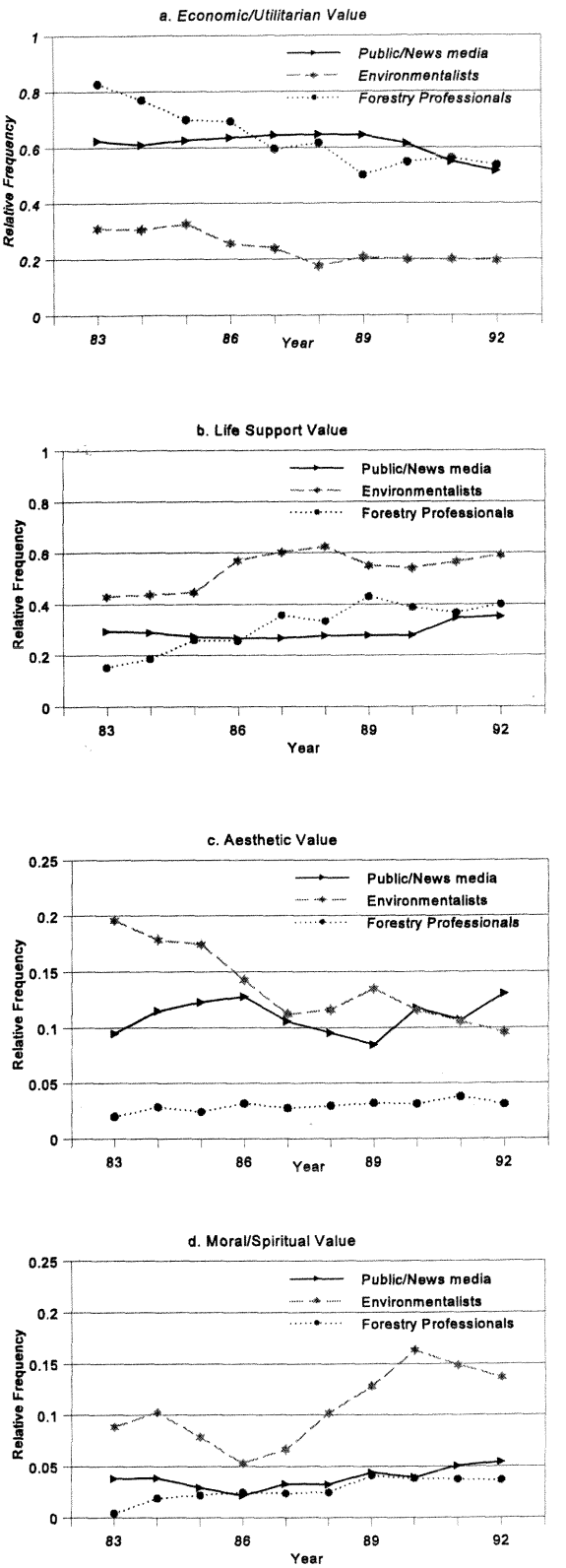

Figure 3 a-d–National forest value time trends.

the early 1990s. The Cochran-Armitage trend test gives strong evidence of an upward trend for forestry professionals and environmentalists over the entire time period (P-values < 0.001), but not for the public/news media (P-value > 0.25). Once again, however, there is evidence of an upward trend for the last 6 years for this group (P-value < 0.025).

Trends in the expression of aesthetic value for the national forests are shown in fig. 3c. Note that the scale on the horizontal axis has changed for figures 3c and 3d, reflecting the fact that aesthetic and moral values are expressed much less frequently than economic and life support values in the text we analyzed. Based on the results of the trends test (table 2), there is no obvious trend for the public or forestry professionals. But a clear downward trend is evident for environmentalists (P-value < 0.01), and there is evidence of a significant increase in the expression of aesthetic value by the public/news media over the last 6 years of our data (P-value < 0.025). Forestry professionals clearly stand out from the other groups with a low relative frequency of expression of aesthetic value.

Finally, fig. 3d shows the trends in the relative frequency of expression of moral value. Results of the trend test provide evidence of a significant increase in expression of this value over the time period by forestry professionals (P-value < 0.001) and environmentalists (P-value < 0.05), but not by the public/news media (P-value < 0.25). As shown in fig. 3d, environmentalists clearly stand out from the other groups in their relative frequency of expression of the moral value of the national forests.

Conclusions

First, life support, aesthetic, moral values, and many noneconomic values cannot be adequately understood through the positivist-utilitarian approaches to studying environmental values that have dominated in the past (Bengston 1994b). A much broader array of disciplinary perspectives and methods–both quantitative and qualitative–will be required to increase our understanding of these values. Research methods that may be useful include indepth interviews, focus groups, content analysis, and interpretation of texts (Patterson and Williams 1994). Content analysis, as one research method in the social sciences, could play an important role in natural resource and environmental management as electronic databases, sophisticated algorithms, and high speed computers are increasingly available.

Second, our integrated coding process combines the advantages of both computers and humans in recognizing language characteristics. Computers have speed, consistency, and accuracy in coding relatively simple and clear language units. But when the ambiguity and complexity of the language increases, computers lose their edge to human coding. Although more sophisticated programs combined with high-speed processing in the future could increase the ability of the computers to deal with complicated language phenomena, the integration of human coding with computer coding will no doubt raise the quality of the results. Our study shows that the joint process contributed to the validity, reliability, and accuracy of the coded results and efficiency of our study. For example, only 8.5 percent of the computer-coded text is required for human coding by a random sampling procedure to obtain a 95-percent confidence interval (table 1).

Third, the integrated coding procedure that we developed could also improve content analysis and increase the quality of this social science technique. In this study, the words and phrases in our dictionaries are only used as indicators (KWIC) of meaningful expressions. With the computer, we can process a large amount of text to increase the reliability of the findings. These KWIC text units, coded and extracted by computer, are highly concentrated in the intended ideas (forest values). In other words, the probability of finding the intended ideas in the concentrated text coded by computers is very high. Our study shows that 88 percent of the computer coded text units contain valid value expressions (table 1). Samples of these concentrated text were further coded manually to ensure the accuracy, validity, and reliability.

Table 2–Results of forest value trends tests for the period 1982-93 (z^2 statistic, with P-values shown in parentheses)

	Forest Value			
Group	Economic/ Utilitarian	Life Support	Aesthetic	Moral/Spiritual
Forestry professionals	299.61 (< 0.001)	236.24 (< 0.001)	1.80 (< 0.25)	35.99 (< 0.001)
Environmentalists	13.85 (< 0.001)	13.34 (< 0.001)	7.46 (< 0.01)	4.68 (< 0.05)
Public/ news media	2.70 (< 0.1)	1.04 (> 0.25)	0.04 (> 0.25)	2.43 (< 0.25)

Fourth, our findings tend to confirm the following intuitive observation from the report of the Forest Ecosystem Management and Assessment Team:

> "The paradox is that those social values for which our ability to define and measure is poorest, are the very ones that appear to be of increasing importance in our society." (Forest Ecosystem Management and Assessment Team 1993: VII-33)

Our findings suggest a shift in forest values away from easily defined and measured economic values, and toward values that are much more difficult to measure and that have often been neglected or ignored. Specifically, the life support and moral value of national forests–which we have argued cannot be meaningfully expressed in economic terms–do appear to be of increasing importance to forestry professionals, environmentalists, and, in recent years, to the public/news media.

Finally, our finding that the life support value of the national forests plays a prominent and growing role in the value systems of forestry professionals, environmentalists, and, in recent years, the public/news media suggests that this concept of what is good about forests is now widely recognized and appreciated. The importance of life support value that we found tends to confirm environmental historian Donald Worster's observation about the influence of ecology on our culture: "So influential has their branch of science become that our time might well be called the 'Age of Ecology'" (Worster 1994: xiii). The increase in the expression of life support value suggests that ecosystem management–which is often characterized as being based on ecological principles and placing greater emphasis on ecological values than traditional forest management–may indeed be an idea whose time has come.

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Nonindustrial Private Forest Landowners in Indiana: Are Their Objectives and Attitudes Consistent with Ecosystems Management?[1]

William L. Hoover, W.L. Mills, Jr., and Sudha Vasan

Abstract

A mail survey and focus group discussions profile non-industrial forest landowners of Indiana. The mail survey indicates most owners support conservation and environmental objectives. Focus group discussions indicate they don't connect their actions with the landscape. They're leery of government programs and protective of private property rights. Public goods and property rights aspects should be addressed before implementing programs. Landowners' desire to be good stewards, however, provides a basis for program development.

Introduction

Nonindustrial private forest (NIPF) owners have been the focus of research for over 30 years. This is inevitable since their holdings account for 58 percent of the commercial forest land in the United States. In Indiana, they account for 87 percent of the commercial forest land, and supply about 93 percent of the sawtimber harvested (Smith and Golitz 1988).

For more than 30 years government agencies have attempted to motivate NIPF landowners to improve management practices on their lands (Weatherhead, Chapman, and Kelso 1982). These programs focused on timber production and met with limited success (Beazley and Holland 1973, Clawson 1979). Experience with the new Stewardship Program should provide insights into the willingness of NIPF owners to participate in broader-based programs. Achievement of ecosystem-level objectives will require participation by critically located owners.

The primary focus of this research was to target assistance programs to the "consumer's" needs. Why do some landowners participate in programs, while others don't? This question must be answered to ensure wider participation and therefore better management. We must define our "consumers" and understand them to successfully market programs. A premise of this research is that early adopters were most easily motivated, and nonparticipants have attitudes about program attributes that are different from those of participants. Increasing participation may require alternative marketing strategies and changes in programs. A comparison of participants and nonparticipants would help in designing and marketing programs.

Methodology

Sample Scheme

Since there is no comprehensive list of forest owners in Indiana, a sampling scheme used to estimate agricultural statistics was employed. Sample points were sections containing at least 20 acres of privately owned land with trees. Sampling points were selected by ranking all counties by area of forest land. Sequential sample points were the sections containing every 40,000th acre of land with trees. Since the acreage of forest by individual township in the state is not known, it was assumed that the acreage of land with trees in a county is evenly distributed over all nonurban sections. Sections identified as urban or more than 50 percent owned by the USDA Forest Service were excluded from the estimate of land with trees and were not subject to selection when the sample was drawn.

The names and addresses of all landowners with at least 10 acres of land with trees in sample sections were collected from tax records in county offices. Ten acres was specified by the sponsor. This is the minimum required to participate in most Indiana assistance programs. The questionnaire was mailed to 574 landowners. A second mailing was made to nonrespondents. Valid responses were received from 319 landowners, a response rate of 55.6 percent.

Only 21.6 percent of the respondents in the initial sample had participated in any assistance program. This resulted from the relatively low proportion of participants in the population of landowners. Comparison of participants and nonparticipants required a more equal representation. Hence, the questionnaire was sent to a random sample of participants in the Classified Forest program. This sample included 215 landowners who were not included in the previous mailings. A valid response was received from 117 landowners, a 54.4 percent response rate. This gave a total effective sample size of 436 landowners.

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[1] Purdue University Agricultural Experiment Station Journal Paper No. 14522

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This sampling scheme eliminated several biases. Many previous studies have sampled only participants in programs. The results of the present study verify that for the sampled population many significant differences exist between the populations of participants and nonparticipants. The results also show that a majority of nonparticipants don't know about the programs. Thus, the comparison of participants and nonparticipants does not discriminate for nonparticipants who have made an informed decision not to participate.

Questionnaire

The components of the eight page questionnaire[2] were based on interpretations of focus group discussions with landowners on five watersheds in Indiana (Yang 1993). Categories of questions were description of wooded land, wooded land use and management, management assistance, and demographic information. Questions were included to provide a profile of participants and nonparticipants, and to develop a logit model characterizing participants.[3]

Analysis

Participants were defined as respondents who had enrolled in either of two classes of programs: classified and cost-share. Classified programs provide a $1 per-acre assessed value for property tax determination. Enrollment is available for qualified lands devoted to timber production, windbreaks, and wildlife habitat. Cost-share programs included Agricultural Conservation Program, Forestry Incentive Program, and Stewardship Incentive Program.

Results and Discussion

Chi-square tests of selected characteristics of participants and nonparticipants indicate significant differences (SPSS, Inc. 1988) for many attributes, especially attitudes towards forest management (Vasan, 1994). These differences are not necessarily indicative, however, of either group's willingness to participate in ecosystems management programs.

Attitudes

Nonparticipants were more strongly oriented toward multiple-use management. They considered noncommercial values to be a more important reason for owning woodland than commercial values. Sixty-one percent of the nonparticipants said that commercial reasons, such as land investment and timber production, were unimportant in their decision to own woodland. Aesthetic enjoyment was at least somewhat important for 88 percent of respondents. There is no significant difference between participants and nonparticipants regarding the importance of aesthetics. It is somewhat more important, however, for owners of less than 100 acres: figs. 1 and 2.

The focus on multiple-use management may be due in part to a personal attachment to the land. Their land was also the location for their home for 51 percent of the respondents. In a related question, 57 percent considered the land to be part of their residence. The difference is probably due to the ownership of second homes. Over 75 percent of the 49 percent not living on the woodland lived within 60 miles thereof. This situation contrasts sharply with that of States like Pennsylvania, where most landowners are absentee owners (Jones 1994).

Nonparticipant landowners showed more interest in participating in noncommercial activities. The activities considered as commercial in this survey include timber sales and timber stand improvements. The noncommercial activities included construction of erosion control

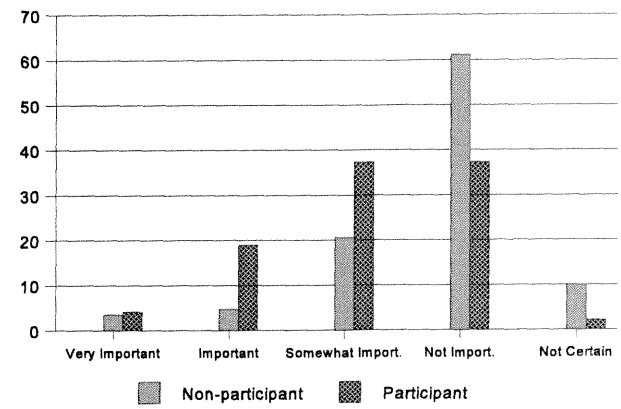

Figure 1–Commercial reasons for owning timberland.

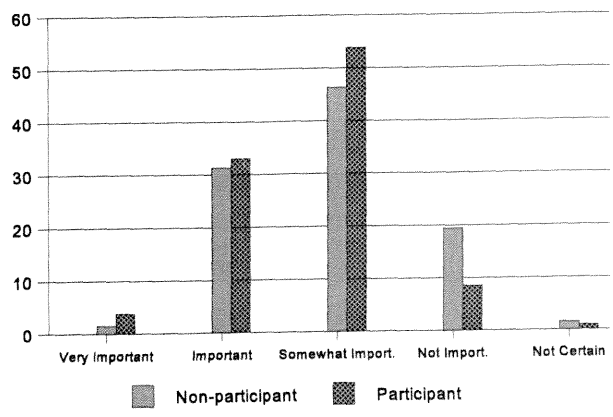

Figure 2–Non-commercial reasons for owning woodland.

[2] Copies are available from the author.

[3] The model is being developed by Nagubadi Rao, Graduate Assistant, under the direction of professor Kevin McNamara, Department of Agricultural Economics, Purdue University.

improvements, ponds, wildlife habitats, enhancements for family recreation, establishment of food plots for wildlife, harvesting timber for personal or family/friend use, and planting trees. Although an increasing proportion of tree planting is for commercial purposes, the majority of planting in Indiana is not based on a reasonable expectation of financial return during the life of the owner. Figures 3 and 4 show that participants in government programs have consistently done more of the commercial and noncommercial activities on their land. However, more nonparticipants say they are planning to do or thinking about doing noncommercial activities on their land. More than half the nonparticipants clearly have no current interest in commercial activities on their land.

The future expectations of both groups showed the same trend. Both expected the importance of noncommercial values of their woodland, such as aesthetics, farm and domestic use, and recreation, would remain the same in the future or become more important. They differed in their expectations about commercial values (timber sale and land investment). Participants were more likely to expect an increase in the value of the property than were nonparticipants.

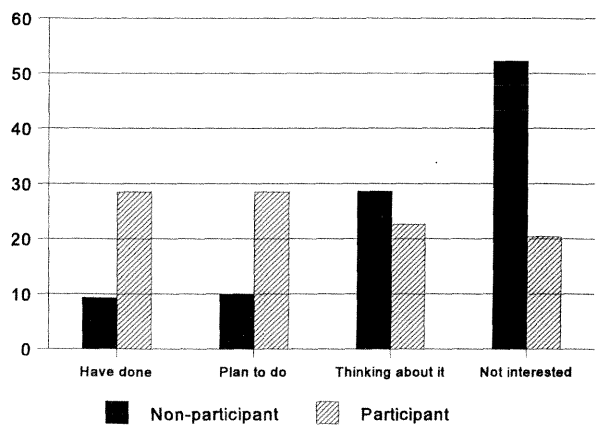

Figure 3–Interest in commercial activities on woodland.

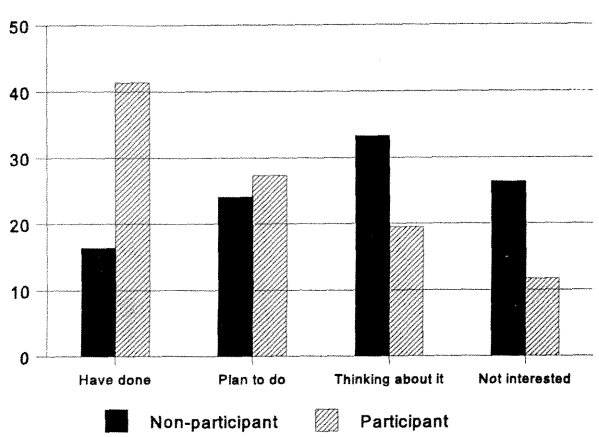

Figure 4–Interest in noncommercial activities on woodland.

Awareness

Nonparticipants were less aware of the services offered by district foresters, the major source of technical forestry information in Indiana. District foresters, located in regions throughout Indiana, are employed by the Department of Natural Resources, Division of Forestry. Overall, nonparticipants were less likely to take advantage of any of the available sources of information. Seventy-four percent of the nonparticipants answered that they did not know if the district foresters provided assistance on cost-share programs. For each of the programs, at least 50 percent of the nonparticipants were unaware of whether the service was provided by district foresters. As expected, the participants were aware of most of the services provided. The least known, however, was assistance on cost-share programs (35.7 percent answered negatively).

Image of District Foresters

Participants were much more aware of the services provided by district foresters than were nonparticipants. The most popular service offered by district foresters was assistance with forest insect and disease problems (table 1). Nonparticipants were also interested in tree planting plans. Respondents don't look to district foresters for overall management advice.

Demographic Differences

Nonparticipants generally had less education, lower incomes, and smaller tracts of woodland. Some occupational groups showed a higher tendency to participate than others (fig. 5). As expected, farmers were more likely to participate. However, the largest

Table 1–Services expected of district foresters

Services wanted	Non-Participants	Participants
	Percent	
Classified forests	25.6	77.1
Cost-shared programs	26.1	70.8
Marketing timber	29.7	71.3
Insect and disease problems	42.6	78.1
Forest stewardship	24.0	62.6
Inventory resources	32.0	67.4
Management plans	31.8	70.9
Tree planting plans	41.8	76.9

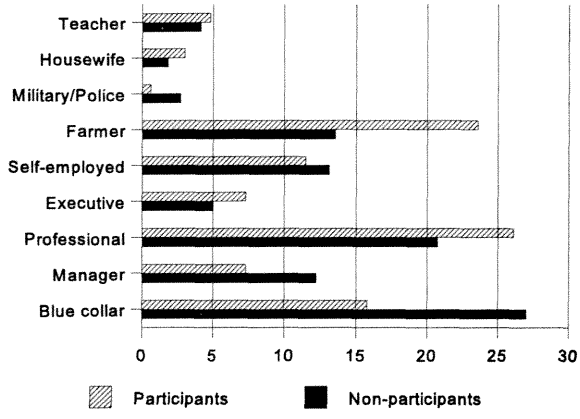

Figure 5–Primary occupations of participants and nonparticipants.

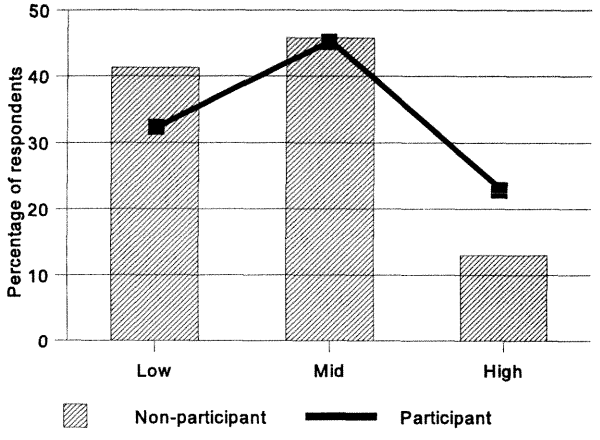

Figure 6–Level of education of participants and nonparticipants.

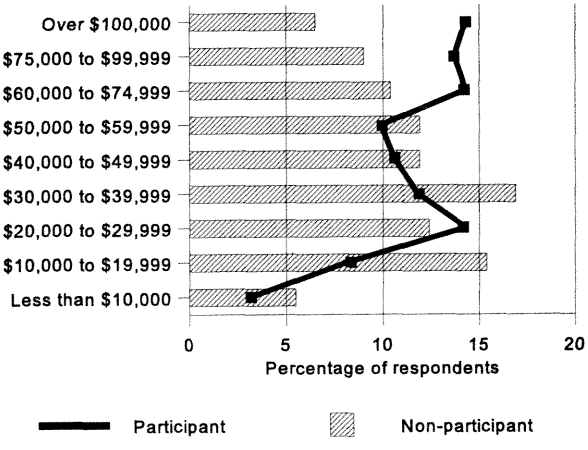

Figure 7–Annual family income of participants and nonparticipants.

occupational group among participants was professionals rather than farmers. Executives, housewives, and teachers were also more likely to participate. Blue collar workers showed a tendency to not participate. Those self-employed or in the armed forces or police were also less likely to participate. Differences in participation were also reflected in levels of education and income. Landowners with higher education were more likely to participate than those with a lower level of education (fig. 6). Similarly, there were more participants among the higher income groups (fig. 7).

Management Implications

The data generally support the view that NIPF landowners are stewardship oriented, and do not own forest land simply for timber production. However, timber production is the primary commercial use in Indiana. Hunting is popular, but hunting leases on private lands are very uncommon. Landowners' current interests relate to noncommercial values. This does not imply that they are against timber production. We conclude that they are interested in a more holistic use of their land. They will be more likely to participate if provided with an integrated program that includes all resource components.

Nonparticipants generally own smaller tracts of land than participants, and have a lower average education and income level. A large percentage are blue collar workers. Noncommercial factors dominate their rationale for owning woodland, and their activities focus on noncommercial uses. They are, however, less aware of the woodland management options and assistance available to them.

A different type of program is probably required to reach nonparticipants. Since they are unaware of most of the options available to them, an information package needs to be designed specifically for this group. All NIPF landowners looked to district foresters mainly for technical assistance, rather than for help with forest stewardship. Again, this will be a point to note for future extension plans. The image of the district forester as a stewardship assistant needs to be built and reinforced.

Ecosystems Management Implications

The general interest in noncommercial values provides a reason to be optimistic about implementing ecosystem management strategies. Although the questionnaire was not designed specifically to address this issue, much of the information gathered is relevant.

Conservation easements

A strategy to permanently implement conservation goals is to obtain easements on private lands. Although this strategy is not widely used in Indiana, 2 percent indicated that a conservation easement applied to their land. Thirty-four

percent of all respondents knew what one was. Knowledge was somewhat higher for cost-share program participants: 47 percent. Of the 34 percent who knew what one was, 16 percent responded that they would be willing to sell an easement. Respondents owning more than 100 acres were more likely to know what one was (40 percent) than those who owned less than 100 acres (29 percent). The same was true regarding willingness to consider selling an easement: 19 and 13 percent, respectively. Overall, only about 5 percent of respondents both knew about and were willing to consider selling a conservation easement. We interpret these results positively. Use of conservation easements is usually triggered by significant increases in real estate values. The resulting high death taxes make it difficult to retain property within a family. This is not a significant problem in most areas of Indiana. Conservation easements are infrequently discussed in local and regional newspapers, and few conservation organizations in Indiana are currently promoting their use.

Loss of management rights

Only 29 percent of respondents believed they had lost options or rights to manage their woodland. This result may be higher than expected, considering that about the only restrictions implemented in Indiana are those federally mandated. Also mitigating the concern about loss of options and rights is the fact that 66 percent of those reporting a loss of options or rights indicated that their major concern was trespass. Only one respondent reported a loss of rights to harvest timber. Twelve percent expressed concerns related to wetlands, 10 percent were concerned with farm operations, and 11 percent with other factors, including deer damage, requirements for Soil Conservation Service farm plans, dumping of garbage, and others. Program participants were more concerned with losses of options or rights than were nonparticipants. Owners of more than 100 acres were also more likely to be concerned than were owners of smaller amounts of land.

Making programs more attractive

Respondents were asked whether participation would be more likely if specific program changes were made. These results also appear to support the concept of ecosystem management. Specifically: adding protection of endangered species and wetlands to program requirements would make 58 percent of respondents more likely to participate. We believe that focus group discussions are needed to properly interpret the response to questions such as this. Our assumption is that these respondents are interested in values related to endangered species and wetlands, and want to be involved in protecting them. It's not obvious that they are familiar with the restrictions that might accompany promotion of these values. Forty-eight percent of respondents indicated they would be more likely to participate if programs enhanced resource values (timber, wildlife, watershed, scenic beauty, etc.). Again, the questions were not specific enough to draw detailed conclusions.

Changes that would make respondents less likely to participate included allowing public access (91 percent); being told what to do (80 percent); increased bureaucracy, paperwork and documentation (86 percent); and restricting management options (69 percent). Nonparticipants were significantly more likely to respond negatively to these possible changes. Experience with existing cost-sharing programs indicates that simply adding cost-sharing provisions would not be the panacea needed to increase participation. Forty-nine percent of nonrespondents indicated that this change would make them less likely to participate. Twenty-eight percent were indifferent.

Availability of stewardship services

On average, about 50 percent of the respondents did not know what services were provided by district foresters. Over 60 percent of nonparticipants were unfamiliar with the services offered. The least-known service was assistance with stewardship. Participants in the classified programs were the most familiar with this assistance. By law, enrolled lands must be inspected by a district forester every 5 years. The questionnaire did not ask what the term "stewardship" meant to respondents.

Forty percent of respondents indicated they would use stewardship services if available from district foresters. The percentage was 51 for owners of more than 100 acres, 61 for participants in classified programs, and 65 for cost-share participants. Only 24 percent of nonparticipants indicated an interest in using stewardship services.

Inconsistencies

There appear to be inconsistencies between what respondents desire to see happen, and their concept of what accomplishing these goals might mean in terms of how they use their property. Indiana landowners, except commercial farmers, have little experience dealing with the type of government agency that might implement an ecosystem management program. Thus, it is possible that more resistance will develop in the future. The forestry community generally emphasizes voluntary approaches. Our success will be tested with a voluntary "best forest practices" program now being developed for Indiana.

Conclusions

We believe that the survey results do not provide evidence to reject an ecosystem management approach out-of-hand. The data seem to support the conclusion that landowners, if

asked, would support ecosystem management. The data show, however, that a majority of landowners are not positioned to make informed choices about the direction ecosystem management should take and their role in the process.

The data did not provide data on landowners' perceptions of their contribution to ecological health. The focus group discussions, however, led us to believe that programs should be evolved slowly. The current emphasis on ecology in K-12 instruction will provide future landowners with a better background in ecological concepts. The data indicate that a majority of the current generation is less inclined to acknowledge their possible contribution to ecosystem health. Such acknowledgment is a necessary, but not sufficient, condition for their participation.

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Thinking About Water Quality Management: Social Values, Wetland Ecology, and Landowner Practices

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Abstract

This paper analyzes how social values can affect wetland management. We outline three frameworks of value: (1) social utility; (2) action theory; and (3) epistemological. Value from the social utility framework arises from an object's usefulness for human purposes. Values from the action theory framework are objects existing in society that facilitate coordinated activity. Value from the epistemological framework arises from routine practices of everyday life. We illustrate how managers' assumptions about value formation, value change, and human behavior differ according to the value framework used.

Introduction

Water quality is an issue of widespread public concern in the Lake Champlain Basin of Vermont and upstate New York. Ecologists, anglers, environmentalists, community officials, and other stakeholders want to improve the quality of fishing, drinking water, and recreational opportunities on the lake. Water quality has traditionally been the domain of ecologists and limnologists, who framed clean water management as a technological problem requiring knowledge of biological systems. The recent trend toward ecosystem management (Gerlach and Bengston 1994, Irland 1994, Salwasser 1994), however, highlights a growing public awareness that environmental issues, like water quality, require more than biological expertise. Treating water quality as a broader social problem involves careful examination of what people do and why. One way of getting at this "why" question in the ecosystem management literature is through the concept of social value (Stankey and Clark 1991). Even a cursory review of "value" literature, however, shows that few social science concepts have received so much attention with so little clarity and consensus. Therefore, this paper seeks to develop a conceptual framework based on the different ways people have used the social value construct. We illustrate how various approaches to the concept of value differ in their assumptions about what values are, how they are formulated in society, how they affect everyday behavior, and the process of value change. We then show how choice of social values construct affects wetlands management in the Lake Champlain Basin. Finally, we suggest how our framework contributes to understanding water quality issues and implementation of ecosystem management.

Water Quality and Phosphorus

Studies of water quality implicate phosphorus as a major pollutant of Lake Champlain (Smeltzer 1990, Vermont Department of Environmental Conservation and New York Department of Environmental Conservation 1994). Prior to extensive human settlement of the Lake Champlain Basin, small amounts of phosphorus entered surface waters through precipitation, erosion of phosphorus-containing rocks and soils, and decomposition of organic matter. Over the past 200 years, settlement has brought increasing runoff of phosphorus-rich manures and commercial fertilizers, and animal, human, and industrial waste. Phosphorus is an element required for plant growth, and additions will enhance growth of farm crops, gardens, and lawns. But only a small percentage of added phosphorus is actually used by plants. Depending on the season and weather conditions, dissolved phosphorus and phosphorus attached to sediments run off into surface waters. Once in the water, phosphorus acts to fertilize aquatic plants, especially certain kinds of algae. Overfertilization of water leads to cycles of eutrophication. During algal blooms, surface waters may become clogged, turbidity may increase, and oxygen may be depleted. These conditions favor bottom-feeding fish over the desired sport fishing species such as trout, walleye, and salmon. Thus, agricultural runoff and suburban lawn care practices can lead to deterioration of the water, plants, and animals in the Lake Champlain ecosystem.

Wetlands (e.g., marshes, bogs, swamps, floodplains, ponds, and seeps) occur extensively throughout the Lake Champlain Basin. Depending on their size, shape, vegetation, and position on the landscape, wetlands have the potential to retain phosphorus. Through a combination of plant uptake, chemical reactions, and deposition of phosphorus-laden sediments, wetlands can improve the quality of surface waters. Consequently, wetlands can have a major effect on the water quality of Lake Champlain.

Historically, resource managers relied most heavily on knowledge about water quality and phosphorus from biologists and ecologists. They assumed that resource

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policy and management practices could be inferred from descriptive models of biological systems. As resource management issues become more contentious, however, managers are finding it prudent to look closer at the human dimensions of natural resource issues. Knowing the role of phosphorus in water quality does not automatically affect the land use practices of the residents of the Lake Champlain Basin. Neither does the importance of wetlands necessarily affect the way landowners and town planners use those wetlands under their ownership or jurisdiction. In other words, biological and ecological expertise is a necessary component, but not a sufficient condition for policy making and wetland management. Resource management literature treats current public debates over land use practices and policies as questions of divergent social values (Koch and Kennedy 1991, Stankey and Clark 1991). This paper explores how the tools of social science in general and sociological theory in particular can contribute to understanding the relationship of social values to wetlands management and water quality in the Lake Champlain Basin.

The Science of Values

Social values have been the object of intensive study across a variety of social sciences during the 20th century. The "fact-value debate" over the possibility of a value-free science has filled the sociology and philosophy of science journals for over 100 years. Social values were the cornerstone of Parsons' (1937, 1951) "structural functionalism," which has been the dominant theoretical perspective in sociology for the last 50 years. Economists have wrestled with such fundamental definitions as use-value, exchange-value, labor-theory of value, and rent theory of value for nearly 200 years. More recently, social psychologists have tackled the quantitative measurement of subjective social values, having extensively tested and validated scales measuring different social and personal values (c.f., Rokeach 1973, Schwartz and Bilsky 1987). The purpose of our study, given this extensive history of values research in the social sciences, is to situate this research within a conceptual framework, and to demonstrate the implications of different ways of thinking about social values for individual land use practices and land management institutional policies.

Definitions of social value and syntheses of the massive literature on social values have been addressed elsewhere (e.g., Brown and Manfredo 1987, Rokeach 1973, Smith 1991). Likewise, other researchers (c.f., Kluckhohn 1951, Rokeach 1973, Heberlein 1981) have outlined useful conceptual distinctions between social values and related social psychological constructs such as beliefs, attitudes, norms, needs, and moral standards. We argue that the lack of cohesiveness in the social values literature is due to widely divergent theoretical starting points used by different researchers and social science disciplines. These divergent theoretical traditions encompass different assumptions about society and social interaction, and, more importantly, use the concept of social value to address different questions and issues about social order. Therefore, this paper proposes three different theoretical traditions for social values, based on three predominant traditions in sociological and economic theory: (1) a social utility approach; (2) an action theory approach; and (3) an epistemological approach.

Social Utility

Value from the social utility perspective refers to the usefulness of objects for a human purpose. Value is reflected in the functional relationship between objects and people. The social utility approach to value has its roots in classic economic theory. Black (1990) traces the concept of value in this tradition to Carmichael's work in 1724, but the most forceful statement that defined the intellectual agenda for this tradition was Adam Smith's *Wealth of Nations*, which dates to 1776. Smith defined value as "fitness for a purpose." Fitness for a purpose implies that objects have value when they help people achieve some desired end state–e.g. food on the table, ownership of desired commodities, or status. Later treatments of the concept of utility attribute the concept of "desiredness," or the ability of an object to satisfy a want or need. Thus, value is defined by how people use objects, and by how well those objects satisfy the goals and desires of individuals. Value is attributed to an object by human intentionality, and gauged by the exchange value that society places on that object.

From this perspective, people attribute value to wetlands because wetlands provide functional benefits to people. Society may value wetlands because they filter phosphorus out of the water that flows into the lake. Waterfowl hunters may value wetlands because they provide duck habitat. Bird watchers may value wetlands because they can accommodate a wide variety of bird species. Landowners may value wetlands for their scenic qualities, and perhaps for what those scenic qualities do for real estate values. In each case, people "add" value to wetlands because they function to produce some desired social outcome.

Historical behavior of society towards wetlands has not always reflected these values. If they were not ditched and drained for agricultural purposes in the early 1900s, wetlands were often thought of as mosquito infested stink holes. Often these "undesirable" wetlands were the recipients of waste disposal of all kinds. Consequently, contemporary wetlands ecologists have perhaps been the most aggressive proponents of the functional value of wetlands. Taxonomies of wetland values abound. Hudspeth and Parsons (1988) list seven primary functions of wetlands including water storage, water quality improvement, groundwater recharge, rare plant/animal habitat, migratory

bird habitat, animal habitat, and fish habitat. They conclude that the value of wetlands lies in their contribution to the diversity of a region's natural heritage. A study by Vermont's Water Resources Board (1990) echoed the water quality and habitat functions mentioned by Hudspeth and Parsons, but also added hunting, fishing, trapping, scenic countryside, natural history education, logging, farming/ pastureland, and scientific research. In sum, the values most often discussed in relation to wetlands are water quality improvement, flood control, water supply, erosion control (shoreline), fish and wildlife habitat, natural resource products, recreation and aesthetics, and aquatic productivity. Bardecki (1984) also adds the interplay of wetlands and atmospheric conditions in surrounding areas. Thus, a wide array of past research studies have attributed value to wetlands because of the functional or utilitarian qualities of wetland ecosystems.

Action Theory

The predominant approach to the concept of social values in the social sciences over the last 50 years has been the action theory perspective. Values from this perspective are objects that exist in a society. Values are not formulated in the functional relationship between people and objects. Instead, they exist among a collectivity of people and serve as socially shared standards of appropriate activity. Individuals may adopt or embrace certain values or value systems in ways consistent with group membership. The value per se exists only as a shared entity in society.

This approach has its roots in the positivism of Durkheim. Durkheim insisted on the objectivity of social phenomena. "The first and most basic rule *is to consider social facts as things"* (Durkheim 1901/1982). Durkheim's methodology set the stage for quantitative sociology that assumed social values were observable, empirical phenomena. Specifically, Durkheim was interested in the social value concept as a way of explaining how people established standards of action in an increasingly complex society. Talcott Parsons later elaborated this theme and made the social value concept the centerpiece of his theory (Parsons 1937, 1951). Parsons asked why self-interested social behavior does not degenerate into unproductive competition and endless social conflict. He maintained that social values are objects in a society that maintain order and coherence in the face of exponentially increasing social complexity and competition. The hallmark of Parsons' theory was the constraining force that society in general, and society's values in particular exerted on the acting individual. Values, for Parsons, serve a superego function in society, where individuals "hold" certain social values that provide standards of appropriate behavior.

The point of the action theory perspective is that values direct behaviors. For example, the way people behave towards wetlands is a consequence of their held values. Homeowners who value a green lawn and manicured landscape will apply fertilizers, herbicides, and pesticides to their lawn and gardens. Certain standards of behavior are prescribed to those who embrace social values for a decorative landscape around one's home. Dairy farmers who value clean water in Lake Champlain will store their manure during the winter in a concrete pit and spread it during their spring plowing. Finally, real estate developers who value their community reputation will adhere to Vermont's Act 250 zoning regulations when building in proximity to a wetland. Thus, values are created and upheld by a collectivity of people. These values establish standards of socially appropriate behavior and facilitate coordinated social action. They constrain individual action and lend predictability and order to everyday activity in a society.

Values and Epistemology

Values from the epistemological perspective are the characteristic orientations of individuals toward the world. Values act as selective lenses, or frames of reference, for perceiving and dealing with objects and events encountered in everyday life. This approach originates from the theory of Weber, who maintained that knowledge is based on a selective process, whereby people attend to only a limited array of objects observed in the "infinite complexity" of the phenomenal world (Weber 1949). These observed objects, for Weber, embodied value "toward which we must take a value attitude," or in other words, to make an evaluation of its relative merit. The way one perceives the world is driven by the value attitudes taken toward those selected objects. Thus, knowledge is driven by its relevance to the values of the knower, and values serve as a selective filter to the complexity of phenomena in the world.

For example, dairy farmers who have traditionally disposed of their manure behind the barn may perceive the world through the lens of economic efficiency. Economic efficiency means expending as little effort as possible in manure management. The farmer, however, may not make a cognitive link between manure storage and water quality. Similarly, the homeowner who maintains a thick, green lawn and well manicured flower beds may perceive the world through the lens of social status. Social status may mean doing whatever it takes to have the most attractively landscaped yard in the neighborhood. Again, the homeowner may not be making the evaluative link between a single-species lawn, fertilizer, and water quality in Lake Champlain. Thus, the everyday behavior of these people does not reflect a recognition of wetlands and water quality.

Further, Giddens (1984) suggests that an evaluative orientation to the world is not easily disrupted. Giddens maintains that people seek routine and order in their everyday existence to offset a pervading sense of "ontological anxiety." This anxiety is an existential fear that can overcome individuals confronted with the "infinite

complexity" of the world. To overcome this fear, people establish routines of social activity to which they tenaciously cling in the face of a changing and complex social world. Thus, dairy farmers who get rid of their manure behind the barn may resist using concrete-lined manure storage pits because they represent a deviation from the routine. They may perceive these innovative farming techniques as "new-fangled" ideas that disrupt manure storage routines that have worked for generations. From an epistemological perspective, the driving force of behavior is the power of mundane routine that lends order and regularity to one's everyday life. Social values do not direct behavior, but are instead outcomes of the way people constitute order and routine in their everyday practices. People evaluate the world with reference to the routines they have established.

Implications for Values Research

What do these three theoretical traditions, derived from macrosociological theory, have to do with contemporary research on social values? More specifically, what do these three traditions have to do with the way researchers think about the relation between social values and the environment? A review of literature shows that social values research in each of the traditions focuses on a distinct analytical question in the dynamic of the social value phenomenon (table 1). The social utility tradition focuses on the *allocation of benefits* among people. Research in this tradition looks at the mechanisms of valuation (what Brown 1984 calls assigned value), and the distribution of these beneficial values to individuals across a society. The action theory tradition focuses specifically on *individual behavior* and more generally on the way behavior is socially ordered among members of a society. The fundamental question of this tradition asks: how do people's values affect their behavior? Finally, the epistemological tradition focuses on the way social values are implicated in *social transformation.* Empirically, this tradition looks at how certain evaluative orientations predominate in a society such that people collectively choose certain social institutions and structures over others. More importantly it also looks at the trends in the way people evaluate objects and conditions in the world, and the way this dynamic evaluative process brings about change across time. Thus, each theoretical tradition is directed toward different typological nuances of the social value construct. The social utility tradition analyzes what might be called *functional value*, the action theory tradition analyzes what could be called *objective value*, and the epistemological tradition analyzes what might be called *active value* or *positional value* (table 1).

Which approach is most viable as a way of thinking about ecosystem management? The recent shift in the USDA Forest Service away from the multiple-use, sustained-yield philosophy of land management toward ecosystem

Table 1–Theoretical framework for the concept of social values; implications for theory and research

	Value type	Analytical question
Social utility	Use-value, functional value	Allocation of scarce resources
Action theory	Objective value	Behavior and social constraint
Epistemological	Positional value	Process of social transformation

management (Gerlach and Bengston 1994, Salwasser 1994) is indicative of the weaknesses of the first two frameworks. The social utility perspective embraces the biological sciences as tools for identifying the benefits a resource may have to offer society. Knowledge of these benefits should lead to the ascription of value by a society, that should then be suggestive of appropriate policy and action. Current resource controversies, however, indicate that this rationalistic approach to resource management is not so straightforward, and that science can never be so detached from policy making and land use implementation. The action theory perspective likewise uses scientific input as a tool for building consensus about land management issues. It uses social science to identify the array of values in society, and then uses biological science to educate people whose values may be based on misinformation or impression. This strategy, however, recognizes that land managers are not neutral mediators of conflict, but are one of the stakeholders in the social dialog with an agenda that reflects the interests of the agency. The partisan nature of the dialog means that consensus is unlikely to be achieved. It is an approach to management that will always be devoted to putting out the fires of ongoing social conflicts. Finally, the weakness of the epistemological approach to value is its methods: conversation analysis, ethnomethodology, and ethnographic observation. None of these methods lends itself to the everyday practices or expertise of most resource managers. Resource managers do have ongoing conversations with their clientele and make field observations of their everyday behavior, but the results tend to exist as "folk knowledge" rather than as systematic "field data," or systematic observations of behavior.

Each of these three frameworks of social value has its advantages. The social utility perspective and the action theory framework lend themselves to well-established empirical methods developed in econometric and psychometric modeling. These methods are readily implemented within the context of resource management, and produce quantitative results that are amenable to statistical manipulation. Such numeric characterizations of

society's values are used as standard inputs into the policy making process, and in the effort to equitably allocate benefits across a diverse society. The advantage of the epistemological framework is that it provides a better method for integrating natural resource ecology with social science. From the epistemological framework, everyday routine behaviors are the input that produce ecological outcomes, and consequently drive the attention of biologists. The intersection between human behavior and the consequences observed in the natural environment lead to the value statements expressed in a society. From this perspective, what people do and why they do it are not consequences of biological function or social value. Rather, what people do and why is the starting point in understanding the link between human behavior and natural resource management.

Research on the relationship between wetland management and social science must compare each of these frameworks using structural equation models. These models are not mutually exclusive in their assumptions about the way the world works. However, each model assumes a different starting point in its analysis. The social utility framework begins with the goal-directed individual, the action theory begins with society's values, and the epistemological framework begins with behavior. The dependent variable in the social utility model is resource allocation, the dependent variable in the action theory framework is behavior, while the dependent variable in the epistemological framework is social value. Each model then hypothesizes different causal relationships between value, behavior, management, policy, and allocation. The point is that understanding the realm of social values is complex. Each of these frameworks contributes to understanding, but by itself is incomplete. We propose a more coherent analysis recognizing the interrelatedness of each of the three frameworks. Such an analysis could help prioritize areas of research that are critical in integrating the social sciences and ecosystem management.

Implications for Wetland Management

Choice of a conceptual approach to value has implications for how to manage wetlands and how to improve water quality in Lake Champlain. From the social utility framework, management is centralized. It relies on regulation to manage potential conflicts in the allocation of benefits, and then counts on public support and participation in its institutional management framework. Management from the action theory framework depends on the input of experts to direct policy and planning, and then uses the techniques of influence and persuasion to implement those plans among publics that may not always be supportive. Finally, management from the epistemological framework uses a decentralized style that recognizes people resist change in their established habits and routines. This perspective assumes that change occurs when individual interaction leads to behavioral change, rather than through regulation or values education. The following sections detail these differences and illustrate the consequences for wetland management.

Social Utility and Water Quality

From the social utility perspective, one manages for water quality by analyzing the reward structure that dictates land-use practices in a region. This perspective assumes values are acquired through learning. People learn from experience what objects and/or events produce certain desired or valued outcomes. Thus, valuation is the process of seeking and realizing desired rewards or benefits from a particular land-use activity (table 2). For example, dairy farmers can cut the cost of their fertilizer bills by spreading manure from their cows on corn fields. This perspective asserts that land-use is driven by rational action. People learn to value the utility of natural resources practices and thus act in a way that maximizes individual reward. Thus, farmers are rewarded with crops and lower fertilizer bills, people in the timber industry are rewarded from the sale of wood products, and wilderness hikers are rewarded with an aesthetic leisure experience. Management, then, is the process of ensuring the supply and equitable allocation of these benefits across society. When the allocation of benefits becomes contested because of either competing or changing values, the principal management solution is to change the institutional structure in a way that realigns the reward structure for stakeholders (table 2). When Vermonters want clean water in Lake Champlain, yet farmers are unwilling or unable to build concrete manure storage pits, the Natural Resource Conservation Service might offer assistance programs for the construction of manure storage facilities, thereby changing the cost structure. The solution to improving water quality in Lake Champlain from the social utility perspective is either governmental regulation or governmental assistance that alters the structure of costs and rewards. Management is the process of mediating and balancing the array of competing social values in a way that allocates benefits to a society and minimizes social conflict.

Action Theory And Water Quality

Management from an action theory perspective is oriented toward creating consensus, and uses the concept of value as a form of social input into the decisionmaking process. People concerned with wetland management and water quality in Lake Champlain can survey stakeholders to determine the mix of held values, and the salience of those values across the population. The action theory perspective assumes that these held values are transmitted among society through the processes of socialization. Once an individual embraces these social values, the values then direct subsequent land-use behavior (table 2). These values provide standards of appropriate land-use behaviors.

Table 2–Theoretical framework for the concept of social values: implications for wetland management and water quality

	Process of value formation	Implications for land use	Value change
Social utility	Reward/ benefit	Rational action, goal directed behavior	Rational planning, managing the reward structure
Action theory	Socialization and constraint	Values direct land use behaviors	Identification, transformation, information, and persuasion
Epistemological	Constitution of everyday routine	Everyday practices constitute value orientation	Interpretive: routines of everyday life

Where people value agriculture, it is appropriate to clearcut forests to make way for corn fields. Where people value wilderness, clearcutting is inappropriate. On the other hand, trail building is an appropriate land-use in a wilderness, but inappropriate through the middle of a corn field. When people value clean water in Lake Champlain, and they understand the relationship of wetlands to phosphorus loading, they will act in ways that do not harm the viability of local wetlands.

The challenge faced by this action theory approach is the problem of consensus. Where consensus exists, managers have fairly clear mandates for subsequent action. But consensus over broad questions such as ecosystem management of wetlands rarely exists, and vocal minorities who oppose a particular management plan have the ability to tie the hands of managers in today's political climate. Consequently managers often become active stakeholders in the consensus building process, using the tools of influence and persuasion to put forth an agenda in the public arena. The fundamental solution to dealing with social conflict over resource disputes is to create consensus through information and education programs (table 2). Information can help facilitate consensus about natural resource values and mobilize coordinated social action. For example, the agricultural extension offices try to influence farmers to adopt so-called "best management practices," and various stakeholders interested in water quality use the media to educate the public on the relationship of phosphorus, wetlands, and water quality in Lake Champlain. Wetland management entails a proactive stance toward management. It assumes that values must first be identified and alternatives presented to achieve effective change in Lake Champlain's water quality.

Epistemological Approach and Water Quality

Management from the epistemological framework is an interpretive effort. Those who value water quality in Lake Champlain do so not because it reflects the shifting tastes of society's values. Rather, they value water quality in Lake Champlain because it reflects the complex of routines they have established over time (table 2). For example, people value family-owned dairy farms because multiple generations have built their lives around the routines of milking cows on a daily basis and supporting those cows by growing grain feed and hay. The value of a self-sufficient farmer supplying the nation its milk and cheese products is a part of the value structure of many United States citizens. As agricultural conditions change making the small family-operated farm less competitive, farmers will cling tenaciously to the established routines of dairy farming. They may indeed take on larger herds to increase profits, family members may seek work off-farm, and they may sell off parcels of land for home development. Nevertheless, farmers retain the valued image and everyday practices of life on a family-owned dairy farm. At the same time they formulate new routines and new value-imbued rituals of everyday life with the changing economic and social conditions of the time. Thus, family farmers may value water quality in Lake Champlain because it reflects all the practices, routines, and pressures that make up the everyday experience of the contemporary dairy farmer in the Lake Champlain Basin.

The task for managers, from this perspective, is to focus on understanding behavior in the context of people's everyday routine. This requires a broader focus on behavior that goes beyond the usual cross- sectional design of survey research. It requires a situated or "ethnographic" knowledge of how people engage in the mundane routines of everyday life that relate to land-use behaviors. Management from the epistemological perspective does not preclude changing the reward structure or persuasive educational programs. It does recognize, however, that improving water quality means a management agency must establish and promote an agenda in a social climate that resists change. People like the familiar and may not easily acquiesce to new management initiatives. Therefore, managers need to develop an ability to recognize the power of people's traditions and mundane routines. Managing for water quality in Lake Champlain requires that managers focus on what people in the Lake Champlain Basin have done in the past, what they do as a course of routine, and an assessment of these behavioral trends over time. This type of trend analysis is the input for how one anticipates and plans for improved water quality in the future.

Summary

We began this paper with a discussion on the need to improve wetland management/water quality in the Lake Champlain Basin. Current management strategies, based largely on biological information, are inadequate. While biological information is necessary in wetlands management, such information does not guarantee a socially acceptable management plan. Because land management involves human behavior, managers are increasingly becoming aware of the need to integrate behavioral models from the social sciences with biological research on wetland ecosystems to help guide policy making and to help implement management plans. In this paper, we traced three different theoretical approaches to the study of values, each having unique implications for understanding human behavior. Researchers approaching the problem from the perspective of the social utility approach have taken their lead from economic theory, focusing on an equitable and efficient allocation of scarce resources. Researchers using the action theory approach adhere to the positivism of Durkheim and Parsons, focusing on the identification of held values and facilitation of consensus where conflicts exist. Researchers in the epistemological tradition follow Weber's interpretive approach to value, and focus on analyzing the relationship of behavior and societal trends in people's land use values. We have shown that each framework uses different analytical starting points and maintains differing assumptions about the relationship between values and behavior. In comparing the three approaches, we have shown the strengths and weakness of each approach and indicated the implications of each framework for natural resource policy and wetland management. We maintain that choice of approach to the concept of value has consequences for wetland management and water quality management.

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An Assessment of Public Perceptions of Forest Values and Uses: The Case of the Florida Division of Forestry

Morgan P. Miles, Linda S. Munilla, and Burt Lewis

Abstract

Natural resource management agencies, charged with managing the environment for the public's benefit and typically with critically limited budgets, are facing increasing pressure to respond to the often conflicting demands of economic development or environmental protection. One area of conflict pertains to resource management agencies' mandate to regulate natural resource based industries, while at the same time attempting to encourage more industrial development. A salient example is the relationship between public forestry management agencies and the sometimes controversial practices of the commercial forestry industries.

"Given current corporate practices, not one wildlife reserve, wilderness, or indigenous culture will survive the global market economy" (Hawken 1993).

Introduction

Public environmental and natural resource management issues have become a focus of great public concern since the early 1970's. Earth days during the subsequent decades are an indication of continued public interest. In 1990, the Roper Organization (1990) found that 78 percent "of the American people think that the government needs to make a major effort to solve our environmental problems." A more recent Times Mirror supported study suggests that only 21 percent of the general public consider themselves active environmentalists, while 55 percent of Americans consider themselves "sympathetic but not active" toward environmental issues (Roper Organization 1993). In addition, 80 percent of the general public were found to be willing to pay higher prices for products that protect the environment (Roper Organization 1992).

Purpose

The purpose of the present study is to offer an alternative framework for exploring the issues pertaining to the conflicts between the public management of commerce and the environment when the public forest management agency is faced with severely limited budgets, resources, and time. Many issues are involved in an assessment of this sort. The present study will offer an attempt to deal with the "real world" issues of (1) extremely limited budgets for market research, (2) extremely politically sensitive topics, and (3) conflicting perceptions between and among the State of Florida's public forestry agencies and various public interest groups (for example, the conflict between the wildlife groups and the paper industry).

Promotional Efforts of Florida's Public Forestry Agencies

Florida's public forestry agencies, as most other States' public forest management agencies, is attempting to enhance its image with the general public primarily by providing a variety of environmental education programs. It is attempting to encourage the public to develop a "conservation" perspective that allows the rational management of the State's natural resources for the benefit of the State's citizens. This perspective suggests the scientific management of the forest's resources, while allowing for the economic utilization of its outputs.

The State forestry agency (Division of Forestry) has two categories of environmental education programs: (1) programs targeted at teachers, and (2) programs targeted at students. No program promotional efforts are currently directed at enhancing the general public's understanding of forest values and uses. However, projects targeted toward both teachers and students will have some impact on the perceptions of the general public through word-of-mouth communication.

Projects targeted toward changing teachers' attitudes toward conservation are: (1) a Forest and Environmental Educational program, and (2) a Project Learning Tree. The Forest and Environmental Education program is a 2-week summer program designed to engender attitude change by providing information and interaction with the natural environment. Project Learning Tree (PLT) is a national program designed to build analytical skills using an integrated approach to environmental

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education. The implicit assumption made in PLT is that both the teachers and the students associated with it will become opinion leaders for environmental issues both within the educational community and in the community at large.

Projects designed at directly changing students' attitudes toward conservation include: (1) a Plant A Tree For Life Program, (2) a Forest and Environmental Education Workshop for Students, and (3) a Fire Prevention program. The Plant A Tree For Life program is designed to integrate within fifth grade classes a variety of environmental educational experiences during the week in which Arbor Day falls. The Forest and Environmental Education Workshop for Students is a week-long field-oriented program designed for students ages 10 through 14. Its objective is to provide a hands-on experience with nature and forest conservation. The Fire Prevention Program is designed to educate students about the hazards of forest fires with visits by "Smokey Bear." Again, the State forest management agency implicitly assumes that students and teachers are the critical opinion leaders for environmental issues within the State. The Federal forestry agency in Florida (USDA Forest Service) cooperatively–through providing funds and personnel–and actively supports the above-mentioned State programs. Also, the Forest Service provides information and education to the general adult population through an association established for that purpose which provides tours, exhibits, and literature.

Objectives of the Forest Management Agency's Environmental Promotional Programs

The underlying objective of all these environmental education promotional efforts by the State forest management agency appears to be to encourage the development of positive attitudes toward the ecologically sound commercial utilization of forests in the teachers and students, and ultimately, through word-of-mouth communication, to affect the general public's understanding of forest values and uses. The success of these efforts may be assessed by understanding the public's attitude toward the ecologically sound commercial utilization of forests.

The Division of Forestry has developed in its strategic plan a set of priority issues pertaining to public perceptions and awareness. External Priority Issue #1 and corresponding goal pertain to an improved public understanding of the ecologically sound commercial utilization of forests. It states that by July 1997, between 75 and 85 percent of a randomly surveyed group of citizens will indicate a basic understanding of forest values and uses. This suggests that we must first define what is a basic understanding of forest values and uses, determine how to measure the public's understanding or awareness of this concept, and then conduct a pretest to determine whether the goal is feasible.

Methodology

The remainder of the present study will attempt to provide the framework the authors used in an assessment of the public's perceptions of the conflicts between the public management of commerce and the environment when the sponsoring agency was faced with limited budgets, resources, and time. The framework consisted of three steps adapted from Churchill's (1979) multistep measure development paradigm: (1) a review of the relevant literature to generate items; (2) internal and external focus groups to refine and reduce items; and (3) the development of a survey instrument for pretesting.

The present study's authors conducted a review of the literature pertaining to the general public's understanding of forest values and uses, and the public's attitude toward the ecologically sound commercial utilization of forests. No previous researchers have attempted to define or measure this specific construct. However, general concepts such as what are conservation, preservation, protection, and resource utilization, were found and used in subsequent focus group studies.

The second step involved focus group research to better define the construct and suggest items that may measure the public's perceptions of the ecologically sound commercial utilization of forests. The first focus group held was internal, with Department of Forestry managers attempting to define the construct pertaining to the ecologically sound commercial utilization of forests. This internal definition was then used as the basis of discussion with an external focus group composed of both forest industry representatives and environmentalists.

The third, and final step, was the development of a survey instrument for use in the pretest. It was developed from items that either were suggested by the literature review or emerged in the focus group discussions. Appendix A contains a version similar to the instrument that will be used in the 1997 study's pre-test.

Findings

Internal Focus Group

The first focus group was held in early December 1993, at the offices of the USDA's National Forests in Florida. This internal focus group, composed of both the Department of Forestry's top management and junior level managers, attempted to define the intent of the PRIORITY ISSUE GOAL #1. The goal states that by July 1997, between 75 and 85 percent of a randomly surveyed group of Florida citizens will indicate a basic

Table 1–Summary of Department of Forestry Internal Focus Group Comments

I. Core Values
   1. Protect forests and nature
   2. Economic benefits from forests:
      a. Consumptive
         (1) Timber
         (2) Hunting
         (3) Fishing
         (4) Minerals
         (5) Water
      b. Nonconsumptive
         (1) Recreation
         (2) Aesthetics
   3. Acculturation of nature oriented "cultural values"
   4. Knowledge transfer via environmental education
   5. Quality of life issues

II. Important Stakeholders of the Department of Forestry
   1. Financial
      a. Long term
         (1) Future generations of citizens
         (2) Forest products industry
         (3) State tax revenues users
      b. Short term
         (1) Recreation industry
         (2) Forest products industry
         (3) State tax revenues users
         (4) Forestry employees
   2. Local communities as affected by above, and by water and environmental quality and private property rights issues

III. Department of Forestry Forest Values
   1. Bringing nature into urban areas to benefit mankind
   2. Aesthetics
   3. Conservation NOT preservation
   4. Individual freedom and private property rights
   5. Consumptive vs. Nonconsumptive values

understanding of Florida's forest values and uses. Table 1 provides a summary of the core issues that the internal focus group felt are related to the concepts of (1) forest values and uses, and (2) the ecologically sound commercial utilization of forests. In addition, items for inclusion in a benchmark study that will attempt to address the 1997 goal were discussed and included in the draft survey.

Table 2–Summary of External Focus Group Comments

I. Core values
   1. Aesthetics
   2. Raw materials from forests
   3. Economic development resources
   4. Wildlife
   5. Air quality
   6. Open space
   7. Climate moderation
   8. Genetic diversity
   9. Management for many values
   10. Promote public use of public lands

II. Forest values
   1. Timber interests have over-ridden other interests
   2. What are timber industries' values
   3. Conservation NOT preservation
   4. Individual freedom and private property rights
   5. Public use of private lands
   6. More environmental education

III. Important Stakeholders of the Department of Forestry
   1. Next generation
   2. Local communities
   3. General public
   4. Forest industry
   5. Private landowners
   6. Recreation
   7. School children
   8. Rivers and their users
   9. Wildlife
   10. Consumers

External Focus Group

The second focus group was held in early March 1994, in the Jacksonville offices of the Florida Extension Service. This external focus group was composed of both environmentalists and forest industry representatives with the goal to define the intent of the PRIORITY ISSUE GOAL #1 and how can it be operationalized. Table 2 provides a summary of the core issues that the external focus group felt related to the concepts of: (1) forest values and uses, and (2) the ecologically sound commercial utilization of forests. In addition, items for inclusion in a benchmark study that will attempt to address the 1997 goal were discussed and included in the draft survey.

Conclusions

The authors have found that this is an exciting area that offers many research and policy opportunities. There are a few issues that must be addressed: (1) the felt need for increased environmental education of both school children and the public at large; (2) more political sensitivity to the topic of private land holders' rights and the public good; and (3) the often-limited budgets that are available for educating the public about environmental issues.

The findings from the exploratory focus groups suggest that environmental education is a high priority issue for all Florida forest stakeholders. Both environmentalists and forest industry representatives suggested that environmental education efforts can help increase the general publics' understanding of complex forest policy issues. An enhanced understanding of the forest environment by the general public would engender much more informed public opinions and decisionmaking.

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APPENDIX A

FLORIDA'S FOREST AND ENVIRONMENTAL AWARENESS SURVEY

Please take just a few moments to complete this questionnaire and return it in the self addressed stamped envelope. **As indicated in the cover letter it is crucial for the purposes of this study that the adult over eighteen who has had the most recent birthday complete the questionnaire**. Your cooperation is completely voluntary. If you choose not to answer any or all questions you may do so. Please note, that you may withdraw at any time and that your responses will remain confidential. Thank you for your time and effort. If you have any questions please feel free to contact Morgan Miles at (912) 681-0777.

Instructions:

The following questions pertain to your perceptions about the State of Florida's Department of Agricultural and Consumer Services Division of Forestry image and activities. There is no right or wrong answer, we are simply attempting to determine how you perceive the Division of Forestry. Please write the number that best reflects your opinion in the blank space to the right of each statement. Your response to each question is critical.

Not at all	To a very slight extent	To a small extent	To a moderate extent	To a considerable extent	To a great extent	To an extreme extent
1	2	3	4	5	6	7

1. I am adequately informed about the mission, activities, and effectiveness of the Florida Division of Forestry. _____
2. I understand what "conservation" means. _____
3. I have some understanding of the basic principles of ecologically sound commercial utilization of forests. _____
4. I believe that the primary mission of the Florida Division of Forestry is to conserve and protect Florida's forests. _____
5. I believe that the primary mission of the Florida Division of Forestry is to preserve Florida's forests. _____
6. I believe that the Florida Division of Forestry should manage Florida's forests to provide economic benefits to the State and its citizens. _____
7. I believe that the Florida Division of Forestry should help educate the citizens of Florida and visitors to the State about the forest environment. _____
8. I believe that the Florida Division of Forestry should manage Florida's forests to provide aesthetic benefits to both residents of the State and its visitors. _____
9. I believe that the Florida Division of Forestry should promote the private property rights of the landowners of Florida. _____

The following set of questions pertain to activities that the Florida Division of Forestry may participate in. Please continue to use the seven point scale. To what extent do you believe the Florida Division of Forestry does the following:

10. Harvests timber. _____
11. Clearcuts. _____
12. Provides disaster relief. _____
13. Manages wildlife habitat. _____
14. Provides teachers and students with forest based environmental education programs. _____
15. Provides communities with urban forestry assistance. _____
16. Provides landowners with technical forestry assistance. _____
17. Issues burning permits. _____
18. Fights forest fires. _____
19. Sells timber off of State land. _____
20. Enforces game laws. _____
21. Manages State parks. _____
22. Is a Federal agency. _____
23. Manages State fish hatcheries. _____

24. Protects Wilderness areas. _____

25. Provides outdoor recreation opportunities. _____

26. Manages watersheds. _____

27. Manages endangered species _____

28. Please list any other activities not mentioned that the Division of Forestry performs.

_____

_____

_____

The following questions pertain to the importance that various ecosystem management activities have to you. A low **rating (1) indicates that the activity is not important to you. A high rating (5) means that the activity is very important to you.**

IMPORTANCE

Low		Moderate		High
1	2	3	4	5

29. Harvesting timber. _____

30. Clearcutting. _____

31. Providing disaster relief. _____

32. Managing wildlife habitat. _____

33. Providing teachers and students with forest environmental education programs. _____

34. Providing communities with urban forestry assistance. _____

35. Providing landowners with technical forestry assistance. _____

36. Issuing burning permits. _____

37. Fighting forest fires. _____

38. Selling timber off of State land. _____

39. Enforcing game laws. _____

40. Managing State parks. _____

41. Managing State fish hatcheries. _____

42. Protecting Wilderness areas. _____

43. Providing outdoor recreation opportunities. _____

44. Managing watersheds. _____

45. Managing endangered species. _____

The following questions pertain to the performance of the Florida Division of Forestry in its management activities. A low performance rating (1) indicates that the activity is not performed to an adequate level by the Florida Division of Forestry. A high performance rating (5) means that the Florida Division of Forestry is performing that activity very well.

PERFORMANCE

46. Harvesting timber. _____

47. Clearcutting. _____

48. Providing disaster relief. _____

49. Managing wildlife habitat. _____

50. Providing teachers and students with forest environmental education programs. _____

51. Providing communities with urban forestry assistance. _____

52. Providing landowners with technical forestry assistance. _____

53. Issuing burning permits. _____

54. Fighting forest fires. _____

55. Selling timber off of State land. _____

56. Enforcing game laws. _____

57. Managing State parks. _____

58. Managing State fish hatcheries. _____

59. Protecting Wilderness areas. _____

60. Providing outdoor recreation opportunities. _____

61. Managing watersheds. _____

62. Managing endangered species. _____

SECTION II

Please take a moment to look at the following Visitor sign profiles. Please circle the sign that represents the Florida Division of Forestry.

(a) USDA FS SIGN PROFILE
(b) DOF SIGN
(c) STATE PARK SIGN
(d) WILDLIFE SIGN

SECTION III

1. Are you: Male___ Female___

2. Below are some descriptions of various racial and ethnic backgrounds. Please mark the one that best describes you.

African American _____

Aleut _____

Asian American _____

Eskimo _____

Euro-American/
White _____

Hispanic _____

Native American _____

3. What are your job title and business?

_____

_____

4. What is the highest grade of education that you have completed?

8th grade or less _____

9th-11th grade _____

12th grade _____

Some college _____

16 years
(college graduate) _____

17 or more years
(grad or professional
school) _____

Don't know _____

5. How important/useful are forests to you? Why are they important to you?

_____

_____

_____

Modeling Political Alienation in a Rural Timber-Dependent Community and the Implication for Ecosystem Management

Mathew J. Johnson and David H. Jackson

Abstract

Alienation, or lack of trust in government, is a political phenomenon which is of interesting importance in the United States. This study examines the underlying socioeconomic dimensions of alienation from the USDA Forest Service, Montana Department of State Lands, and county commissioners as they manage land in the proximity of a small, rapidly changing, rural, timber-dependent community. While substantial numbers of community members are alienated, there are important differences in the underlying dimensions of trust-mistrust for county commissioners than for either the Forest Service or State forest land managers. Collaborative efforts between agencies, or elected officials and their publics, in order to be most effective must be designed to deal with the problems associated with alienation.

Alienation: An Introduction

Political alienation might be defined as an estrangement from the polity. Its importance can be viewed in a variety of contexts. The failure of citizens to vote or otherwise participate in the political process is but one aspect of alienation. Other behavior, which may often be an outgrowth of mistrust of government in general or of specific governmental agencies, may take the form of watchdog activities, appeals of agency decisions, litigation and "monkey wrenching" or illegal acts designed to stop or inhibit otherwise legitimate public actions. Alienation may be a critical factor that will undercut new ecosystem management initiatives because nonbelieving publics may be less likely to participate in processes designed to articulate public land management goals and aspirations. Before presenting some statistical models regarding political alienation in a small, rapidly changing, rural, timber-dependent community, a brief review of studies of the subject will help set the stage for the models and results of this study.

Hamilton (1972) viewed political alienation in terms of two dimensions: political mistrust and inefficacy. In the first instance, alienated people would likely believe that government is not serving citizen interests. In the second instance, alienated people believe there is very little that a citizen can actually do to influence political decisions. Chen (1992) added a third dimension to the idea of alienation, namely political meaninglessness or apathy, and was particularly interested in how alienation affected voter turnout in presidential elections.

Herring and others (1989) saw alienation as a social class phenomenon. The less congruent the actions of the State with the interests of a social class, the more likely members of that social class would be alienated. Herring (1989) saw the lower classes as being alienated, and Schwartz (1973) and Miller (1974) felt that the alienated social classes would transcend generations.

The role of political conflict, unemployment, and broader social discontent in alienation was addressed by Macke-Statham (1979), while growth in alienation throughout the United States was examined by Vehling (1991) who found that the Harris Poll's alienation index had doubled in 25 years. He found that by 1990, some 60 percent of all Americans were alienated. Like other studies, Vehling found that the people in the lower socioeconomic classes were more likely to be alienated than the upper classes.

Some earlier studies also point to age as another determinant of alienation. Agger and others (1961), Milbrath (1965) and Cole (1973) all found that cynicism toward government increased with age, although Vehling (1991) found that the young are the most likely to withdraw from political processes.

Perhaps of most interest to proponents of ecosystem management, Yin and Lucas (1973) found that decentralizing government and increasing citizen participation increased the sense of citizen efficacy but **not** the sense of trust. Hence, the implication is that public involvement processes may increase the participant's sense that they can influence decisions, but not have a corresponding increase in the sense of citizen trust for the agency's land management activities.

Empirical research focusing on alienation typically examines one of two alternative (but highly related) operational definitions of the phenomenon: trust and efficacy. Several studies have chosen to define and examine trust (See Chen 1992, Hart 1978, Hamilton 1972, Miller 1974, Macke-Statham 1979, Mason and others 1985, Vehling 1991, Cole 1973). In contrast, Agger and others (1961), Milbrath (1965), and Cole (1973) examined efficacy. While some studies found that trust and efficacy

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tend to be found together (See Mason and others 1985, Macke-Statham 1979, Chen 1992, Vehling 1991, and Herring and others 1991), it appears that using trust as an operational definition of alienation is by far more common than using efficacy.

This paper reports the results of a study of political alienation in a small, rural, timber-dependent community. It will be shown that while many of the earlier studies provide important insights into political alienation that can be generalized to this community, some valuable new insights into the determinants of alienation are also possible. We will examine alienation toward Federal and State land managing agencies as well as toward locally elected officials in order to determine whether the determinants of alienation are specific to particular governmental entities.

The Swan Valley Community

Like so many areas of the American rural west, the Swan Valley is a timber-dependent community that is experiencing rapid change. (See Jackson and Lambrecht 1993). The study area is one that is bounded on the east by the Bob Marshall Wilderness Complex and on the west by the Mission Mountain Tribal Wilderness area. By Montana standards, the lower elevations comprise good timber growing sites and the forest lands are owned by a major forest products firm, the Flathead and Lolo National Forests, the State of Montana, and other nonindustrial private owners. Timber harvests in the area have peaked and are in decline. National forest harvests in Montana have been declining irregularly since about 1970, and the industrial harvests in the valley are now declining as well. Harvests from the remaining private lands are not expected to offset the trends of the major owners in the foreseeable future. (See Flowers and others 1993).

In spite of the diminishing harvest levels, a rural planning expert recently acknowledged that the Swan Valley is the fastest growing part of Missoula County (Lambrecht 1996). New residents, whose livelihoods are typically unrelated to the timber economy, are moving to the area in record numbers. As the changing economic and social setting of the valley evolved in the recent past, open hostilities between various factions concerning highly visible logging practices surfaced a few years ago (Lambrecht 1996). In a related study, Jackson and Lambrecht (1993) used a community survey in order to identify and prioritize important community problems. Of the 27 problems identified by a community group, the authors concluded that the two most important problems facing the community were: "Depletion of timber" and "Not enough good jobs." Using a seven-point Likert scale to indicate the urgency of each problem, the median score for each of these problems was 6 where a score of 7 was "very urgent" and a score of 1 was "not urgent."

Given the earlier notions of potential discontent associated with unemployment and economic issues, political alienation from government agencies such as the USDA Forest Service or Montana Department of State Lands is obviously possible. However, rapid in-migration of new citizens is also itself a potential source of social discontent, particularly if the new residents are significantly different in their social and environmental values than the longstanding residents. Clearly, in-migration has the potential to redefine the sense of community and Jackson (1994) has shown elsewhere that length of residency is a persistent variable useful in explaining differences in several related environmental attitudes and beliefs in the Swan Valley. Thus the process of in-migration in the Swan Valley has been one of infusing new values into the community and is a dynamic source of community conflict and change.

Modeling Political Alienation in the Swan Valley

Two survey instruments were developed and employed in the Swan Valley. A door-to-door census of the human capital was conducted and an anonymous survey designed to gauge people's attitudes and values concerning problems facing the valley, environmental values, and trust in institutions in managing the lands in the valley, was distributed to each adult 18 years of age and older at the time of the census. While the anonymous questionnaires were fairly long (100 questions), 303 of them were ultimately returned yielding an extremely high sample of the adult population. An estimated 56 percent of the entire adult permanent and seasonal population of the community participated in the survey used in this analysis. (See Jackson and Lambrecht 1993 for more details of the study procedures).

People were asked to respond on a seven-point Likert scale regarding the degree to which they trusted various groups in managing the lands in the valley.

Table 1 includes the questions and the various groups. The frequency distribution for each group is shown with the median score highlighted in boldface. Clearly, no group in the valley is accorded a high degree of trust. The least trusted group is out-of-state businesses. Coming in next in terms of the least trust are environmental action groups, followed in turn by county commissioners. Finally, all other groups and institutions are given a median score of 4, at the middle of the scale between great trust and no trust.

Predictive models for 9 of the 10 groups were developed in Johnson (1994). Three of the models that deal most directly with political alienation will be summarized here. The Forest Service is a Federal agency that directly deals with both wilderness management as well as developed forest land management in the valley. The Montana Department of State Lands is charged with managing all of the state lands in order to provide income for the school trusts, and a designated State forest is located in the area. Thus, State

Table 1–Alienation questions

How much would you trust the following groups to manage lands in the Swan Valley?

Organization	No Trust					Great Trust	
Scale	1	2	3	4	5	6	7
Out-of-state business	**242**	29	15	8	1	0	3
U.S. Forest Service	40	36	40	**92**	40	36	13
Montana Dept. of St. Lands	33	35	48	**84**	45	35	12
Locally owned business	41	37	61	**75**	40	24	16
Environmental action groups	111	**39**	27	43	34	21	21
The general public	41	32	55	**87**	34	20	25
Scientists and technologists	1	38	42	**79**	48	27	7
Nonprofit conservation association	62	35	34	**46**	51	35	30
County commissioners	71	63	**53**	65	32	11	1
Local landowners	21	23	36	**70**	59	39	50

Note: Median score for each group is identified in **Boldface**.

lands differ from Forest Service lands in terms of both their place in a Federal system of government and their legal mandates for management, although both of these agencies are staffed with highly qualified civil servants. In contrast, county commissioners represent not only local government, they are also elected and may play a significant role in land use ordinances affecting private lands in the valley. Thus, each political group has a somewhat unique role affecting land management in the valley and also is influenced by somewhat different political/legal processes.

Ordered probit models, which are a form of maximum likelihood techniques, were used to model the relationship between trust in each group and a list of independent variables. Those who are unfamiliar with the statistical procedures should be referred to Maddala (1983). Since the y-variable in each model is an ordinal number (the seven-point Likert scale response) with unique and discrete categories, ordinary least squares fail to adequately capture the essence of the limited dependent y-variable. What the ordered probit does is estimate the probability that a particular observation will fall in each of the seven ordered categories based on the argument of independent variables. The category with the highest predicted probability is the predicted response. Unlike ordinary least squares, goodness of fit (R-squares) are not readily available in the maximum likelihood world. The virtue of the ordered probit model is that it allows the researcher to posit or hypothesize a model with several independent variables and test the significance of each with common student t-tests of significance.

Before presenting the statistical models, a few words about the independent variables used in each model are worth mentioning. Consistent with some of the earlier cited literature, we hypothesized that age would be a determinant of the degree of alienation. The variable **AGE** measured in years is included as an independent variable in each model. Consistent again with the earlier mentioned literature, we hypothesized that income would also be a determinant of alienation. We used two separate dummy variables to express household income classes. **LOW INCOME** is a dummy variable (1 = low income, 0 = not low income) for households with incomes less than $24,000 per year. **HIGH INCOME** is a separate dummy variable (1 = high income, 0 = not high income) indicating household incomes greater than $54,000 per year. Years of education (**YEARS EDUCATION**) was collapsed into six ordered categories. Since we had found that years of permanent and seasonal residence were important in determining environmental values, they were also included in the models of trust. The number of years of seasonal residence (**YEARSEAS**), and the number of years of permanent residence (**YEARPERM**) were included in the models as independent variables. In addition, a dummy variable indicating whether the respondent was a permanent or seasonal resident at the time of the survey (**PERMVSEA**) was included since several of the permanent residents had previously resided in the valley as seasonal residents. Two behavioral predispositions of the respondents were also included as independent variables. The survey included a question inquiring whether the respondent belonged to a "preservation group such as the Sierra Club or Wilderness Society." Preservation group members (**PRESERME**) were coded 1 and nonmembers were coded 0. Respondents were also asked if they belonged to a conservation group such as a "rod and gun club." Conservation group members (**CONSERME**) were coded 1 and nonmembers were coded 0. Finally, a forced response question that identified the respondent's ideology regarding limited versus unlimited private property use rights in land. At one extreme was a statement which said "private landowners in the valley should use their property as they wish." At the other extreme was a statement which said "Private landowners in the valley should be restricted from using their property in ways which harm the community." A seven-point Likert scale was placed between the two contrasting statements and respondents to MODEL 1 were directed to "circle the box that best indicated their preference for one statement over the other." Responses to this question indicated a high degree of polarization within the community concerning the question of land use controls and restrictions on private rights. This independent variable is called ideology and low scores indicate a preference for unrestricted property rights, while

high scores represent a preference for restricting private land uses in order to reduce harm to the community.

Model 1 (table 2) is designed to predict each respondent's level-of-trust score for the USDA Forest Service. The overall frequency distribution of responses to this question is shown in table 1. Clearly, since the model is designed to predict the probability that a particular observation will be in each of the seven categories of trust, it is important to understand how a marginal or small change in an independent variable will affect the probability of each of the seven ordered categories. For example, if there is a small increase in the age of a respondent, the probability of each category of trust cannot decrease. The sum of the probabilities that a particular observation will lie in each category of the seven-point scale must be one! Thus a change in age would increase the likelihood of some of the trust scores, while decreasing the likelihood of others.

The interpretation of table 3 of significant relationships is as follows. If a respondent is in either a low income household, or a high income household, there is a greater likelihood that there will be low trust levels (scores of 1, 2, or 3) than if the individual is not in a low or high income household. Hence the middle income households in the valley are more likely to trust the USDA Forest Service in managing the lands in the valley than are either the upper or lower income households. Forest Service trust in the Swan Valley is a middle income phenomenon.

Table 2–Trust in the USDA Forest Service

Independent variable	Estimated coefficient	t-statistic
Constant	1.33407	3.22755*
Age	-0.00539	-1.01804
Low income	-0.35983	-2.32911*
High income	-0.36414	-1.90311*
Years education	0.0258217	0.44484
Years perm	0.00127533	0.22632
Year seas	-0.01542	-1.41323
Perm v sea	0.34599	1.60099
Preserme	-0.44226	-2.40484*
Conserme	-0.11170	-0.68339
Ideology	0.0261396	0.86456
Threshold 1	0.51430	9.62459*
Threshold 2	0.93217	17.26828*
Threshold 3	1.80776	30.51671*
Threshold 4	2.28952	33.72905*
Threshold 5	3.09079	23.36329*

Log likelihood
Final model (unrestricted) = -464.0138;
Initial model (restricted) = -615.652 n=263;
Percent correctly classified = 32.6996.
Chi square (10 d.f.) = 19.57742, significant at alpha = .05
* Denotes significant at alpha = .10 using two-tailed test.

Table 3–Signs of changes in each probability of each category with respect to changes in significant independent variables

Independent variables	Probability of Category I						
	No trust						Great trust
	P(1)	P(2)	P(3)	P(4)	P(5)	P(6)	P(7)
Low income	+	+	+	-	-	-	-
High income	+	+	+	-	-	-	-
Preserme	+	+	+	-	-	-	-

The other significant variable in model 1 (table 3) is the dummy variable indicating membership or nonmembership in environmental organizations such as the Sierra Club or Wilderness Society. The entry of signs for changes in membership indicate that members of these kinds of groups are more likely to have low trust for the Forest Service than are nonmembers. Nonmembers are more likely to choose trust scores of 4, 5, 6, and 7.

Note also in the summary statistics that about 32.7 percent of the observations are correctly classified. If a respondent chose a trust score of 5, and the probit model calculated a probability for trust category 5 that exceeded the calculated probability for all other categories, then that observation is correctly classified. Near misses don't count in this form of summary statistic. Since the odds of correctly classifying an observation purely by chance are 1 in 7 (14.285 percent) and the model correctly classified about 32.7 percent of the observations, the model more than doubles the odds of correct classification over random chance. Finally note that the Chi Square statistic indicates that the overall equation is significant at alpha = .05.

The coefficients for the threshold variables in model 1 (table 2) are calculated along with the coefficients of the independent variables. These threshold coefficients are used in the calculation of the categorical probabilities for each observation. In the context of testing hypotheses and developing theory, the threshold variables are uninteresting.

Now let us turn to model 2 (table 4), the model predicting trust for the Montana State Forest Land managers. The frequency distribution summarizing responses to this question is shown in table 1. The underlying structure of support for the Montana Department of State Lands, Forestry Division is surprisingly similar to that of the USDA Forest Service. The same variables are significant in Model 2 (table 4) as is the case in model 1 (table 2), and the signs of the marginal changes of the coefficients of the significant variables (table 5) are again virtually identical. Middle income residents are more likely to have middle to high degrees of trust for State land managers than are high and low income residents. Preservation organization members are more likely to distrust State land managers than are nonmembers.

Table 4–Trust in the Montana State Lands Division of Forestry

Independent variable	Estimated coefficient	t-statistic
Constant	1.29681	3.13061*
Age	-0.004795	-0.95789
Low income	-0.34878	-2.26165*
High income	-0.37316	-1.94274*
Years education	0.006159	1.05946
Years perm	0.005841	1.05453
Year seas	-0.004127	-0.57328
Perm v sea	0.23530	1.09987
Preserme	-0.51756	-2.78547*
Conserme	-0.059276	-0.36366
Ideology	0.0287465	0.94040
Threshold 1	0.53798	9.18932*
Threshold 2	1.05669	18.56218*
Threshold 3	1.84908	30.38469*
Threshold 4	2.40973	33.40951*
Threshold 5	3.16691	24.15814*

Log likelihood,
Final model (unrestricted) = -460.056;
Initial model (restricted) = -622.6644 n=259;
Percent correctly classified = 28.95753
Chi square (10 d.f.) = 18.32383, significant at alpha=.05
*Denotes significant at alpha=.10 using two-tailed test

Table 5–Signs of changes in probability of each category with respect to changes in significant independent variables

Independent variables	Probability of Category I						
	No trust						Great trust
	P(1)	P(2)	P(3)	P(4)	P(5)	P(6)	P(7)
Low income	+	+	+	-	-	-	-
High income	+	+	+	-	-	-	-
Preserme	+	+	+	-	-	-	-

Now let's examine the alienation or trust for county commissioners as shown in model 3 (table 6). The variables that are significant in predicting the degree of trust for county commissioners are the number of years of the respondent's education and permanent versus seasonal residency (table 7). Individuals with lower levels of education are less likely to trust the county commissioners than are residents with higher levels of educational attainment. Seasonal residents are more likely to trust the county commissioners than are permanent residents. While we did not ask whether each respondent voted and where they were registered to vote, it is was assumed that the seasonal residents would be less likely to be registered to vote in the Swan Valley as compared to permanent residents, since many of the seasonal residences are not occupied during the fall election period.

Table 6–Trust in county commissioners

Independent variable	Estimated coefficient	t-statistic
Age	-0.00197	-0.43885
Low income	-0.036344	-0.24842
High income	-0.20642	1.08660
Years education	0.11540	2.44929*
Years perm	-0.00041	-0.072204
Years seas	-0.00322255	-0.48770
Perm v sea	0.38873	2.14612*
Preserme	0.0078761	0.04271
Conserme	-0.063292	-0.38408
Ideology	0.033209	1.08002
Threshold 1	0.64207	12.33464*
Threshold 2	1.13330	20.87490*
Threshold 3	1.186347	25.62725*
Threshold 4	2.51346	22.20733*
Threshold 5	3.50301	10.87852*

Log likelihood,
Final model (unrestricted) = -443.8496;
Initial model (restricted)= -529.659 n=264;
Percent correctly classified = 27.27273
Chi square (9 d.f.) = 18.17199, significant at alpha=.05
* Denotes significant at alpha = .10 based on two-tailed test

Table 7–Signs of changes in probabilities of each category with respect to changes in significant independent variables

Independent variables	Probability of Category I						
	No trust						Great trust
	P(1)	P(2)	P(3)	P(4)	P(5)	P(6)	P(7)
Years Educat.	-	-	-	+	+	+	+
Perm v Seas	-	-	-	+	+	+	+

Some Broader Conclusions

The social determinants of alienation toward State and Federal forest management agencies are virtually identical. In contrast to these two organizations, determinants of alienation toward county commissioners are very different. Some people trust one governmental organization more than another. While there is strong evidence of an income class orientation to alienation for State and Federal land managing agencies in the Swan Valley, this class orientation is not evident with respect to trust and mistrust of the county commissioners. Of course, one key difference between the State/Federal management situation and county commissioners is that of the public versus private orientation of land management.

Both Federal and State foresters manage public lands and it is quite possible that residents perceive that the management of these lands is oriented to the middle income classes. In contrast, the county commissioners have the legal authority to effectuate limitations on the use of private lands in the valley. Instead of a class orientation explaining trust for direct governmental management of public lands, some of the existing theory that education levels help explain alienation is replicated, but only with regard to the county commissioners. As mentioned before, the right to vote for elected representatives appears to operate in a somewhat perverse way. Although county commissioners are elected officials, the seasonal residents are more likely to trust county commissioners with managing the lands in the valley than are the permanent residents. Possibly, the seasonal residents, while less likely to have a voice in the election of county commissioners, may see their own interests being forwarded by proactive (managing) county commissioners. Contrarily, permanent residents who may have to deal with county officials more frequently, may have formed more negative impressions of specific commissioners.

Unlike other studies of alienation, this study focuses on the community level, allowing residents to use their own perceptions of "lands in the valley" and specific organizations. No doubt, when many residents think of the USDA Forest Service or Montana Department of State Lands managing lands in the valley, they may even think of specific individuals who actually reside in the community, or of specific management situations. Hence, people in the valley may have different levels of alienation regarding government in general than is the case where they are familiar with particular agencies, officials and management situations.

It is interesting to note that the USDA Forest Service, Department of State Lands, and county commissioners all were accorded more trust than was "out-of-state business." In fact, there was so little variation in the no trust scores for out-of-state business in managing lands in the valley, that it was impossible to model the variable. Two hundred and forty-two of 298, or about 81 percent of the usable responses, indicated a code of 1, the lowest possible no-trust score for "out-of-state business." It is interesting to speculate whether this exceptional level of alienation is a result of actual management practices, specific people, or whether little or no public involvement in private sector land management contributes to these high levels of mistrust of out-of-state business management of land in the valley.

If there is a message to public land managers in the valley, it is to carefully examine how agency programs mesh with the values and aspirations of the lower and upper end of the income strata. Are the two public agencies too middle class in the orientation of their programs? Can the agencies tailor particular programs with unique class appeal? What particular elements of agency policy and management are most likely to alienate low and high income residents, and do the same programs that create mistrust among the lower income classes also create mistrust among the more wealthy residents? Likewise, can a government agency like the Forest Service or Office of State Forester segment its publics and provide services that are designed to appeal somewhat uniquely to various classes of citizens?

Trust is an extremely important quality between agencies and their publics. Of course, one might ask, how can an organization improve its public trust? Four key ingredients from the literature on alternative dispute resolution seem to bear on this question (See Axelrod 1984). First, "enlarge the shadow of the future." In other words, always deal with publics as though you will have to deal with them again. Second, change the payoffs where possible. To the extent possible, establish a system of rewards and sanctions which encourages socially responsible cooperation (some of the new Forest Service appeals initiatives may have accomplished this). Third, teach people to care about each other. It is not necessary for people to become more attached to nature by simultaneously becoming less attached to people. Finally, "teach reciprocity." Reciprocity is the key to cooperative behavior. If you want to foster cooperation and trust, never cast the first stone, and don't overreact when being stoned.

Ecosystem management involves implementing new ways of thinking about managing lands and the relationship between lands and people. Imposing change in communities where there is already a substantial degree of suspicion and mistrust presents some unique challenges and opportunities. How will new ecosystem management initiatives be perceived by the alienated and nonalienated publics? Will ecosystem management be seen as solving problems that are identified within the rural communities? Will the alienated participate in processes designed to incorporate their values and aspirations, or is ecosystem management itself a product of those publics who don't trust the agencies but who have oriented their actions toward the media and the courts instead of withdrawing from the system entirely?

Finally, allow a few words about the renewed interest in the area of rural development. If rural development is thought of as helping rural communities achieve community-defined development goals, reduction of alienation may, itself, be a requisite of rural development. Rural development in part means a community orientation and alienation–in the sense of withdrawal from the polity–is a fundamental rural development failure. Thus rural development means that agencies have to work to enhance community trust as a basis for rural development. Overall, the public land managing agencies in the valley don't have as far to go as do some of the other groups, but this study indicates some of the kinds of people in the community where mistrust is comparatively greatest. If the public land

agencies are able to achieve greater trust beyond the middle income classes and from the members of environmental action groups, while not losing trust from other residents, it will likely enhance their ability to effectuate rural community development goals.

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Values, Institutions and Ecosystem Management: A Research Agenda for Policy Analysis

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Abstract

We propose one method of integrating three critical dimensions of ecosystem management and the social sciences: the principles of ecosystem management; the underlying values which form the basis of our society; and the institutions with which we regulate social interaction. This analysis lends itself to a three dimensional matrix that allows visualization of the intersection of each of the three dimensions. Seeing the interactions among all factors allows identification of productive places for social science research on the ecosystem management approach.

Introduction

> "The usual experience with ecosystem data is that there is not enough to define the biology with any confidence, but far too much for a single human mind to assimilate" (Lee 1993).

One of the most important research challenges we face in integrating the social sciences and ecosystem management is finding the mechanisms which will allow us to identify the relevant components and examine their interactions. Given the complexity of ecosystems and the social and cultural contexts in which we seek to manage them, this is no simple task. To do so, it is particularly important that we understand how our values and institutions frame the possibilities for ecosystem management. To the extent that ecosystem management suggests changes that challenge these values and institutions, the suggestions will either be discarded or tremendous debate will ensue.

This paper proposes one method for integrating three critical dimensions of ecosystem management and the social sciences. These dimensions are 1) the principles of ecosystem management, 2) the underlying shared values which form the basis of our society, and 3) the institutions with which we regulate social interaction. While these principles, values and institutions seem quite basic, we believe that it is only through understanding the interaction of these fundamental factors that we can frame the possibilities for implementing ecosystem management (Lee 1993). By juxtaposing the concepts within these dimensions, we can examine their interactions and suggest a practical research agenda for public policy and ecosystem management.

We first review the principles of ecosystem management, the underlying social values, and the institutions that enforce them. We then describe a three dimensional matrix which allows the researcher to conceptualize the interactions of the components. Finally, we provide examples of relevant research questions produced through application of the matrix.

Ecosystem Management

Despite well intentioned public policy efforts, many scientists, managers, and other stakeholders are increasingly concerned with decreasing biodiversity, and ecosystem health, resiliency, and sustainability. In the United States, these concerns have been particularly acute in public land management and are increasingly expressed with regard to private lands. The Government Accounting Office (1994:19) reports that "despite the enactment of numerous laws to protect individual natural resources, ecological conditions on many federal lands have declined."

The concept of ecosystem management emerged in response to these concerns. Grumbine (1994) traces the history of the concept from the 1930's. More recently Robertson (1992) and the Society of American Forester's Task Force Report on Sustaining Long-Term Forest Health and Productivity (1993) have added impetus to the discussion.

Moote and others (1994:1) describe ecosystem management as: A management philosophy which focuses on desired states, 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.

Perhaps less explicitly Grumbine (1994:31) suggests: Ecosystem management integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term.

Based on an extensive review and synthesis of the literature, Moote and others (1994) derived five principles integral to ecosystem management: (1) socially defined goals and management objectives; (2) integrated, holistic science; (3) broad spatial and temporal scales; (4) collaborative decision

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building; and (5) adaptable institutions. These principles are described below:

Socially Defined Goals and Objectives

"Desired future 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. There is nevertheless a recognized need for human society 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 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 requires management on larger spatial and longer temporal time scales than has been the norm in resource management. Ecosystem management means 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, in order 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 revisited 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."

Values

Salwasser (1994:9) writes "Neither science nor economics gives us values, and values indicate what is desired and guide our choices." Similarly, Bormann and others (1994:25) add: "people chose goals for ecosystem goods, services and states based on their perceptions of needs; goals are set and evolve by cultural and political processes." These cultural and political processes reflect an underlying set of common values which form the basis for governance. They are the fabric of a world view which acts as a screen or frame of reference through which all is considered (Dunlap and Van Liere 1978 and 1984, Wildavsky and Dake 1990, Disinger and Tomsen 1994). Allocating these basic, shared values among members of society often results in conflict (Cobb and Elder 1983, Amy 1987, Stone 1988, Gerlach and Bengston 1994).

In reviewing the literature we find a set of five core values which capture the essence of the social contract in Western democracies. They are: (1) justice; (2) liberty; (3) freedom; (4) economic opportunity, and (5) environmental quality.

Justice

Justice is a fundamental social value. In The Federalist Number 50, Madison (1787) writes "Justice is the end of government. It is the end of civil society. It ever has been and ever will be pursued until it be obtained or liberty be lost in the pursuit." Plato suggests that justice equilibrates the other virtues (Cahn 1968). There are several aspects of justice that are important components of the larger concept: substantive justice, procedural justice, allocative justice (or equity) and remedial justice.

Liberty

Laski (1968) defines liberty as self-realization, an affirmation by an individual or group of her or its own essence. This realization requires three factors: a balance of personality, absence of restraint upon the exercise of this affirmation, and the positive organization of opportunities to continually exercise this right (Laski 1968). The fundamental problem of liberty is balancing individual restraint with providing opportunity within a society. Liberty must be reconciled with the necessities of the social process. It has to find terms upon which to live with authority. (Laski 1968:444)

Freedom

At first blush, liberty and the related value of freedom may seem indistinguishable. They are separate but related

concepts. Freedom is specifiable only in relation to others, but liberty (as self-realization) is distinctly individual despite its inexorable ties to the social process. Freedom can be defined either negatively or positively as in what one is not constrained from doing, or the space within which one may act. These conceptions include the freedom of choice and the freedom to act unless it impinges on another's freedom. These ideas of freedom of choice are strongly linked to both liberty and justice. "Equal freedom, not more freedom is the essence of democracy." (Oppenheim 1968: 555). Thus the distinction can be described: freedom is liberty constrained by group process.

Economic Opportunity

Economic opportunity, like justice, may be viewed as a first principle in social organization. In the Liberal philosophy of Locke and others who influenced the framers of the U.S. Constitution, government exists as a device by which individuals can protect their economic opportunity. As the modern welfare state evolved, our conception of economic opportunity has also evolved. Okun (1975:17) writes "The assurance of dignity for every member of the society requires a right to a decent existence–to some minimum standard of nutrition, health care and other essentials of life." Beyond this fuzzily defined "safety net," society offers an opportunity to compete for material well being. In theory, the opportunity is extended equally to all who seek it. In practice, the distribution of opportunity is far from uniform. Yet economic opportunity lies at the heart of why humans come together in societies and the interactions between humans and ecosystems are profoundly affected by our quest to acquire material well being which is insured by economic opportunity.

Environmental Quality

Environmental quality must also be regarded as one of the fundamental values in modern society. Although it did not emerge until the mid-to-late 19th century (Marsh 1864) because of the relative abundance of natural resources, several authors suggest the emergence of a "new environmental paradigm" or world view since the 1960's (Dunlap and Van Liere 1978, Milbrath 1984). As industrial societies make the transition from relative abundance to relative scarcity (Salwasser 1994) it is increasingly clear that without clean water, fertile soil, clean air and the natural resources they provide, justice, liberty and freedom are not possible.

Institutions

In the United States, our historically shared values are reflected in the Constitution and enforced through a collection of social and political institutions. The dictionary (Merriam and Merriam 1967) defines institutions as "a significant and persistent element in the life of a culture that centers on a fundamental human need, activity or value...usually maintained through social regulatory agencies." Parsons (1960; quoted in Gerlach and Bengston 1994) defines institutions as "generalized patterns of norms which define categories of prescribed, permitted, and prohibited behavior in social relationships for people interacting with each other as members of their society."

We have arranged these institutions into the following categories: state (government at all levels), private property conventions, economic systems, social discourse (information exchange), and religious and ethical institutions.

State

By the state, we refer to the legislative, regulatory and judicial functions of government at the local through national levels. Broadly conceived, the state is a mechanism for regulating the interactions of individuals and groups. By definition, it has direct involvement in matters of public policy. In the United States, it has limited powers of coercion derived from the consent of the governed. We assign the state limited responsibility for authoritatively allocating values for the whole society (Easton 1953, Cobb and Elder 1983). The state negotiates and enforces bargains and manages conflict among interest groups and other institutions. When society is forced to reallocate values to meet new circumstances, the state plays a critical role in managing the transition through statutory incentives and penalties and judicial oversight. The dynamic balance of power between the state and the individuals and groups which it regulates is a constant source of conflict. The connection between the security of the state and the management of natural resources is well established (Francis 1990). The appropriate role of the state in managing large scale ecosystems that cross political jurisdictions and property units will be controversial because of its power to influence individual and group behavior.

Property Conventions

Rousseau suggested that law and government were invented to protect property and that the aim of civil society was to provide peace for everyone and to ensure property rights for those with property. Property is a cultural system of duties and privileges that define what may be done with land and personal possessions. Cronon (1983:79) credits Locke with discerning that:

> "It was the attachment of property in land to a marketplace, and the accumulation of its value in a society with institutionalized ways of recognizing abstract wealth that committed the English in New England to an expanding economy that was ecologically transformative."

The concept of property is given special emphasis in the U.S. Constitution. The Third Amendment forbids the quartering of soldiers in private homes. The Fourth Amendment forbids the government from committing unreasonable searches and seizures. The Fifth Amendment provides that no one may be "deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation." What is less clear and more important is the relationship between the public's interest in private property and an individual's duties and privileges regarding the public welfare.

Karp (1993:739) suggests that if the right to survival is to be honored:

> "This finite resource upon which we rely must be conserved. There is surely a consensus that the right of survival crosses time boundaries, and that given that this right exists, duties must exist as well. This may end the consensus. It is much easier to enjoy the rights to nature's bounty than to constrain our claims by honoring our responsibilities to the community at large and to future generations."

Because property is defined culturally, the specification of public and private duties and privileges is in constant flux. Leopold (1966:237) illustrates this change with his recounting of Odysseus:

> When God-Like Odysseus returned from the wars in Troy, he hanged all on one rope a dozen slave-girls of his household whom he suspected of misbehavior during his absence. This hanging involved no question of propriety. The girls were property. The disposal of property was then, as now, a matter of expediency, not of right and wrong.

More recently Bromley and Hodge (1990:198) observed:

> "More generally private property in land is said to constitute the foundation of democracy, individual freedom, and a bounteous market. These traditional property rights remain largely intact–and rarely challenged–today, even though economic conditions and relative scarcities are quite different from those prevailing when modern agriculture first began to develop."

The specification of property rights is particularly important in ecosystem management because large scale ecosystem boundaries and property boundaries rarely coincide. This fact will require property owners to work across boundaries to protect or restore components, functions and structures.

Economic Systems

Economic systems such as capitalism and the quasi-free market provide us with a theoretically efficient means of allocating scarce resources. In early societies, the primary social mechanisms that allowed survival were based either on tradition (in which roles were strongly defined) or command (where behavior was directed by leaders). As justice, liberty and freedom were extended to larger classes of individuals, choice became more important. The market emerged as a mechanism for applying individual choice (Heilbroner 1961).

Modern capitalist democracies must balance the quest for efficiency with the need for equality. Okun (1975:1) observes that in this system "the big winners feed their pets better than the losers can feed their children." Our economic system sends signals about the prices of commodities such as wood fiber, livestock forage, outdoor recreation on private lands, and atmospheric sulfur emissions. For a variety of reasons, "Many who have benefited most from the uses of natural resources have avoided the resulting costs or damages" (Gerlach and Bengston 1994:19). To be effective in the long term, ecosystem management must address the equity as well as the efficiency concerns of the society it seeks to serve.

Social Discourse

The public's conception of ecosystems and how we manage or fail to manage them is defined through social discourse or information exchange. Our primary institutions for exchanging information include our formal and informal education systems and the mass media. Formal and informal education systems are an important part of socialization. They transmit social norms as well as information and provide a mechanism for developing new knowledge. The mass media not only transfer information, they play an important role in shaping public perception and public policy by influencing issue visibility.

Within the context of ecosystem management, public participation is often suggested as a mechanism for social learning (Shannon 1987, Cortner and Shannon 1993). In this conception of public involvement stakeholders come together to learn from each other and share responsibility for the outcomes of the management actions taken in their behalf. Bormann and others (1994) suggest ecosystem management requires societal consensus and acknowledging, examining and reconciling underlying assumptions and values. In this view, social discourse is a broad process for conflict resolution.

Religious and Ethical Institutions

Religious organizations and social norms are important institutions for regulating interactions among people and between people and our environment. White (1967) and Nash (1982) discuss ways in which Judeo-Christian notions of the separateness of humans and nature and the concept of wilderness as a place of waterless suffering and tribulation influenced European attitudes toward nature and environmental management.

Organized religion has been particularly effective in regulating behavior through moral instruction. The secular counterpart of organized religion–social norms–share a similar function. Subjective norms are an individual's perceptions of other people's feelings regarding his or her actions (Azjen and Fishbein 1980). Leopold's (1966:238) well known argument for a land ethic ("An ethic, ecologically, is a limitation on freedom of action in the struggle for existence.") is a suggested social norm. Hardin (1968) also suggests a norm as a method for solving the tragedy of the commons when he prescribes "mutual coercion, mutually agreed upon."

The Matrix

As social scientists consider ecosystem management, we are reminded of Walt Kelly's Pogo, who found himself surrounded by insurmountable opportunities. The breadth and scope of the issues and questions seem infinite. But which questions should we ask first? We lack a coherent system for examining the interactions and prioritizing our efforts.

We have suggested three important dimensions of ecosystem management and the social sciences: Moote et al's (1994) principles, core social values and the institutions that regulate our behavior. The analysis lends itself to a three-dimensional matrix (fig. 1). Each of these dimensions has five components, a total of 15 factors which combine in 125 possible forms.

From an ecological perspective, we understand that species (richness, diversity) often increases along ecotones. This edge effect also has merit as we consider a research agenda for ecosystem management and the social sciences. By providing a way of seeing the interactions among all 15

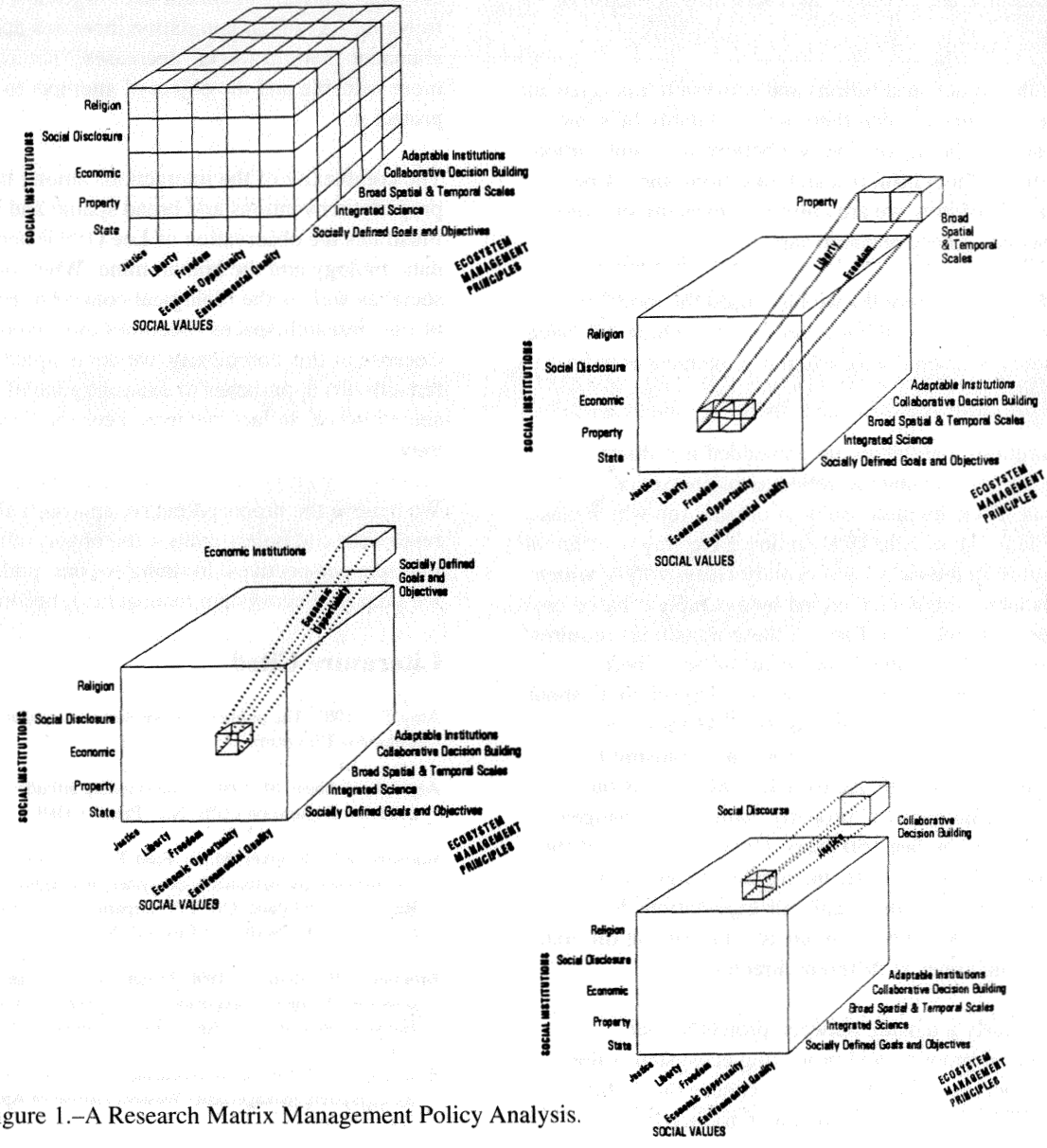

Figure 1.–A Research Matrix Management Policy Analysis.

factors, we create conceptual ecotones–productive places for researchable ideas. The intersection of each of the factors describes an area which we call a "research space." It is likely that problems in implementing ecosystem management will occupy more than one of these spaces. Using the matrix to characterize our current research efforts should reveal the gaps in our research programs as well as suggesting areas which deserve additional exploration.

For example, it is the combination of managing at a broad spatial and temporal scale (an ecosystem management principle) combined with property conventions (an institution) and the values of liberty and freedom, that make ecosystem management controversial on private lands. Similarly, socially defined ecosystem management goals interact with our economic institutions to influence economic opportunity and environmental quality. Collaborative decision building is only possible through social discourse and certainly interacts with our sense of justice.

Because the values, institutions and ecosystem management principles are fundamental there will inevitably be some overlap among the factors, but we believe the combinations may stimulate thoughtful research questions and a first level analysis of how we are currently investing our very limited social science research capital.

During the last few months we have used the model to stimulate our thinking about several issues which will need to be addressed soon if ecosystem management is to be implemented.

Our institutions and values are embedded in cultural contexts and they change to reflect evolving social consensus. Thus the philosophy of cut and run which was acceptable in the middle 19th century gave way to efficient conservation in the early 20th century (Hays 1959), which in turn is increasingly challenged by a paradigm based on ecosystem sustainability. Each of these transitions requires a redefinition of individual and social justice, liberty, freedom, economic opportunity and our expectations about what constitutes environmental quality. As these values evolve, the institutions which enforce and transmit the values must also change. An excellent example is our conception of humans as "property" which has changed considerably in the last 150 years. Our conceptions of the appropriate role of the state, the market, religious and ethical treatment of nature, and our expectations for education and communication are all changing at different rates and sometimes in different directions.

There is clearly a tension between protecting our conception of property and protecting ecosystem values which cut across ownerships. If we choose one at the expense of the other, are we prepared to face the consequences? If both must be compromised to find a middle ground how will we manage the inevitable social conflicts? Gerlach and Bengston (1994:21) suggest: "The challenges of today– which can be summarized as institutionalizing ecological and economic interdependence democratically and managing the resulting conflict–are also formidable."

A particularly rich literature (Francis 1990, Powell 1878, Pinchot 1947, Stegner 1953, Webb 1931, Turner 1986, Sweirenga 1984, Cronon 1983) suggests that our political institutions are influenced by environmental factors and our perceptions of abundance and scarcity. Locke (1690) acknowledged that "the same law of nature that does by this means give property does also bound that property, too." But "because there is enough land in the world to suffice double the inhabitants," the rights of one individual to use her property did not interfere with the rights of another. Until relatively recently we have simultaneously enjoyed relatively abundant natural resources, liberty and freedom. As human population increases and the relatively abundant "natural world" decreases, "nature" becomes more valuable and the object of attempts to conserve or protect it.

The complexity of the interactions among liberty, freedom, property conventions and broad spatial and temporal scales illustrates the observation of Lee (1993) about ecosystem data, biology and the human mind. When one adds the social as well as the biological context of ecosystems, each of the "research spaces" becomes even more complex. Because of this complexity, we are tempted to use reductionist approaches to examine each of the defined spaces, when, in fact, we must keep the broader, holistic view.

We believe the proposed matrix approach allows the researcher and policy analyst the opportunity to gain multiple perspectives. In doing so, our understanding of the puzzle of ecosystem management becomes clearer.

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Economic Values, Development and Impacts of Ecosystem Management

Economic Value of Ecosystem Attributes in the Southern Appalachian Highlands

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Abstract

The hedonic travel cost method was used to make preliminary estimates of the economic value of ecosystem attributes found in the Southern Appalachian highlands. Travel costs were estimated using origin-destination data from Wilderness Area permits, and site attribute data were collected by field crews. Ecosystem attribute price frontiers were estimated and used to estimate attribute demand functions. Preliminary analysis of a data subset indicated that wilderness visitors hold relatively high consumer surplus values for viewing large trees, and lesser consumer surplus values for viewing rhododendron and the availability of camping areas. Overall, these initial results indicate that the hedonic travel cost method can be a useful tool to help land managers weigh the costs and benefits of various ecosystem management practices.

Introduction

Widespread public concern with sustainable patterns of economic development have engendered programmatic responses such as the USDA Forest Service's recent mandate for ecosystem management. The success of ecosystem management as a guiding paradigm for national forest management will depend upon the ability of proponents to articulate and operationalize basic concepts that distinguish this approach from other approaches to land management. Proposed goals for ecosystem management such as ecosystem health (Costanza and others 1992) and ecological integrity (Woodley and others 1993) are not value-free concepts and can be evaluated only from the point of view of a value system. An understanding of human values relating to ecosystems is essential for ordering priorities and making management decisions.

Human values can be articulated from many disciplinary perspectives including ethical, cultural, esthetic, and economic. While we encourage the development of pluralistic value theories with the goal of establishing criteria with which to evaluate the success of ecosystem management, in this paper we focus attention on the application of economic theory to the articulation and measurement of value. The economic concept of value that we utilize has its foundation in neoclassical welfare economics. This concept is based on the premise that each individual is the best judge of how well off they are in any particular situation and that an individual's welfare depends on their consumption of both private goods and services provided by the market and their consumption of nonmarket goods and service flowing from the environment (Freeman 1993). This focus on the individual does not negate or necessarily omit ethical or altruistic values held by individuals.

Four basic economic methods can be used for valuing nonmarket forest resources: the contingent valuation method, the generalized travel cost method, the discrete choice random utility model, and the hedonic travel cost (HTC) method. In this study we use the hedonic travel cost method to estimate the economic value of specific forest ecosystem attributes in the Southern Appalachian mountains. Rather than valuing a particular species of animal or a particular recreational site, the HTC method is used to value a set of attributes that characterize both the biotic (e.g. vegetation type and size) and abiotic (e.g. campgrounds, roads) attributes of a forest ecosystem. The types of ecosystem attributes that are valued by the HTC method are also those attributes that are subject to management decisions. The value estimates can be directly compared with management costs to facilitate management planning and decision making.

The Hedonic Travel Cost Model

The basic theory underlying the HTC was initially elucidated by Brown and Mendelsohn (1984). Since that time few studies on the HTC method have been published and none to our knowledge have been conducted in the South. A recent study by Englin and Mendelsohn (1991) on forest attribute values in the Pacific Northwest is germane to our study.

The overall goal of using the HTC method is to evaluate changes in net economic benefits accruing to consumers of nonmarket forest attributes when the levels of attributes change. We begin by assuming that individuals make recreational decisions by considering the attributes inherent to various forest areas and the specific costs of accessing those areas. The consumer's problem is to maximize utility subject to budget constraint:

$$Max\ U(Z,X) + \lambda(Y - C(Z) - XP) \qquad (1)$$

where U is individual utility, Z is a vector of forest characteristics, X is a vector of all other goods, P is a

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vector of market prices, C is the cost of purchasing a trip with characteristics Z, and λ is the marginal utility of income. The first order conditions for constrained utility maximization require that the individual set the marginal value of each attribute equal to the cost of enjoying it; likewise, the marginal values of consuming other goods are set equal to their marginal costs:

$$U_{z(i)}/\lambda = C_{z(i)} \text{ also } U_{x(i)}/\lambda = p(i), \qquad (2)$$

where the subscripts denote partial derivatives. Equation 2 says that the marginal value to the individual of forest characteristic z(I) is equal to the marginal cost of accessing that characteristic in the same way that the marginal value of a market good is equal to its price. Because attribute values are not directly observable (i.e. there is no market for them) marginal costs are used to estimate marginal attribute benefits.

By analyzing how far individuals travel to access forest sites with different bundles of characteristics, we can estimate the marginal cost of obtaining individual forest characteristics. Of course, the access cost to any particular bundle of attributes depends upon the individual's origin. Therefore the first step in the HTC method is to estimate the implicit marginal costs (benefits) of forest characteristics for each origin zone by regressing site attributes on travel costs:

$$C = C(Z) = c_0 + \sum_{i=1}^{m} c_i z_i. \qquad (3)$$

By combining the first-order conditions with the consumer's budget constraint, a system of individual demand equations for the set of forest attributes can be derived and written as:

$$Z = G(C_z, W), \qquad (4)$$

where W is a vector of individual characteristics by origin zone. In order to estimate equation (4), sufficient variation must exist in the estimated marginal costs C_z. That is, the sample must contain origin zone information for individuals with dispersed locations around forest destinations. To be consistent with a well-behaved utility function, the demand system in equation (4) should have negative own price terms and symmetric cross-price terms. The latter condition is imposed by estimating the demand system using seemingly unrelated regression with symmetry constraints.

Marginal attribute values as estimated by equation (3) are useful for estimating the value of a small change in the quality of a single site. The marginal social value of such a change is the sum of the marginal dollar costs across all visits to the site. Forest attribute demand curves, on the other hand, can be used to measure changes in values (consumer surplus) associated with changes in the systemwide level of a particular characteristic across all levels of that characteristic. Consumer surplus values associated with policy changes that influence the height but not the shape of the hedonic price gradient can be measured by the area under the demand function minus the travel cost:

$$\int_0^{z_j'} G(C_{z_j}, W)dq - C_{z_j'} * z_j', \qquad (5)$$

where z_j' is the typical consumption level of ecosystem attribute z_j.

Data

Three types of data are generally required to implement the hedonic travel cost method. First, information on individual origins and destinations are required to compute travel costs. Second, information about the attributes of the forest system at the sites chosen by recreationists is also required. Finally, it is useful to obtain information about individual characteristics that enter the model as demand shifters.

The origin-destination data were obtained from Wilderness Permit registration cards for wilderness areas in the Southern Appalachian mountains. Cards are collected from voluntary registration boxes on various ranger districts and sent to the regional headquarters in Atlanta for processing. With the cooperation of the recreation staff in Atlanta, we were able to receive a computerized record of the coded information. The wilderness permit cards include information on zip code, entry and exit points, and length of trip. Round-trip distances were computed using the ZIPFIP software package.

Information on forest attributes along the trails identified by the wilderness permits was collected by students from the Yale School of Forestry and Environmental Studies. The decision on which forest attributes to measure was made in collaboration with district rangers and wilderness and recreation specialists for the sampled forests. Field crews hiked trails and made observations every fifth mile on a list of trail attributes including basal area, forest type, stream crossings, and views. Trail attributes were collected for the first 3 miles of each included trail. After this distance, intersections with other trails made it impossible to unambiguously assign routes to individuals. Trailhead information was also recorded for such attributes as campsites and parking spaces.

Finally, socioeconomic information on individuals by origin zone is available in the Census and other data sets provided with the ZIPFIP software. This allows us to test for the influence, if any, of variables such as income and percentage of urban population on the demand for individual forest characteristics.

Results

The results presented in this section are based on analysis of a subset of the overall data. As such they should be viewed as strictly illustrative. The entire data set consists of over 2,500 observations on trips to wilderness areas in Tennessee, North Carolina, and Georgia. The preliminary results are based on a subset of 305 observations on trips to wilderness areas in Tennessee from eight origin zones in relatively close proximity to the wilderness areas.

Table 1 provides the descriptive statistics and acronyms for the forest attributes considered in the preliminary analysis. The ecosystem components we studied were (1) the average basal area along the trail in trees greater than 1 foot in diameter, (2) the proportion of observations along the trail with rhododendron thickets, (3) the number of waterfalls viewed along the trail, (4) whether or not the trail passed through a clearcut (outside the wilderness area), and (5) the number of campsites within 5 miles of the trailhead.

One of the keys to a successful implementation of the HTC method is deciding which attributes to include in the estimation system. Table 2 shows the relationship between ecosystem variables. It is not surprising that we found correlations between the various ecosystem attributes. The implication of this result is that forest attributes may be proxies for distinct ecological types. For example, rhododendron is generally found at mesic sites at low and middle elevations. An important area for future research is to explore how groups of attributes such as elevation, aspect, vegetative cover, and basal area may be combined to represent an array of ecological types that can be included in the demand analysis.

Table 3 shows the estimated demand system relationships. As can be seen on the main diagonal, all own-price effects were negative as expected. The off-diagonal effects demonstrate substitute-complement relations. For example, these results suggest that waterfalls and rhododendron are complements in consumption.

Using the parameter estimates from the demand system, the largest estimate of consumer surplus per trip was associated with large trees, followed by the availability of campsites and presence of rhododendron vegetation. Presence of clearcuts had zero consumer surplus for the group of recreationists in our sample, although we expect that this result would not hold for other groups such as hunters. Surprisingly, we also found zero consumer surplus for waterfalls. This is probably due to the small sample size used in the preliminary analysis.

Evaluation of the estimated demand functions showed that the typical quantities consumed of the specified attributes were in the neighborhood of the estimated consumption amount if the attribute could be accessed at zero price. This implies that consumers in our sample are satiated or nearly satiated with the forest attributes we considered. This is not surprising since our subsample was drawn from origins relatively close to the wilderness areas.

Table 1–Descriptive statistics for forest attributes

Acronym	Variable	Mean value (std. dev.)
LARGE	Avg. basal area in trees > 1' dbh	14.52 ft^2 (2.93)
RHOD	Proportion of obs. with rhododendron	0.66 (0.31)
FALLS	Number of waterfalls	1.46 (0.98)
CLEARCUT	Trail through clearcut, dummy variable	0.14 (0.35)
CAMPG	Number of campsites within 5 miles	46.65 (47.36)

Table 2–Correlation matrix for ecosystem variables

Variable	LARGE	RHOD	FALLS	CLRCUT	CAMPG
LARGE	1.00	0.35	0.06	-0.29	0.77
RHOD		1.00	0.29	-0.51	0.53
FALLS			1.00	-0.15	-0.29
CLRCUT				1.00	-0.34
CAMPG					1.00

Conclusions

Based on our preliminary analysis we conclude that the hedonic travel cost method is a promising method for estimating economic values associated with forest ecosystem characteristics. Because the method relies on observations of actual, versus stated or intended, behavior the method is not subject to the usual criticisms associated with surveys of stated preferences. The method is particularly useful for evaluating the economic impacts of system level changes in the level of particular attributes.

Table 3–Estimated demand system relationships

	LARGE	RHOD	FALLS	CLRCUT	CAMPG	R
LARGE	-	0	0	0	-	0.30
RHOD	0	-	-	+	-	0.32
FALLS	0	-	-	+	-	0.91
CLRCUT	0	+	+	-	+	0.91
CAMPG	-	-	-	+	-	0.50

Note: 0 indicates the relationship was not significantly different than zero at the 0.05 level.

Future research should focus on exploring methods for grouping forest attributes that may better represent specific ecological types. Quantitative information relating changes in the condition of ecological types with economic benefits and costs will help land managers make decisions in the pursuit of ecosystem management.

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Economics In Ecosystem Management: Do We Know What the Public Wants?

Karen J. Lee

Abstract

Increased public involvement in national forest management is a primary emphasis of the USDA Forest Service's shift to ecosystem management. Application of economic theory and methods to participation decisions, eliciting relative public values, and institutional processes can contribute to this shift. Specifically, economists can (1) examine current and proposed public involvement processes, and (2) assess tradeoffs the public is willing to make with respect to choices and options for ecosystem management. While public values must be balanced with other objectives for managing public lands, a better understanding of these values and tradeoffs is essential to informed decisionmaking.

Introduction

A key principle of ecosystem management (EM) is an increased emphasis on eliciting public values and improving public participation in national forest management. However, the equity and efficiency of the methods used to gather information about public values have garnered little attention in either the resource economics or EM literature. There is also a need to explore the potential conflicts between the EM goal of ecological integrity and the public's goals for publicly owned forestlands. Tradeoffs between productivity, sustainability, health, and beauty are inevitable as demands for forest resources increase, but available national forest land and Forest Service budgets do not. The purpose of this paper is to outline and emphasize two important roles for economics in ecosystem management: obtaining information on what the public wants and assessing the methods we use to get that information.

Public Values, Science, and Ecosystem Management

Public involvement is often viewed as a means of reducing conflict and improving decisions (Knopp and Caldbeck 1990). Increased public involvement is also important because members of the public view themselves as the owners of the national forests and thus their views and opinions should be considered in national forest management. Although interpretations differ, there is nearly universal consensus that EM requires an improvement in assessing public values. The current process has been criticized both because the Forest Service maintains a "...unitary perception of the public interest" (Voth and others 1994) and because multiple use management does "...not adequately involve people in the decisions that affect them" (Kessler and others 1992). Some authors insist that EM demands improved local control (Salwasser 1994, Gerlach and Bengston 1994, Grumbine 1994), while others believe that EM involves a primacy of rural interests over the currently dominant urban interests (Fortman and Fairfax 1991, Voth and others 1994). Still others place importance on consulting with relevant publics, without specifically defining who these publics are (Kessler and others 1992, Cawrse and others 1994).

Empirical studies of public participation have not generally supported the perception that participation reduces conflict (Gericke and Sullivan 1994) or provides for maximum public input leading to better decisions (Force and Williams 1989). This, combined with a dissatisfaction with the current process, has led to a recognition that improved public involvement may require the development of new processes (Gerlach and Bengston 1994, Wenger 1994). Because public participation and involvement are economic decisions, economic theory and methods can be used to assess both current and proposed public involvement processes. Stakeholders' economic decisions to participate affect the quality of the information obtained through the public involvement process. An individual who participates–an activist–is someone who attends meetings, calls, writes letters, or who is represented in these arenas by interest or trade group representatives. Yet public participation often focuses on obtaining information from already activist individuals and local stakeholders, possibly ignoring values held by nonactivists or nonlocal stakeholders. Three specific economic questions relate to (1) efficiency and equity of current public involvement methods, (2) value differences between different constituent groups, and (3) value differences between Forest Service employees and the public.

Because EM is a process of both defining goals and working toward those goals, there are unlimited opportunities for differences in values and opinions. Both national forest land and Forest Service budgets are limited, implying that we can no longer supply all of the needs of the American people for forest resources. Thus, there will likely be winners and losers in applying any management scheme, including EM. While the public generally supports

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EM (Schindler and others 1993), more information about public values is needed to implement actual management of national forests. One role of economics, as a science, is to provide information to supplement the information derived through the public participation process or from other sources. Three specific areas economists can address are (1) public tradeoffs between outcomes, outputs, and desired future conditions, (2) public tradeoffs between ecosystems and individual attributes or species, and (3) public tradeoffs for priority actions by the Forest Service.

Current Methods of Obtaining Value Information

The Forest Service currently obtains information about public values from several different sources. Perhaps the most structured of these is through representative democracy. The public is presumed to vote for the candidate who most closely represents the voters' views. However, many voters do not vote for single issue candidates, and the influence of pressure groups (Becker 1983) and the presence of logrolling (Buchanan and Tullock 1962) make this a less precise measure of public values about EM than would be hoped. Values are transmitted from the representatives to the Forest Service through laws, regulations, budgets, and oversight. This generally results in a top-down portrayal of public values.

A second method of incorporating public values is the Resources Planning Act (RPA) process. This process results in both a national strategy for national forest management and specific values for forest uses (such as the value of a recreation visitor day) that are intended to be applied to analytical forest planning efforts. Again, this is generally a top-down portrayal of public values. It is assumed that both voting and the RPA represent both activist and nonactivist public values, but this assumption has not been examined.

Participatory or consensus decisionmaking is often viewed as a cornerstone of EM (Brown and Harris 1992, Cawrse and others 1994). In addition, public participation is the method of obtaining value information that has garnered the most attention in the EM literature. Participation includes meetings and hearings, as well as letters and calls, and thus represents only the activist public. The fairness and efficiency of using public participation as a filter for interest in national forest management issues needs to be addressed. If information is costless, if transactions are costless, and if the population is perfectly mobile such that everyone who is interested in a particular forest lives within the commuting area, then public participation may indeed be an adequate and complete method of obtaining public values. However, if these assumptions are invalid, then relying solely on participation may be misleading.

The final source of information is through the decisionmakers' position as agent for all parties not otherwise represented in the process. This includes the nonactivist public and may include future generations and all other life and land forms who are unable to represent themselves at the human negotiating table. The following discussion focuses on the current generation, including both the activist and nonactivist public. Acting as an agent for the public in decisionmaking requires knowledge of the public's values and its willingness to make tradeoffs between the EM objectives of productivity, health, sustainability, and beauty.

Two Roles for Economics

Although economics has other roles in defining and implementing ecosystem management, I believe the evaluation of current processes and the elicitation of relative public values are two important contributions that economics can make in the quest for improved public involvement. This discussion does not address the weight the decisionmaker must give to the various groups in making the decision, but instead focuses on improving the quality of information given to the decisionmaker.

Evaluating the Current Process

The current process by which the Forest Service obtains information on public values should be examined carefully to find out if these methods are efficient, equitable, and accurate. The present climate in the agency is that having more meetings results in improved public participation. There may, however, be an optimal level of participation where information is maximized subject to the costs of participating. Increasing numbers of meetings could lead to undue influence by those who can afford to attend all of the meetings, often the paid staff of national interest or trade organizations.

The EM literature, as noted above, makes a point of emphasizing local participation. Only Grumbine (1994) and Wenger (1994) noted the possibility of disagreements between local and national interests. Because the forests are national through both ownership and funding, it seems prudent to examine differences in national and local public values. There is also a need to determine differences between rural and urban constituencies, although one study found similar values in the activist public (Force and Williams 1989).

There is also a strong possibility that agency or professional values will continue to be substituted for public values. Twight and Lydon (1989) found the Forest Service did not occupy a middle perspective on use of the national forests. This substitution of professional for public goals is not unique to the Forest Service, but has been characterized as a universal trait of bureaucracies (Adrian and Press 1974). It may be laudable for the agency to strive for best scientific management, but the determination of where that management is headed should be a socially

determined goal, not a bureaucratic one. While under EM the agency goal is likely to be ecological integrity or ecosystem sustainability, it is not yet clear that these goals are representative of public goals any more than the agency goal of timber harvest targets was representative of the public goal of adequate wood supply. It is also important to ask if managers are being given the right incentives to manage for public goals.

Eliciting Relative Public Values

The second economic question related to public involvement in EM is about relative values. Asking the decisionmaker to represent all public values without providing adequate information on the nature and intensity of these values is unfair both to the decisionmaker and to the public he/she is supposed to represent. The values the public places on outcomes, systems, and priorities are essential to the informed management of the national forests. This does not imply that the forests must be managed to be directly consistent with known public values, because of the potential conflict with interests and values of future generations and other life/land forms.

Most literature on EM assumes that ecological integrity or ecosystem sustainability should be the dominant focus of EM (Society of American Foresters 1993, Grumbine 1994, Salwasser 1994). The question should be asked whether this dominant focus is what the public wants for their lands. Although the agency may choose to emphasize ecological integrity because of concerns for future generations or other life and land forms, regardless of public values, it is still important to understand current public values. It is also important to understand the public's willingness to make tradeoffs between the various conditions, outputs, and outcomes. Better management will not continually increase the productivity, sustainability, health, and beauty of the forest, and thus the decisionmaker will be forced to make difficult choices between these forest management objectives.

The Forest Service has demonstrated an understanding of the importance of the tradeoffs between ecology and commodity outputs. For example, the Forest Ecosystem Management Assessment Team (Forest Ecosystem Management Assessment Team 1993) report deals almost exclusively with these tradeoffs. A large part of the report was devoted to ecology, and the economics section was dominated by timber supply, jobs, and income. However, it had less than a page on other values, with the primary importance being the effect of these other values on attracting more business and industry, i.e., jobs and income. There was only a brief mention of the demand for these other values not related to jobs and income. But these values, particularly beauty and existence values, are enormously important in understanding the shift in public values and demands for change in the Forest Service. Whether you view the Forest Ecosystem Management Assessment Team report as a summary of where the Forest Service has been or a picture of where the agency is headed, the lack of economic analysis on nonemployment-related values may reflect the agency's unwillingness to recognize that tradeoffs exist between other values, ecology values, and commodity values, and that people are willing to pay for these tradeoffs.

Another aspect of relative values is the importance people put on valuing whole ecosystems as compared to individual species or attributes. Definitions of ecosystems, the appropriate management size for an ecosystem, and other questions about tradeoffs between the ecosystems and the parts are necessary information for the decisionmaker.

A third aspect of public values that also needs further examination is how people want the Forest Service to make budgetary tradeoffs. Given that the agency budget is limited, even if the Forest Service knows and is doing what the people expect from ecosystem management, priorities for management must be established. Are people most interested in the forests closest to them? In ecosystems not currently represented in public ownerships? In high profile national forests such as the Yellowstone ecosystem? How would the public trade large improvements in the health of one forest with small improvements in many forests? Again, the point of this is not to make decisions relying only on public input, but to obtain and use the best possible information on relative public values.

Summary

This paper proposes two roles for economics in ecosystem management–assessing the public involvement process and improving the information available to decisionmakers. While other sciences will also play a part in providing this information, and there are other roles for economics, the issues described above can and should be analyzed through a careful application of economic theory and methods. Given the importance of public involvement in the establishment and success of ecosystem management, it would be unwise to ignore the insights and information available through the use of economic science.

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From Rhetoric to Reality: Research on the Well-Being of Forest-Based Communities

Catherine Woods Richardson and Harriet Christensen

Abstract

Despite regular references to the welfare of timber towns in forest management discussions over the past century, it is only within the past decade that researchers have begun to critically examine the contributions of forest management to the welfare of neighboring communities. This paper reviews changing foci in U.S. forest-community research and explores how the resulting improvements in knowledge may assist the inclusion of rural communities in ecosystem management.

Keywords: Community stability, community well-being, forest dependency, ecosystem management

Introduction

In the United States and around the world, forest scientists and managers are observing that the welfare of forests and the people who live and work in them are inextricably linked (e.g., Bormann and others 1994, World Commission on Environment and Development 1987). The science of ecology, which informs ecosystem management, rarely addresses the role of humans in ecosystems, but many landscapes that ecosystem managers are asked to understand and manage provide habitat for people as well as plants and animals. Successful ecosystem management thus requires knowledge and monitoring of the social as well as the biological systems that comprise ecosystems.

The purpose of this paper is to review trends in recent research on forest-based communities in the United States, with particular attention to the Pacific Northwest. Several themes and significant changes in terminology appear in recent research:

1. From community stability to community well-being: social scientists recognize that forest-based communities were and are dynamic places; they have not, and cannot be expected to, display the stability that forest managers have sought on their behalf.

2. From timber dependence to forest base: researchers are beginning to recognize and describe the diverse and complex ways in which forests may contribute to community welfare.

3. From economic to socioeconomic measures of well-being: social scientists realize that jobs and dollars attributable to forest management represent only one aspect of the influence forest management can have on forest communities. The concept of well-being incorporates noneconomic measures of individual and community health and capacity that greatly enrich understanding of community function.

"What is Community Stability, Anyway?"

The welfare of the nation's timber-producing communities has been an expressed concern of the USDA Forest Service since its earliest days, when Gifford Pinchot (1910, p. 51-52) noted:

> It is the duty of the Forest Service to see to it that the timber, water-power, mines, and every other resource of the forests is used for the benefit of the people who live in the neighborhood or who may have a share in the welfare of each locality.

For much of the 20th century, the concept of community stability has been a touchstone in discussions of conditions in timber-producing communities. Despite the long history of the concept in U.S. forest management, however, few people sought to clearly define community stability prior to the past decade. Before then, community stability was generally assumed to be a product of sustained-yield timber management, which, in theory, would promote stable employment and income in local wood products economies (Drielsma and others 1990, Lee 1990, Schallau 1990).

By the late 1980s, the efficacy of USDA Forest Service timber sale policies as a means for stabilizing local wood products economies had come into serious question (Schallau 1989, Wear and others 1989). Although some economists had been questioning the stabilizing effects of sustained yield for several decades (Drielsma and others 1990), the severe effects of the recession of the early 1980s and subsequent restructuring of the timber industry on some timber-producing communities in the Pacific Northwest, among other events, contributed to a broad-scale questioning of the relations between local community welfare and public timber management policies (Lee and others 1990, LeMaster and Beuter 1989, Society of American Foresters 1989). The basic gist of this

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questioning was, "What is community stability, anyway? And, if we can figure out what it is, how do we get there from here?"

As part of this questioning, some researchers have traced the use of the term "community stability" in forest management discussions and legislation and found it to be an abstract, often emotionally laden concept that many people could embrace while each interpreted it differently (Fortmann and others 1989, Schallau 1989, Schallau and Alston 1987). Recognizing the overwhelming symbolic and political uses of the term, Lee (1989, p. 36) commented in 1987, "We don't know what community stability is; we have seldom tried to find out; and, as a result, we haven't measured it."

In the 7 years since Lee's observation, community researchers have defined and begun to measure community stability, described below. This does not mean that the question has been answered for all people and places in this country, however. The question, "What is community stability, anyway?" continues to be debated in various forms in legal, political, and scientific circles at the national level, in resource agency field offices, and in communities themselves. Richardson (1993), for example, documents particular legal and community concerns for the Bureau of Land Management in western Oregon regarding definitions of community stability in the Oregon and California Railroad Act of 1937 (43 U.S.C. 1181), which directs much of the BLM's land management in the region. The 1993 forest conference and resulting Presidential Forest Plan were driven by dual concerns for the health of Northwest forest environments and communities (Clinton and Gore 1993, Forest Ecosystem Management Assessment Team 1993). Currently, the National Academy of Science/National Research Council Committee on Environmental Issues in Forest Management in the Pacific Northwest is seeking to clarify the relation between forest management policies and community welfare in the region (Heberlein 1994).

Definitions of Community Stability

For community researchers, the problem of defining community stability is twofold: one must define both community and stability. In recent discussions, natural resource sociologists have identified three broad categories of definitions for human communities: a community may be defined as a geographic area, as a local social system, or as a type of relation; for example, Carroll's description of the occupational community that exists among Northwest loggers (Carroll and Lee 1990, Forest Ecosystem Management Assessment Team 1993, Society of American Foresters 1989). In analyses of community stability, researchers have most often defined communities operationally by political boundaries, but these political boundaries have rarely coincided with the boundaries of the social and economic relations that constitute functional human communities (Forest Ecosystem Management Assessment Team 1993, Machlis and Force 1988, Schallau 1990). In addition, researchers have chosen geographical regions ranging in size from towns to collections of counties to represent a single community (Machlis and Force 1988).

Researchers also have struggled with the concept of stability. Waggener (1977) has argued that the maintenance of the status quo is the most accepted definition of stability, but researchers have been challenging this notion from the earliest studies of rural, timber-producing communities in the 1940s. From their 1946 study of two Montana communities, Kaufman and Kaufman (1990, p. 32) noted,

> "The term community stability, as used here, does not imply a static condition, the absence of change, or the necessity of maintaining the status quo. The basic implication is orderly change rather than a fixed condition.

Machlis and Force (1988) noted that stability means different things in different academic disciplines. For example, in ecology, it may be considered a dynamic equilibrium, resilience in response to external stress, or ability to accommodate change. Social scientists often have considered stability to have multiple dimensions; for example: rates of change and adaptation, definition of personal roles, diversity of community economy and functions, community population and structure, and social conflict (Machlis and Force 1988).

Recognizing the importance of the concept of community stability in U.S. resource management and law and the difficulties in defining it, a National Task Force of the Society of American Foresters worked in the late 1980's to clarify these issues. The task force, consisting of nine resource sociologists, economists, and managers who had worked on community stability policy and research, provided the following definition of community stability in their report, adopting the Kaufmans' concept of stability as "orderly change":

> Community stability is best defined as a process of orderly change within those political and geographical areas that are significantly affected socially or economically by forest resources....This issue cannot be adequately considered apart from quality of life, environmental considerations, and nontimber and noncommodity uses of forest lands. *Community stability concerns the prosperity, adaptability, and cohesiveness of people* living in a common or functional geographic area *and their ability to absorb and cope with change* (emphasis Added; Society of American Foresters 1989, p. 6).

This definition is similar to one adopted by the USDA Forest Service (1982, p. 17,942) earlier in the decade: "[Community stability is] the capacity of a community to absorb and cope with change without major hardship to institutions or groups within the community."

From Community Stability to Community Well-Being

By the early 1990's, some community researchers in the Pacific Northwest had begun to advocate the concepts of community capacity and well-being over the well-worn notion of community stability. The term stability, in their view, misrepresented the dynamic processes community researchers were describing and had an irredeemable history as a political buzzword, rather than a precise sociological concept. In place of stability, the term well-being referred to general community welfare, and the term capacity referred to a community's ability to address local problems and respond to external threats (Forest Ecosystem Management Assessment Team 1993, Kusel and Fortmann 1991).[1]

In the early 1990's, one university researcher studying community stability and the USDA Forest Service also observed:

> Rural development specialists within the Forest Service realize that community stability is more than non-declining even flow of timber. However, the past narrow constraints that have been associated with the Agency's emphasis around community stability have left many of these specialists to totally disavow this terminology. As one development specialist stated to me: "I do not understand why you use that term, *it does not serve the agency well.*" (Phelps 1992, p. 34, emphasis in original).

The period of questioning among forest managers and natural resource social scientists about community stability, described above, coincided with a critical reexamination in government and academic circles of the condition of rural communities across the country and the efficacy of traditional rural development policies. This latter questioning was driven in large part by the farm crisis of the 1980s and perceptions of stagnation or decline in many of the nation's rural areas, not only, or even primarily, in its forested regions (Humphrey 1994b, Madigan and Vautour 1991). Despite this broader focus, the outcomes of this reexamination have influenced the ways in which agencies and social scientists understand forest-based communities.

In January 1990, the Presidential Initiative on Rural Development, ordered by President Bush, directed a reexamination and reformulation of the Federal role in rural development across several Federal agencies (Madigan and Vautour 1991, McWilliams and others 1993, U.S. General Accounting Office 1992). The previous year, the U.S. Department of Agriculture had completed "a hard look" at its own rural development programs (Rural Revitalization Task Force 1989). And in late 1990, Congress passed the Food, Conservation, and Trade Act (Farm Bill: S. 2830, Public Law 101-624, November 28, 1990) that contained new authority in the Rural Development Title (Title XXIII) for the USDA Forest Service to assist eligible national forest-dependent rural communities. Subtitle G, chapter 2, cited as the "National Forest-Dependent Rural Communities Economic Diversification Act of 1990" refers to the well-being of rural communities in several instances, and though its main intent is the promotion of economic diversification strategies, a more general purpose of the act is stated "to improve the economic, social, and environmental well-being of rural America" (sec. 2373.b.1). This act has directed a new focus on rural development across all branches of the USDA Forest Service (McWilliams and others 1993), but the change most pertinent to this paper was in Forest Service research, described in USDA Forest Service (1991). The National Research Program outlined in that document provides direction for socioeconomic research on rural communities in Forest Service research stations across the country and specifically notes a transition in the USDA Forest Service's role from promoting community stability to promoting community well-being and rural development (USDA Forest Service 1991).

While the Federal Government, and particularly the USDA Forest Service, was reexploring its relations with the nation's forest-based communities around the turn of the decade, academic sociologists were gathering to address the issue of poverty in the nation's rural communities. The product of that effort, *Persistent Poverty in Rural America*, explores theories for why poverty continues in rural communities (Rural Sociological Society Task Force 1992). One chapter specifically addresses poverty in natural resource-dependent communities, and subsequent papers on poverty in such communities have appeared in special issues of *Society and Natural Resources* (Freudenburg and Gramling 1994; Humphrey 1994a, 1994b; Johnson and Stallman 1994; Nord 1994; Peluso and others 1994). Although poverty and well-being are distinct concepts, researchers who have developed the concept of well-being

[1] The concept of well-being has by no means gained universal acceptance among community researchers in the Pacific Northwest or elsewhere. Many researchers continue to use the concept of community stability, while others consider both terms so imprecise that they use neither. One reviewer of this paper noted, "I think we in the social sciences need to move away from these mega-concepts (although they may have some valuable political uses) and focus instead on specific impacts of decisions on specific groups of people." While his point is well-taken, in the authors' opinion, "mega-concepts" such as these (also sustainability, forest health) are unavoidable in the current research and policy climate; thus, discriminating among which "mega-concepts" we use is a pertinent exercise.

consider poverty to be a critical indicator for well-being (Kusel and Fortmann 1991), and advances in understanding the dynamics of poverty in rural, forest-based areas will contribute significantly to improved understanding of community well-being and its links to forest resources.

From Timber Dependence to Forest Base

In addition to rethinking community stability in the 1990's, researchers also began to describe the variety of community-forest relations that may exist. The demise of the notion that sustained timber yield automatically contributes to community stability, and increasing recognition of nontimber sources of income and employment in forest communities, contributed to the examination of nontimber aspects of forest-community relations.

Recreation-based economies have received the greatest attention among the various nontimber economic alternatives for rural, forested areas. The National Forest-Dependent Rural Communities Economic Diversification Act of 1990 defined forest dependency in terms of timber and recreation-tourism labor and income (S. 2830. Sec. 2374.3.A-B). The economic potential of amenity resources for rural development is attracting increasing interest and analysis (e.g., Lime 1990, Zeigler 1991). In addition to attracting tourists and recreationists, amenity resources have helped to attract retirees and telecommuters as well as nontimber businesses and industries to locate permanently in some rural communities, which has provided another source of economic benefit in some regions (Salazar and others 1986, Schallau and Polzin 1983).

Even though several researchers have documented various nontimber, forest-related sources of employment and income in rural communities, the unit of analysis has often been a specific economic sector, rather than an entire community. Studies on the economic diversity of forest-based communities have helped to expand this focus to consider the overall structure and function of community economies (e.g., Ashton and Pickens [in press], Phelps 1992). Economic diversification has gained favor as a strategy for improving community stability and well-being among a wide variety of rural development specialists, as evidenced in the 1990 Farm Bill and numerous rural development publications (e.g., Sommers and Birss 1991; Thomas 1987, 1990).

As researchers have begun to examine actual community economies and issues of economic diversification, they have observed that terms such as "timber dependent" or "recreation dependent" are often inadequate descriptors of the multiple ways in which a single community's economy may be linked to forest resources. Thus, the term "forest dependence" and the even broader term "natural resource dependence," which can include sectors related to mining, fishing, and ranching, have gained favor. Some researchers also eschew "dependence," which in their view has come to connotate addiction (see Freudenburg 1992), in favor of "forest-based" or "timber-producing," but most recent literature maintains the term "dependence" (e.g., Humphrey 1994a, Peluso and others 1994).

After surveying conditions in about 300 rural communities in the Pacific Northwest, the Forest Ecosystem Management Assessment Team (Forest Ecosystem Management Assessment Team 1993) observed that "forest dependence means many things," and that the rural communities in their study area revealed great variety and complexity in their forest bases. This was not a novel observation, but the scope of the Team's work and current interagency ecosystem management planning efforts for interior Washington and Oregon have demonstrated the need for systematic means of documenting and describing the variety of forest bases in communities in an ecosystem management planning region (Bormann and others 1994).

Little empirical work has been completed for such an inventory, though gathering community-level data that will permit such analyses of communities' forest bases is one of the major research priorities of the Rural Development Team (Christensen and others 1994). Gale's (1991) theoretical typology of the variety of forest-based communities in the Pacific Northwest provides an example of the sorts of community-forest relations such a study might reveal. Gale described nine types of forest-based communities in the Pacific Northwest and probable community reactions to "new forestry." His community types were natural resource manufacturing or administration, indirect or nonlocality dependent manufacturing or service, transit recreation, destination recreation, recreation residence, retirement residence, commuter residence, art colony and educational, and Native American. The distinctions Gale draws among various types of recreation and residential forest dependencies, and the differing forest-related social and economic issues each type of community may experience provide a useful caution against too-simple generalizations about forest-based communities in the Pacific Northwest or elsewhere.

From Economic to Socioeconomic Measures of Well-Being

The advent of community well-being and capacity as concepts in community research has not fully resolved the definitional issues that proved problematic with community stability. Researchers who have developed these concepts have been careful to explain them clearly, but the terms are abstract enough to remain open to interpretation and reinterpretation. Compared with the concept of community stability, community well-being and capacity are clearer in one important respect, which is that they cannot be reduced to purely economic measures and standards. Understanding the structure and function of a community's economy

remains critical to research on its well-being and capacity, but it provides only a part of the picture.

One important area of community well-being research is historical: identifying how the past has shaped the present and what traditions of strength or independent action a community may claim. For example, a team of researchers at Auburn University is examining how different race-relation and agricultural histories of Alabama counties have shaped the present-day structures of forest industries across the state (Bliss and others 1993, Bliss and Flick 1994). In California, Kusel and Fortmann (1991) have explored how the circumstances of a mill town's founding and its history of labor-industry and community-Forest Service relations can affect current community capacity for self-determination.

Well-being and capacity also can include a community's physical infrastructure; for example, roads, schools, hospitals, utilities, and the distance residents must travel to acquire basic goods and services not available in the community (Forest Ecosystem Management Assessment Team 1993, Muth and Lee 1986, Phelps 1992). Social or human capital in a community is often measured in terms of residents' education levels (Forest Ecosystem Management Assessment Team 1993), and social cohesion or civic responsiveness may be measured through community volunteerism, membership in churches and service organizations, continuity of community traditions in festivals, museums, or memorials, and support for public services (Force and others 1993, Phelps 1992, Weeks 1990). Informal systems of social support and sharing among households also are important, though rarely as obvious as formalized systems (Muth 1990). Common indicators for poor capacity or ill-being are signs of stress or poor functioning: divorce, drug and alcohol abuse, crime, domestic violence, or poverty, all of which might occur across a community or only in pockets (Forest Ecosystem Management Assessment Team 1993, Force and others 1993, Kusel and Fortmann 1991, Lee and others 1991, Machlis and others 1990). Conflict in a community over resource management or social issues could be a sign of ill-being, but its absence is not an automatic signal for well-being, if it results from the domination of community governance and leadership by a like-minded elite or from minimal interaction among different social groups in the community (Lee 1991). For example, Brown (1994) documents the increasing invisibility of working-class viewpoints in rural communities in southwestern Oregon. Minorities and the poor may also have little voice or recognized presence in a community.

In addition to intracommunity relations, researchers have examined the dynamics of a community's relation to the outside world. The area of interest in this relation has often been a community's ability to influence its future, examined via measures such as land and business ownership patterns (small, locally owned vs. large, absentee-owned forest tracts and businesses) and community representation and voice in county and State government and with large, public or private landowners or businesses in the region (Brunelle 1990, Fortmann and Starrs 1990, Kusel and Fortmann 1991, Shannon 1990). Economic analyses also have pointed to the influence of international markets and business cycles on local economies, and noted that different rural diversification and development strategies may insulate a community from dramatic economic fluctuations or make it more susceptible to them (Ashton and Pickens, in press; Gramling and Freudenburg 1990).

Integrating Community Research into Ecosystem Management

Although considerable progress has been achieved in recent years toward understanding the structures and dynamics of forest-based communities in this country, many of the theories and empirical results are not yet in a form such that they can be easily applied by ecosystem managers. Case studies of individual communities, counties, and regions have done much to demonstrate the complexity of community-forest relations, but they also have tended to emphasize the unique circumstances of each case, and thus are not of direct use to people interested in other places. The research to date does, however, provide guidance on where to look and what to examine in analyses of community well-being and capacity and lays essential groundwork for constructing more systematized, wider range analyses that may distinguish the common and distinct traits of multiple communities in a region. One important advance has been methodological: researchers working under temporal and budgetary constraints have begun to develop methods for eliciting and analyzing community socioeconomic data in less time than traditional, ethnographic community studies have taken (Forest Ecosystem Management Assessment Team 1993, Kusel and Fortmann 1991, Phelps 1992, Richardson 1993). In doing this, researchers have drawn from established techniques and theories of Rapid Rural Appraisal and Participatory Rural Appraisal that have been used in community studies and rural development projects in many Third World nations (Kusel and Fortmann 1991, Phelps 1992). Reviews of some of these time-constrained efforts (most notably, Forest Ecosystem Management Assessment Team 1993) have been critical and emphasized the importance of clearly outlining and following a scientific method of data collection and hypothesis testing (Gale 1994, Lee 1993). The combination of sound study designs with more rapid data collection and analysis techniques will provide a major advance towards integrating rural communities into ecosystem management.

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Meeting Human Needs for Food, Water, Minerals and Other Basic Resources: Maslow's Hierarchy of Human Needs and its Foundation

Thomas K. Collins, James R. Craig, Donald B.K. English

Introduction

The "human dimension in ecosystem management" encompasses a virtually limitless field of study. One way to approach such an encyclopedic study is to look for some unifying or comprehensive framework to help ensure that the full range of human needs are considered. One such framework is the Hierarchy of Human Needs, developed by noted psychologist Abraham H. Maslow (1970).

Maslow's Hierarchy of Human Needs is usually visualized as a pyramid (fig. 1). At the base of the pyramid are physiological needs, such as the need for food and water. Next are safety needs, such as protection from criminals and from natural hazards. Next up the pyramid are belongingness and love needs and then esteem needs. At the top of the pyramid is the need for self-actualization: the human desire for self-fulfillment–for a musician to make music; for a climber to climb mountains; for you to be all you can be.

Looking at the different levels of the pyramid one can refer to physiological needs as the base-level or foundation of the pyramid. The physiological and safety needs can be considered together as lower level needs. The levels above can be referred to as higher level needs.

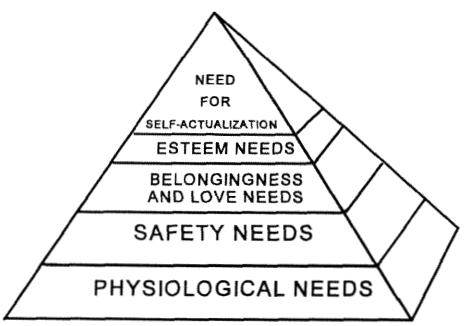

Figure 1–The Hierarchy of Human Needs (Maslow, 1970).

Generally, the lower level needs require attention before higher level needs can be fully pursued. Some people are poor, cold, and hungry and spend most of their day scraping about for food, shelter, and warmth. These people are not likely to fly away and take ski vacations in Colorado. As Maslow noted, "A person who is lacking food, safety, love, and esteem would most probably hunger for food more strongly than for anything else." (Maslow 1970, p.37).

Section 1: Adapting the Hierarchy to Ecosystem Management

Maslow's Hierarchy of Human Needs can be expanded into a framework for approaching the human dimension in ecosystem management. The steps to expand the Hierarchy into a framework are briefly described below.

Step 1: Specify the Human Needs

The first step is to subdivide the general need at each level into more specific needs. As a prototype, we have subdivided the general need at each level of the pyramid into some of its component needs (fig. 2). These component needs are only examples, and by no means an exhaustive list.

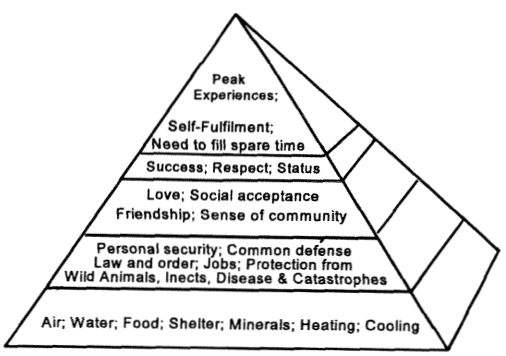

Figure 2–Step 1: Specify the human needs.

Geologist, Jefferson National Forest, Roanoke, VA; Geologist, Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA; Research Social Scientist, Southeastern Forest Experimental Station, USDA Forest Service, Athens, GA.

Physiological needs can be subdivided into such components as the need for air, water, food, shelter, minerals, heating, cooling, etc. Safety needs can be subdivided into such components as the need for personal security, common defense, protection from natural catastrophes, wild animals, insects, disease, etc. The higher level needs can also be divided into more specific components.

Step 2: Identify the Activities Used to Satisfy Human Needs

The second step is to identify the activities that humans undertake to satisfy each level of their needs. Again as a prototype, we have listed some of the activities associated with two levels of the Hierarchy (fig. 3).

To satisfy the base-level (physiological) needs, people engage in such activities as:

1. Farming; subsistence hunting, gathering and fishing; animal husbandry.
2. Mining; tool-making; timber harvesting; fuel gathering.
3. Building shelters, means of transport, trails and roads.
4. Transporting food, tools, fuels, and construction materials.

In satisfying self-actualization needs, every person is different. The range of activities used to satisfy these needs is limitless. Many of the "self"-type needs can be grouped here, such as self-fulfillment, self-expression, self-enjoyment, self-indulgence. In addition to lofty needs, such as for creative expression, the "self-actualization" top of the pyramid can include such mundane but very real needs as the need to fill spare time. In an affluent society the need to fill spare time is widespread. Only a tiny fraction of "self"-oriented activities is listed below.

1. Writing, painting, acting, dancing, playing music, reading, philosophizing.
2. Being the ideal mate, mother, father, daughter, son, worker, friend.
3. Achieving the greatest spiritual and religious experiences.
4. Climbing mountains, seeking solitude, riding dirt bikes.
5. Swimming, jogging, body-building, team sports, individual sports; hiking.
6. Bird-watching, coin collecting, gold panning; treasure hunting.
7. Making your mark in the world, tilting at windmills; storming the Bastille, saving the world.

We have just listed some activities associated with satisfying needs at the top and bottom of the pyramid. In the interest of brevity, the activities associated with the intermediate levels of the pyramid are not listed in this paper. For each person and for society, the same activity can occur on more than one level because that activity might be satisfying more than one level of need. For example, farming satisfies not only food needs but also jobs needs.

Step 3: Identify the Resources Used to Satisfy Human Needs

The third step is to identify the resources used to satisfy human needs. Resources can be grouped into two categories: Internal (human) resources and External (natural) resources. Some of these resources are shown in fig. 4. Survival skills, education, and social and political organization are resources that are internal to the human species. In contrast, human habitats, raw materials (biotic and abiotic) and ecosystems are resources which are external to the human species.

As an example of "identifying the resources," we will take a brief look at external resources that humans typically need to satisfy base-level (physiological) needs.

Habitats required for human physiological needs–Many species require a variety of habitats. A natural opening with

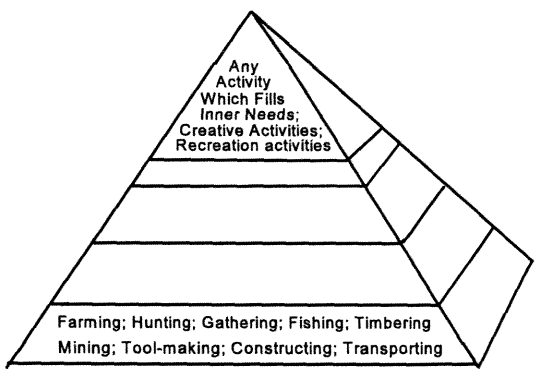

Figure 3–Step 2: Identify the activities used to satisfy human needs.

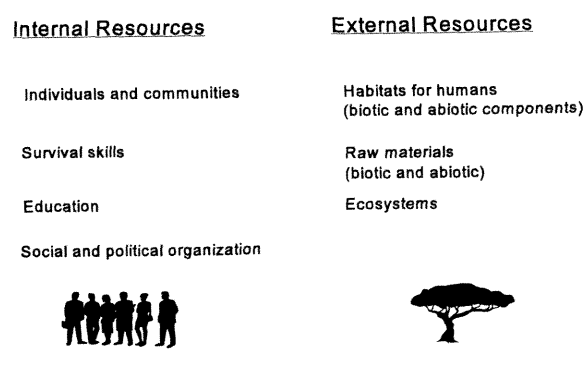

Figure 4–Step 3: Identify the resources used to satisfy human needs.

tender browse is a habitat where a deer can satisfy its need for food. A forested area which provides cover is a habitat where a deer can satisfy its need for safety and sleep. An area with a natural salt lick is a habitat where a deer can satisfy its need for mineral salt.

The human species likewise requires a variety of habitats. Like deer, humans have food gathering habitats, such as farms. Like deer, humans have habitats where they seek safety and sleep, such as communities of homes and apartments. Like deer, humans have mineral gathering habitats, such as salt mines.

Raw materials required for human physiological needs– Meeting each basic need (food, shelter, heat, etc.) requires far more raw materials than many people realize. For example, feeding people involves much more than just sprinkling seeds on the ground and harvesting a crop a few months later. Farming and related activities to feed people are listed below:

> Land clearing, plowing, planting, fertilizing, weeding, harvesting, crop processing (shucking, etc.), food processing, food preserving, packaging and transporting food, storing food, fumigating storage and transport facilities, cooking of food, disposal of food/cooking wastes.

These activities require tools, utensils, equipment, means of transport, energy, etc. All of these require raw materials to make them or to power them. Even societies with low-level technology must use many raw materials such as wood, plants, stone, metals, clay, and beasts of burden to do the many tasks required to feed people.

The same need for raw materials applies to meeting many other physiological needs such as shelter, heating, water, etc. Raw materials are either grown (animate) or mined (inanimate). Raw materials from renewable resources include agricultural, forestry, plant or animal raw materials. The nonrenewable resources (mineral or elemental solids, liquids, and gases) are mined by extraction from the continents, oceans, and the atmosphere and include fossil fuel minerals, industrial and metallic minerals.

Ecosystems required for human physiological needs– Humans use, and sometimes transform, certain ecosystems to meet human physiological needs. For example, the boreal forest ecosystem has been a source of lumber for shelter; wood for heating and cooking; animals for food and clothing (fur and hides). The North American prairie ecosystem has been a source of buffalo which provided food, clothing, shelter (skins) and implements for Native Americans. Much of this prairie is now converted to farms to feed the United States and other countries.

Section 2: Potential Uses of Maslow-based Framework in Ecosystem Management

In the previous section we expanded on Maslow's Hierarchy of Human Needs to create a framework for approaching the human dimension in ecosystem management. This Maslow-based framework has three components:

1. Specify the human needs,
2. Identify the activities used to satisfy human needs, and
3. Identify the resources used to satisfy human needs.

The human drive to satisfy needs leads to purposeful activity to seek and to use natural resources. Uses include both consumptive or nonconsumptive uses. The Maslow-based framework can be used as:

1. A systematic process to identify human needs in ecosystem management.
2. A comprehensive net to ensure that the full range of human needs, and associated resource requirements, are considered in ecosystem management.
3. An approach to analyze competing resource demands and to prioritize resource allocations.
4. A basis for developing planning and implementation time horizons. For example, the base-level needs may require shorter planning and implementation timeframes than some higher level needs.

Section 3: Foundation of Maslow's Hierarchy: Meeting Human Physiological Needs

Because of its overarching importance, we will now focus on the foundation of Maslow's Hierarchy. In central Africa in the summer of 1994, hundreds of thousands of refugees fled from the civil war in Rwanda across the border into Zaire. Refugees scoured the countryside for food, water, shelter, and fuel for cooking. The United Nations mounted a massive effort to help the refugees. For months, millions of TV viewers in the industrialized countries witnessed the drama and tragedy as one million refugees struggled to meet their basic daily needs.

The Rwanda-Zaire tragedy is not uncommon. The newspapers and TV often report on desperate struggles for survival in different countries. Here in the U.S. we also see reports on the struggle by some Americans to scrape together life's bare necessities. Across the U.S., from the hollows of Appalachia to the barrios of inner cities, millions of Americans struggle for basic needs every day. Some of the urban homeless rummage for food in the discards of restaurants, erect cardboard boxes for shelter, and lay down on the steam grates on city sidewalks for warmth on a cold night.

For many people in the U.S. and around the world, every day is filled with searching the rural or urban landscape for food, shelter, warmth, and other basic needs. In contrast, most Americans do not, personally, spend all day hunting for food and gathering firewood to keep warm and to cook with. These Americans also have a relatively large amount of leisure time. The base-level needs of most Americans are generally satisfied. In such an affluent society it is easy to overlook or take for granted these base-level needs.

But, in an important way, we Americans are like the Rwandan refugees. Every day the UN undertakes a massive effort to feed the Rwandan refugees. Every day in the U.S. a massive effort is underway to feed us Americans. An armada of trucks, ships, planes, and railroads rescues us from hunger every day.

Similar massive efforts are required every day to meet Americans basic needs for heating, cooking fuel, etc. Every day around the world, massive efforts are underway to feed and to meet other basic needs for billions of people.

In planning for ecosystem management in an affluent society it is all too easy to overemphasize the amenities and to neglect the necessities. If the poor people in Bangladesh or Somalia or Appalachia or America's inner cities were to hold a conference on "integrating the human dimension in ecosystem management," it is likely that meeting basic human needs would receive great emphasis. Meeting these needs is just as important, critical, and deserving of great emphasis for everyone in an affluent society. Meeting these needs is essential for the survival and well-being of all members of society.

Meeting human needs for food, shelter, heat, energy, etc. is a 24-hour-a-day, 365-days-a-year massive effort. The planning and implementation needed by private enterprise and public agencies to insure continuing supplies of raw materials and to avoid catastrophic shortages is a monumental task. Society depends on a large number of raw materials. The supply and demand analysis for so many raw materials is a continuing challenge.

The agencies of the Federal Government manage huge areas of the United States which account for a significant portion of the natural resource base. The government, through laws and regulations, also has a big hand in the management of the natural resources on private lands. One of the key responsibilities for any government is to provide a framework in which the base-level needs of its population can be met.

Planning for, and meeting, the basic needs of people should be the foundation for any comprehensive approach to integrating the human dimension in ecosystem management. Meeting human needs for basic resources is essential and critical for all societies. These needs must be met not only for basic survival, but also as a foundation to pursue higher level needs.

Searching for, supplying, and struggling for control over raw materials needed to support life are central to the human experience. Improved understanding of society's needs for raw materials, and the role it plays in meeting higher level needs, should be a fundamental part of further study and research on the human dimension in ecosystem management.

Section 4: Role of Mineral Resources in the Foundation of Maslow's Hierarchy

The previous section highlighted the importance of meeting base-level (physiological) needs as the foundation for the Hierarchy of Human Needs. The following sections highlight the important, but unappreciated, role of mineral resources in meeting those base-level needs: food, shelter, heat, etc.

In this paper, "mineral" refers to the vast array of nonrenewable resources (mineral or elemental solids, liquids, and gases) which can be extracted (mined) from the continents, oceans, and atmosphere. It includes fossil fuel minerals, such as coal, oil, and gas; metallic minerals, such as copper, lead, and zinc; and industrial minerals, such as limestone, sand, and gravel. The word "mining" is used in a broad context signifying the extraction of solids, liquids, and gases from the continents, oceans, and atmosphere. So, for example, "mining" includes drilling and extracting petroleum and natural gas.

To illustrate the pervasive, and generally hidden, role of minerals in meeting basic needs, food will be used as an example, since food is one of the basic needs which people generally do not connect with mining.

Mineral-based Nutrition in Food

The human body needs iron, calcium, sodium, potassium, phosphorous, iodine, zinc, selenium, chromium, copper, manganese, molybdenum, and cobalt. Four ways that mining helps people obtain food with essential mineral elements will be mentioned briefly. First, mining, such as salt mining, provides people with some of these nutritional elements in a form that is directly added to food or ingested as vitamin and mineral supplements.

Second, mining supplies the mineral fertilizers that benefit soil and crops with essential elements, such as potassium, phosphorous, and nitrogen. Mineral elements which the crops take up from the soil provide some of the essential elements people need from food. In 1990 American farms were so productive that, on average, each farm worker fed 96 people. But farmers had a lot of help in feeding people. Miners, for example phosphate miners producing mineral

fertilizers, are a key part of producing food. In 1990 each phosphate miner fed more than 45,000 people.

Third, mining supplies mineral preservatives for food processing. The preservatives allow food to be packaged, stored for long periods, and transported great distances to consumers.

Fourth, the mineral-based transportation network makes possible the delivery of nutritionally diverse foods. Natural soils in different farming regions contain mineral elements in different amounts. The diet of Americans is rich in a variety of elements because the foods are grown in a variety of soils. But Americans can enjoy this variety only because the food is transported to them from hundreds or thousands of miles away. The food transport network requires a vast mining network. Just a few examples: mining metals to build trucks, trains, and ships; quarrying stone for highway and railroad beds; and drilling oil wells to fuel the transport network. Americans can eat a lot of fresh fruits and vegetables, year-round, because oil fields are pumping oil, and petrochemical plants are refining fuel, for trucks, trains, and ships.

Mineral-based Production and Distribution System for Food

Growing food and feeding Americans requires an enormous mining and mineral processing infrastructure. Everything from ploughing to planting to harvesting uses farm machinery built from metals from many mines. The fuel to run the farm equipment comes from oil fields. Mineral soil conditioners, like gypsum and limestone, are used to improve soils for crop production. Mineral fertilizers supply soil and crops with essential elements for the growth and health of crops.

But the farm is just the start of the mineral use needed to feed Americans. Using wheat as an example, a long journey

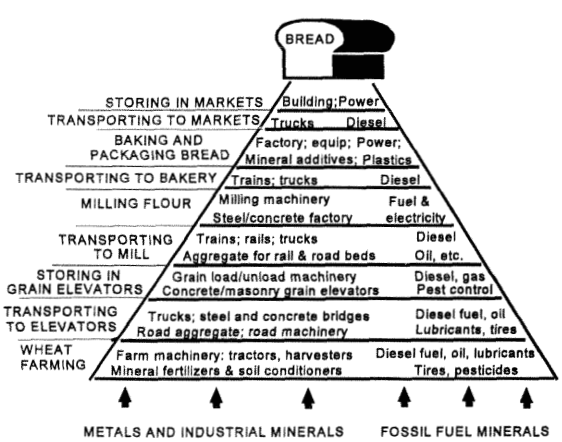

Figure 5–Mineral-based production and distribution system for bread.

and many mineral-rich steps must be taken to convert wheat to bread and to deliver the bread to the consumer (fig. 5). Hauling the wheat to a railhead requires metal trucks and diesel fuel; then there is fossil-fueled loading and unloading at temporary storage in concrete or masonry grain elevators. From there the wheat travels by diesel-fueled, metallic trains or trucks over crushed stone rail and road beds to the flour mills. In the steel/concrete mill, the wheat is ground using metallic machines and industrial minerals. The factory is lighted and powered by fossil fuels and metallic power lines spanning hundreds of miles.

Then the flour is packaged and transported by train and/or truck to a bakery. In the steel/concrete bakery, the flour is mixed with other ingredients (including minerals like salt and mineral preservatives) using metallic machines and industrial minerals. These ingredients each had their separate mineral-based production and transportation to reach the bakery. The bakery is lighted and powered by fossil fuels and a metallic electric grid spanning hundreds of miles. Metallic machines slice the bread and package it in plastic wrappers. The plastic wrapper started as petroleum in a distant oil field, and was processed at a large petrochemical plant, then manufactured into a plastic wrap at another factory, and then shipped hundreds of miles to the bakery.

The bread is hauled to grocery stores in diesel-powered, metallic trucks over crushed stone and asphalt roads. The grocery store, constructed from cinder blocks or other industrial minerals, stores the bread on metal and plastic shelves. The bread is preserved from spoilage by the fossil-fueled heating and cooling system in the store. The grocery store is kept clean, disinfected, and pest-free using petroleum-based products. The consumer can find the bread thanks to the store lighting powered by fossil fuels and delivered by metallic powerlines and an electric grid spanning hundreds of miles.

The above description suggests the enormous scope and depth of the mineral-based production and distribution system for bread and other foods. Wheat is an essential, but minor, raw material in bringing a loaf of bread to the grocery store. The major raw materials in the entire food system, from farm to consumer, are the fossil fuel minerals, industrial minerals, and metallic minerals.

Mineral Resources for Other Basic Needs

Mining-derived resources occupy the lion's share of the raw materials needed to bring food to Americans' tables. Mining plays a similar role in meeting the other basic needs, such as heat, water, shelter, energy, etc.

In terms of raw materials used, the United States is overwhelmingly a minerals-based, not a wood-based, society (fig. 6). This revolutionary change from a primarily wood-based society to a primarily minerals-based society

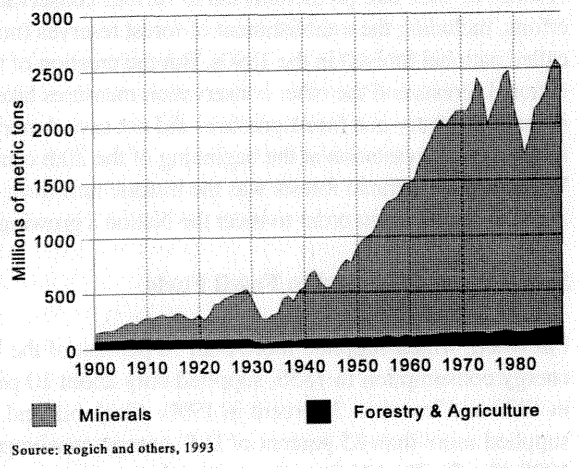

Figure 6–U.S. consumption of raw materials, 1900-1989.

occurred many decades ago. Unfortunately, this historic change is not yet widely recognized.

Section 5: Resource Illiteracy: an Obstacle to Overcome

"Where do bread and butter come from?" "The supermarket." "Where do cars come from?" "The auto dealer." "Where does gasoline come from?" "The pump at the gas station." "Where do computers, TVs, and VCRs come from?" "The department store."

Most people in the U.S. do not grow the food, cut the timber or mine the minerals they use in their daily lives. Most people are consumers of end products. They live far from the farms, forests and mines.

Most people in the U.S. live comfortable lives which allow them never to come face-to-face with the ploughed ground, the tree stumps, and the open pit mines required to sustain their lives. As a result, resource illiteracy is rampant in the U.S. Not just kids, but adults who are otherwise highly educated are ignorant of natural resources which meet their basic needs.

Resource illiteracy is especially severe in regard to mineral resources. Food and wood are generally recognizable in the end products that people consume. However, minerals often are so processed (melted, mixed, transformed into familiar shapes, painted, etc.) before being assembled in the end product that we tend to see just the product, not its mineral components. For example, we see a car door, a car windshield, a car hood, but not the iron, aluminum, silica, and other minerals that make up a car. Many people are unaware that much of, in some cases most of, the clothes they wear originate in the oil fields, not the cotton fields.

Food products have ingredient labels. But manufactured products do not have ingredient labels listing all the minerals in a product. In homes and on the jobs people use and depend on mineral resources for virtually everything they do. But people see only products and services, not the minerals and mining which make it all possible. Most people could not put in an order for, and name, the minerals that their life depends on.

Since computer illiteracy is a popular topic, we will use computers and the information highway to illustrate resource illiteracy. The following resource information will be new to many well-educated, computer-literate people.

The information highway requires more mines than a real highway. Most of a highway is made from simple crushed rock or gravel from one or two local mines. A highway (including bridges) also contains some cement, asphalt, and steel, usually derived from more distant mines. In contrast, the information highway is made from a myriad of minerals derived from many distant mines. For example, a computer can contain more than 30 minerals, everything from aluminum to zirconium.

These minerals are obtained from open pit mines, underground mines, and oil fields. The number and variety of mines needed to build computers and the other components of the information highway are much greater than those needed to build roads.

Every piece of computer hardware (computers, fax/modems, etc.) and every piece of software (disks) are derived from mining the earth. Fiber optic lines, cable lines, rocket-launched satellites, and all the other paraphernalia of the information highway are built on a colossal pyramid of mines and advanced mineral processing. The information highway is the epitome of mineral-dependence.

Every time your finger presses a key on the computer keyboard, you are using electrical energy. Every key stroke is burning more coal, oil, natural gas, or uranium in power plants, or running more water through the steel turbines of hydroelectric plants at the concrete dams on rivers. The information highway is fueled by electric energy supplied on demand 24 hours a day, 365 days a year. Offices and homes are supplied with electricity from an electric transmission network which rivals the road networks: thousands of miles of high-voltage transmission lines, local power lines, and wiring in homes and offices. The information highway is the epitome of energy-dependence.

Many highly educated people working with computers and "information" think of their work as clean and nonpolluting and devoid of the raw materials needs of smokestack industries and manufacturing plants. However, their work requires many, many minerals and a vast network of underground mines, open pit mines, and oil and gas fields. In fact, the minerals that make "information" work possible must be a higher grade of mineral and require much more

energy-intensive processing and refining to meet the high purity standards for use in computers and the other components of the information highway.

Resource illiteracy in the U.S., especially about mineral resources, is a major obstacle to informed discussion and analysis of the human dimension in ecosystem management. A major task for the future is to develop an educational initiative on resource illiteracy. A broad-based initiative is needed, targeted to (1) schools ("Resources" - the 4th "R"), (2) the general public, and (3) the ecosystem management community. The remainder of this paper is based on a draft paper (Collins and Craig 1995).

Section 6: One Link Between the Human Dimension and the Biological Dimension of Ecosystem Management: How Mining Saved American Forests

From around the world every year there are reports of forests cut down and vast areas denuded. In many poor countries people are scraping the landscape bare in their desperate search for wood for fuel and shelter, and to clear the land for farming. While here in the United States we are blessed with beautiful forests from coast to coast. Despite a long history of logging forest land, American forests are "in significantly better condition today than they were a century ago." (MacCleery 1992).

Americans are conspicuous consumers compared to people in poor countries. Why is it that in some countries poor people with very meager material requirements exhaust the forests and can not sustain, or survive on, the renewable vegetative resources? How can America today have the luxury of hundreds of millions of acres of forest after decades of profligate consumption?

There was a time when American forests were being cutover at a pace that could have destroyed virtually all the forests. There was a time when American forests were well on the road to devastation.

During the period from 1860 to 1910 the pioneers of the American conservation movement were warning about the unbridled logging of American forests. The settlement of the West and the general rise in population were resulting in the cutting and burning of millions and millions of acres of forested land.

The conservation pioneers were predicting the catastrophic loss of American forests.

> "As early as 1865, Frederic Starr predicted an impending "National famine of wood"– a concern that would be raised frequently in the next few decades. Use of the term famine was apt, for wood in its various forms was among the most widespread and essential materials both for domestic use and industry." (MacCleery 1992)

A series of such dire predictions led to various conservation efforts, including the establishment of forest reserves (now called national forests) in the 1890s. But the creation of the national forests and the other conservation measures taken in regard to forestry and forest practices did not save American forests from devastation at the beginning of the 20th century. What saved American forests was the historic turn from the forest to the mines in order to meet the Nation's growing needs.

Switch from Firewood to Fossil Fuels

Firewood, which supplied more than 90 percent of the U.S. energy consumption in 1850, supplied only about 10 percent in 1920 and less than 3 percent in 1990. Coal, oil, and gas supplied more than 85 percent of U.S. energy consumption in 1920 (fig. 7). Total U.S. energy consumption has been rising from about 2 quads in 1850 to 21 quads in 1920 and has reached 84 quads in 1993. Not only were minerals fuels replacing wood's share of U.S. energy, they were meeting the sharply rising absolute amounts of U.S. energy consumption (fig. 8). These two factors indicate the enormous magnitude of the switch from wood to minerals fuels.

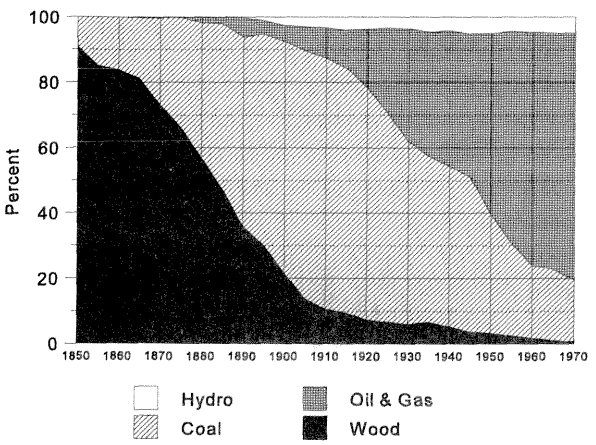

Figure 7–U.S. energy consumption, share by fuel type, 1850 to 1970.

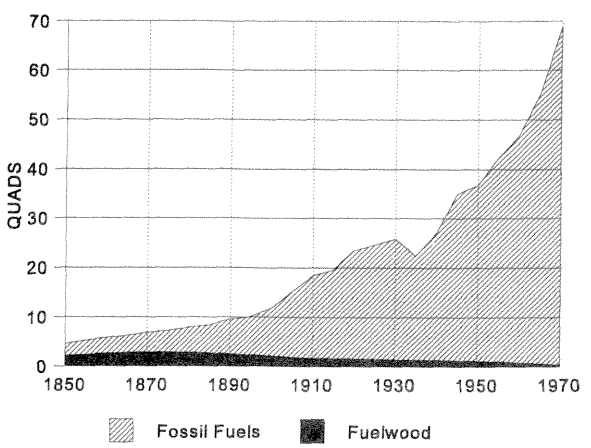

Figure 8–U.S. energy consumption annual use (in quads), 1850 to 1970.

Switch from Lumber to Construction Minerals

From 1850 to 1910, annual lumber production was sharply increasing to supply the construction needs of a growing Nation. Millions of acres of forests were clearcut. There seemed to be no end in sight to the continuing rise in annual lumber production. But as the use of minerals to meet construction needs rose in the first decades of the 20th century, the historic upward trend in annual lumber production was broken, and even reversed.

Brick, concrete, and steel replaced wood in many construction applications. But minerals did more than replace wood. Minerals opened a whole new world of construction and architecture far beyond the limited technical capacity of wood. Minerals allowed cities to reach for the sky: to house more people on less land; to provide more working space on less land.

Switch to Mineral-based Technology for Farming

Between 1800 and 1920, the cutting of forests to create cropland resulted in the loss of millions of acres of forest land. This escalating loss of forest to cropland was halted when farmers turned to mineral-based technology.

> "...use of fossil fuels in internal combustion engines substantially reduced the pressure to clear forest land for agriculture because it released millions of acres of cropland to grow food for humans rather than for draft animals. Petroleum was also the base for fertilizers and pesticides that substantially increased agriculture production after 1930." (MacCleery 1992)

The metals to build tractors and other farm equipment as well as the fuel to power the equipment were all derived from minerals extracted from the earth. The rise of irrigation (dependent on metal piping and energy) on the high plains greatly expanded crop production without cutting more forests. The rapid rise in the use of mineral fertilizers (phosphates from Florida and potassium from New Mexico) and the development of the atmosphere-based nitrogen fertilizers (using natural gas) at about the beginning of World War I improved farm productivity and reduced the demand for cutting more forests to provide more cropland.

Forests Saved

312 million acres of American forests were lost in the period from 1630 (1,044 million acres) to 1920, (732 million acres). This trend of forest loss was broken about 1920 and since then the U.S. has sustained the acreage of forest land at about the same level as in 1920. In 1992 there were more acres in forest land (737 million acres) than in 1920 (732 million acres).

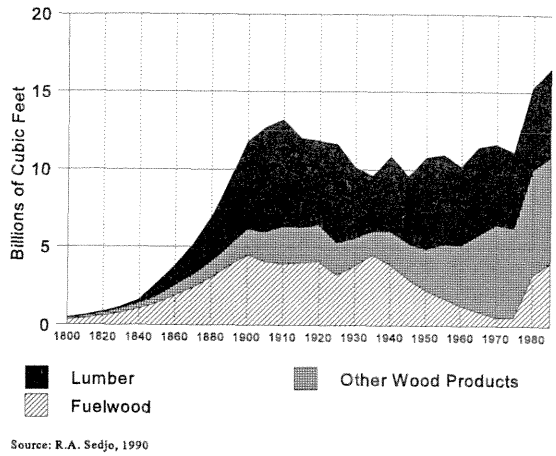

Figure 9–Domestic production of forest products, 1800-1985.

More importantly, the skyrocketing trend of timber production in the U.S. between 1840 and 1913 was dramatically stopped, as if it had run into a brick wall (fig. 9). The more the Nation turned to minerals and the technology that minerals makes possible, the more the forests were saved.

If the clearcutting and burning of the forests had continued as the early conservation leaders feared, American forests would have been devastated. But an historic shift to the use of minerals brought an historic shift from the woods to the mines. Mining saved the American forests.

Section 7: the Continuing Link: How Mining Continues to Save American Forests

Mining saved American forests at the beginning of the 20th century, and since then has been saving American forests every year–year after year. To appreciate the scale of this Herculean task, it is useful to consider what it would be like if the United States had to meet its energy needs by using the Nation's forests.

For 1987 the Forest Service classified about one-third (731 million acres) of the Nation's land as forests. The Forest Service classified about two-thirds of forests (483.3 million acres) as timberland, capable of producing 20 cubic feet per acre of industrial wood annually and not reserved from timber harvest by statute or administrative regulation (Wilderness designations, etc.).

For 1987 the Forest Service estimated the Nation's 483.3 million acres of timberland contained 831.3 billion cubic feet of timber volume (U.S. Department of Agriculture 1990a). The Forest Service has also estimated that the dry weight of all live trees on timberland averages about 36.9 dry tons per acre (U.S. Department of Agriculture 1990b).

Estimating that a dry ton of wood converts to 17.2 million BTU of energy, the 36.9 dry tons on an average acre of timberland offers the equivalent of 635 million BTU per acre. In 1987 the U.S. consumed about 76.89 quads (quadrillion BTUs) of energy. One quad of energy is equivalent to the BTU content of the timber on 1.58 million acres. To supply the 76.89 quads of energy used by the U.S. in 1987 would require the equivalent of clearcutting about 121.5 million acres of forest.

At that rate of 121.5 million acres per year, it would take about 4 years to exhaust the timber on the 483.3 million acres of the Nation's timberland. And it would take about 2 more years to deplete the timber on remaining lands classified as "forests." Assuming for a moment that it were technically and logistically possible to convert timber to energy at this rate, the 731 million acres of the Nation's forests would be clearcut in about 6 years.

Mining and the processing of minerals at some locations in the U.S. has caused and is still causing damage to forests. For example, coal strip mining and air pollution from burning coal has damaged some forests. As severe as some mining damage is, the past 100 years have demonstrated that, on balance, mining has brought far more benefit than harm to American forests. American forests owe their very survival to mining.

Summary

The greatest threat to American forests was from the cutting of forests for fuel, cropland, building materials, and other forest products. As the cries of early conservation leaders warned, American forests could not survive if they had to meet the growing demands for materials as the U.S. entered the 20th century. The timber on American forests is woefully inadequate to meet America's basic material needs for energy, building materials, etc. Even at greatly reduced per capita consumption, American forests would be ravaged if society had to rely solely, or mainly, on this renewable resource. Mining sustains American forests.

An understanding of mineral resources is a key part of any comprehensive approach to the human dimension. This understanding is vital not only for the human dimension. In today's world, it is also vital to the sustaining forest ecosystems.

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Economic Analysis in the President's Forest Plan: Real or Relativistic?

Richard H. Phillips Jr.

Abstract

A primary objective of the Forest Ecosystem Management Assessment Team process was to ensure the viability of late-successional and old-growth species in the range of the northern spotted owl. This objective led many people to consider economic analysis irrelevant. Unfortunately, the role of economics is too often seen as a decisionmaking process where choices are made solely based on economic values. Economics should be viewed as a valuable tool in problem formulation, and it is uniquely appropriate to the search for better answers.

The integration of social science in ecosystem management is the challenge recognized for this conference. This is not a new challenge. The Forest Service has mountains of manuals, handbooks, and research findings covering social and economic integration in planning. It would take years to plow through it all. We have the experience, the expertise, and we have the direction.

Given the desire and the capacity to do social and economic assessments, why is the lack of a human dimension component a major concern reported by the pilot watershed analysis teams implementing the President's Plan? The concern was noted November 1994 in Eugene, Oregon, at the conference titled "Federal Watershed Analysis: The '94 Experience." Is it a lack of time, expertise, direction, or some other factor? Should economic or social analysis have a role in ecosystem management? This last question continually needs serious examination.

I would like to address the problem from my own perspective by reviewing my experiences integrating social sciences in ecosystem management during the development of the President's Plan. I believe everyone involved with Forest Ecosystem Management Assessment Team (FEMAT) would agree that they are not comfortable with parts of the FEMAT process or the ensuing results. Yet, if failure exists, is it a problem of process or of product?

The April 1994 issue of the Journal of Forestry (Journal of Forestry 1994) gives a thorough summary of policy development using the FEMAT model. It is difficult to walk away from the issue without a sense of awe, realizing that something significant happened during the FEMAT process, but not being able to define it as good or bad (Caldwell, Wilkinson, and Shannon 1994; Thomas 1994; Thomas and Raphael 1993). What went into the FEMAT process was an "all-or-nothing" stance which was divisive. The subsequent result establishes a new policy for public land management which also is divisive. Yet, the points of difference have changed remarkably from those at the start of the FEMAT process. In the beginning, they were based on ignorance. I believe we now know why we disagree.

It is not a good idea to throw ecologists, biologists, hydrologists, and other "ologists" into a room full of economists nor is it a responsible action to do the opposite. The result is called the "eco" wars of misunderstanding because there is a fundamental difference in disciplinary thought between economists and "ologists." Economists thrive on words such as opportunity costs, tradeoffs, efficiency, discount rates, risk, and the best of all, a global optimum. The "ologists" also believe in optimums but there is a distinct and necessary difference. Where economists must consider costs in developing their optimums, the "ologists" must not. It would be inappropriate for these advocates to consider the social costs of achieving optimums for such things as ecosystem diversity and species viability. Their ideals become "if some is good then more is better," and "the optimum is also the minimum."

The FEMAT process did the inconceivable. It threw a bunch of economists into a room with a bunch of "ologists" including a large group of sociologists. The sociologists were easily identifiable. They were the ones with the cellular phones.

The results were predictable. The "ologists" were to obey the law and maintain viable species, and the economists were to "... identify management alternatives that attain the greatest economic and social contribution from the forests of the region." One became either a tree hugger or a tree cutter, wore shoes or sandals. It took more than half of the allotted project time to make communication inroads. The trust level was never high between the economists and the "ologists."

The FEMAT Report, Chapter VI, Economic Evaluations of Options, was based on data and special reports provided by a variety of resource economists, operations research analysts, planners and other contributors (Thomas and Raphael 1993). Brian Greber and Norm Johnson were the

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coordinators and primary designers and authors of the chapter. I had the privilege to work with the FEMAT assessment and, later, with the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA-USDI 1994a).

The FEMAT process was guided by a mission statement given to the FEMAT scientists by the Clinton administration (Thomas and Raphael 1993). You would be very naive to think that the FEMAT team had little to do with the design of this statement. Let me review the challenge that the scientists gave themselves. The mission states:

You should address a range of alternatives in a way that allows us to distinguish the different costs and benefits of various approaches (including marginal cost/benefit assessments), and in doing so, at least the following should be considered:

- timber sales, short and long term;
- production of other commodities;
- effects on public uses and values, including scenic quality, recreation, subsistence, and tourism;
- effect on environmental and ecological values, including air and water quality, habitat conservation, sustainability, threatened and endangered species, biodiversity, and long-term productivity;
- jobs attributable to timber harvest and timber processing; and, to the extent feasible, jobs attributable to other commodity production, fish habitat protection, and public uses of forests; as well as jobs attributable to investment and restoration associated with each alternative;
- economic and social effects on local communities, and the effects on revenues to counties and the National Treasury;
- economic and social policies associated with the protection and use of forest resources that might aid in the transitions of the region's industries and communities;
- economic and social benefits from the ecological services you consider;
- regional, national, and international effects as they relate to timber supply, wood product prices, and other key economic and social variables.

This is an interesting list for a 60-day project and, as I previously mentioned, the mission statement did not simply fall out of the sky. The list also suggests that economists had a major part in its design. So how did the Team do in addressing these points? The easy answer is that all were addressed, but the hard answer is how well were the assessments received, both internally and externally.

One of the difficulties with a 60-day project is who gets to drive. The economists, analysts, and planner types thought that they were most qualified to develop management alternatives. Their disciplines were well schooled in the process to set up alternatives that would systematically display the tradeoffs of different management choices. Any "rational" person would understand that this is the correct analytical approach to decisionmaking. A production possibilities frontier would be mapped. The search for an optimal solution to the policy questions at hand would be done. However, one problem existed, they were not driving.

There is a key difference between analysis and assessment. In a decision science context, analysis is the process of optimizing choices given a set of criteria. An assessment is a price-out of predetermined choices. Assessments assign values to known or projected states. The "ologists," with their mandate to meet the applicable laws and regulations, identified the "appropriate" states. They, the "ologists," were driving.

Bestowed these options, the FEMAT economists produced numerous charts and graphs documenting historic and current commodity and noncommodity resource uses (Greber 1994). Where feasible, they also projected future supplies and uses. Yet, the primary effects assessed and displayed were those related to timber harvests, timber prices, jobs and income associated with logging and wood products manufacturing, returns to counties, and returns to the Treasury. It appears the only thing the economists were seriously worried about was stumps. Is this their true focus or simply a desire to display those effects that changed significantly in the suggested policy options?

The FEMAT process was a closed-door procedure. It doesn't take a lot of effort to project the responses of the various publics when the Report saw the light of day. The FEMAT scientists were recognized for their innovative work, but the President's Plan was seen as either an ecological disaster (Anderson 1994) or an economic catastrophe (McKillop 1994). The timber harvest was still way too high or too low, and job losses were being under- or over-reported. As an economist, I also found it interesting that very few people were concerned because efficiency did not play a role in option development or alternative selection. Perhaps the traditional role of benefit/cost analysis is very limited in broad-scale ecosystem assessments.

However, economic analysis and the concept of tradeoffs and efficiencies are important in any decision framework. What happened in the FEMAT process and what is being

carried into other planning efforts is the lack of trust both within disciplines and between disciplines. The cry of "when in doubt, zone it out" or the goal of zero percent risk are not inherently bad concepts. What is troublesome is when the application of these ideals become management approaches codified against challenge by the scientific community. One must realize that the entire FEMAT process and the implementation of the President's Plan is a process of adaptive management. I personally would be amazed if we got it right.

The FEMAT process taught me an important lesson. I learned that breaking gridlock has nothing to do with having your cake and eating it too. Timber supplies are not what has held the Pacific Northwest communities hostage. Breaking gridlock is about social change, especially within the agencies that manage public lands. There is no such thing as technical fixes to social problems whether you are an economist or an ecologist (Volkman and Lee 1994). Now we have to wait to see if the Interior Columbia River Basin Ecosystem Management Project's "fishbowl" process can adapt and achieves better acceptance (USDA-USDI 1994b).

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The USDA Forest Service, other government agencies, and private forestry interests are emerged in the rapid and widespread social change occurring in the United States. As we move into the 21st century and as forestry interests evolve, there is need for better ways to understand, become a partner in, and effectively adapt to social change. The conference on which these proceedings are based was designed to bring social scientists, resource managers, and other forestry interests together in a common forum to share knowledge, concerns, and learning. Key social scientists were invited to discuss the capabilities of their disciplines. These papers are being published in a companion book entitled "Integrated social sciences with ecosystem management" to be released by Sagamore Publications in early 1998. Publication of these proceedings from the conference held in Helen, GA, includes papers written by scientists and practitioners who had completed projects where social science techniques and social knowledge had been integrated into forest management processes. The learning that resulted from these efforts to effectively integrate social sciences and the human dimensions these sciences focus upon is the subject of these proceedings. The aim in publishing these papers is to further encourage integration of human dimensions into forest management.

The Forest Service, U.S. Department of Agriculture (USDA), is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.