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STAKEHOLDER ATTITUDES AND VALUES WITH IMPLICATIONS FOR ECOSYSTEM-BASED MANAGEMENT IN SOUTHERN MICHIGAN

By

Robert H. Holsman

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ABSTRACT

STAKEHOLDER ATTITUDES AND VALUES WITH IMPLICATIONS FOR ECOSYSTEM-BASED MANAGEMENT IN SOUTHERN MICHIGAN

By

Robert H. Holsman

The advent of ecosystem management presents many challenges to the Michigan DNR's Wildlife Division-- including understanding and integrating public values for management of wildlife resources. Development of ecosystem management plans for Southern Michigan State Game Areas (SGAs) is especially challenging because these areas have traditionally been managed to provide hunter recreation. In some cases, this management has included intensive agricultural practices to attract and hold wildlife during the hunting season. Evolving ecosystem-based approaches to management suggest a shift in emphasis would prioritize the maintenance of the diversity and functions of ecosystems. At issue is the extent to the public understands and values these ecological benefits relative to more tangible, traditional management goals (e.g., game species). This study sought to improve our understanding of stakeholder attitudes and values for the management of ecosystems in Southern Michigan and to examine the potential influence of these values on an individual's commitment to ecosystem stewardship.

A three dimensional conceptual model of ecosystem values was developed to guide resource managers with the integration of social values into ecosystem management planning. The model describes six basic categories of values ecosystem benefits: ecological dependence, consumptive recreation, nature appreciation, existence, extractive,

and play space. The value preference of five different stakeholder groups--pure hunters, dual-use hunters, Audubon members, Sierra Club members, and nonconsumptive nonmembers were compared from data gathered in mail questionnaire. Though significant differences were found across all six categories, all groups placed high importance on ecological dependence, nature appreciation, and existence values. Survey results suggest that the most substantial differences in attitudes occur in stakeholder perceptions of the extent to which many wildlife benefits are currently being provided in Southern Michigan. All groups were slightly positive to hypothetical ecosystem based approaches that included trade-offs to traditional benefits. However, these attitude about ecosystem management reflected much uncertainty--including a high percentage of undecided responses. Finally, causal models of ecosystem stewardship were tested in LISREL 8.0 for both hunters and nonhunters and these implications are discussed.

For Sarge, my dad

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CHAPTER 1

INTRODUCTION

"... all history consists of successive excursions from a single starting point, to which man returns again and again to organize yet another search for a durable scale of values"--Aldo Leopold (1949).

A new approach to management

Following the lead of the U.S. Forest Service in 1992, ecosystem management continues to be adopted by both state and federal resource agencies and large-scale private and corporate land owners as a guiding philosophy for management of natural resources (Jones et al. 1994, Ecol. Soc. of America 1995, Haufler et al. 1996). The goals and definition of ecosystem management are evolving amidst much debate among scientists, academicians, land managers, environmentalists and others. In the most general sense, ecosystem management is a complex, holistic and integrated approach to managing natural resources (Wallace et al. 1996), where intact, functioning ecosystems become the valued attribute of management (Peyton 1990). Ecosystem management differs from traditional wildlife management in its explicit recognition of the need to consider multiple spatial and temporal effects of land use decisions and management practices on the long-term sustainability of all resource values. This philosophy represents a significant paradigm shift for natural resource agencies that have been oriented toward short-term production of a subset of resource commodities (e.g., featured species management) for nearly a century (Bengsten 1994, Jensen and Everett 1994, Super and Elsner 1994, Kellert 1995, Knight 1996).

It is important to consider why this paradigm shift in resource management is taking place. There are several significant biological and social forces that have precipitated the development of ecosystem management. Some have argued that ecosystem management is an attempt by resource management agencies to realign their missions to be more congruent with changing public values (Bengsten 1994, Jones et al. 1994). The changing public values have generally been described as a shift from resource use (utilitarianism) to resource protection and can be inferred from several trends: 1) continuing public support for environmental protection; 2) changing trends in demands for outdoor recreations; and 3) increased litigation over forest/wildlife management plans. These indicators of changing values are briefly discussed below.

Several authors have remarked that public values toward the environment have shifted from resource utilization to a more environmental or stewardship orientation (Dunlap and Van Liere 1978, Bengsten 1994, Brown and Peterson 1994, Salwasser 1994, Kellert 1995, Kempton et al. 1995, Knight 1996, Deason 1996-97). Xu and Bengsten (1997) conducted a content analysis study of newspapers, forestry publications, and environmental magazines from 1982-1993 to provide some empirical evidence that trends in forest values have shifted away from economic/utilitarian values to more ecological and spiritual values. Parallel to increased ecological concern, there may indeed be "new" values developing among people such as a "biodiversity value" (Bengsten 1994). Though the public expresses support for environmental protection in principle in opinion polls, that support seems to erode quickly when it comes at cost to other important values (Times-Mirror 1995, Belden and Russenello 1996, NEETF 1997).

Another potential indicator of changing public environmental values is the recent trends in wildlife recreation. Changing patterns of recreation are evident from national surveys showing marked increases in "nonconsumptive" activities like bird watching and decreases in hunting and fishing (U.S.F.W.S. 1993). While most fish and wildlife agencies have engaged in so called non-game or endangered species management programs for many years, they have not always fully understood or adequately responded to the preferences of the nonhunting public (Kellert 1995). Meeting the needs of a broad based constituency is important if agencies hope to maintain both political and financial support for wildlife conservation efforts (Witter 1990).

More evidence for a values shift can be inferred from the increasing political challenges directed at resource agencies over management of natural resources, such as lawsuits brought forth by environmental organizations regarding forest management plans (Alverson et al. 1994, Jones et al. 1994, Yaffee 1994, Wallace et al. 1996). The most well known example includes the numerous court battles over the effects of logging old growth timber on the survival of the Northern Spotted Owl (*Strix occidentalis caurina*) (Yaffee 1994). Other legal challenges have specifically targeted the failure of land management agencies to adequately address the conservation of biodiversity in planning and management activities on public lands (Alverson et al. 1994).

Finally, the most significant trend shaping ecosystem management is the growing interest in conserving biodiversity--the variety of life forms and processes that make up the world's ecosystems (Wilson 1992, Grumbine 1992, 1994, Boyce and Haney 1997). The emergence of theory and research from a pair of "new" sciences--conservation biology and

landscape ecology-- has focused attention on the relationship among habitat fragmentation, degradation, and loss on the global acceleration of species loss and endangerment (Grumbine 1992, Wilson 1992, Wilcove et. al. 1998). Overall, the growing recognition by both scientists and environmentalists of the deepening biodiversity crisis is the largest force behind the development of ecosystem management (Grumbine 1994)

Our enhanced ecological understanding has created concern among resource managers that some of our land management practices may actually contribute to ecosystem degradation, habitat fragmentation and species loss through the cumulative impacts of "stand level" management on both public (Scott et al. 1995) and private lands (Sample 1994). This problem may be further compounded by disparate missions and jurisdictions of agencies at federal, state, and local levels (Gerlach and Bengsten 1994, Kellert 1995, Wallace et al. 1996). As conservation biologists, landscape ecologists, and others have sought solutions to conserve biodiversity, public lands-- especially those in the eastern U.S.-- have been singled out as critical components for several reasons. First, public lands often provide the last vestiges of undeveloped land in a sea of expanding urbanization and intensive agriculture. Second, resource managers have more control over the management objectives on public lands than on private lands. Third, even where private lands do contribute parcels of wildlife habitat to the landscape matrix, public lands often represent the largest, least fragmented patches of wildlife habitat that remain. For all of these reasons, many have argued for the prominent role of public lands in developing strategies to conserve biodiversity (Scott et al. 1995).

Though the potential exists for public lands to provide integral pieces to the biodiversity conservation puzzle, current management of state public lands in Michigan and elsewhere may actually be contributing to the decline of biodiversity. A report prepared by an ad hoc committee of professional wildlife ecologists for The Wildlife Society identified two dimensions of this possibility. One is the "need to re-examine the extent of early successional stages of habitat maintained on public lands, given that much of the lands surrounding these public land holdings are early successional and will continue to be" (Scott et al. 1995: p. 651). The other is the tendency to artificially increase biodiversity at small scales by providing the highest number of generalist species on public lands and ignoring the needs of specialists that are threatened regionally (Scott et al. 1995).

Public land management in the fragmented and intensely developed landscape of Southern Michigan provides a good example of both the problems and opportunities that exist for biodiversity conservation. The Michigan Department of Natural Resources (MDNR) Wildlife Division manages 58 discrete public land areas in Southern Michigan known as State Game Areas (SGA's). These areas have traditionally been managed primarily to provide hunter recreation in Southern Michigan. In some cases, this management has included intensive agricultural practices to attract and hold wildlife during the hunting season. The ecological merit of such approaches may be becoming increasingly hard to defend, especially where SGA's are already surrounded by a sea of agricultural fields and where other native vegetation types are under-represented.

However, the potential for public lands to contribute to biodiversity conservation strategies comes at a time when resource managers are also being asked to serve an array of human demands and values, increasing in both number and intensity. The role that public lands may play in achieving this balancing act between maintaining biodiversity and satisfying public demands--including those for wildlife recreation-- has been the subject of increasing attention (Salwasser 1994). Development of ecosystem management plans that would encompass Southern Michigan SGAs is especially challenging because it can be argued that both hunters and wildlife viewers currently using SGAs have developed expectations regarding the current management of the areas.

Does the public really want Ecosystem Management?

It is difficult to predict either the depth or breadth of support for the development and implementation of ecosystem management. To say that public values are shifting or have shifted implies a uniform movement that runs deep within society. Such an oversimplification threatens to underestimate the continuing demand for food, fiber, and other utilitarian uses (including recreation) of public lands that show no signs of decreasing (Salwasser 1994). There are alternative hypotheses to consider with regard to the public's current ecosystem values. Any shift in environmental values has likely occurred within segments of the population, rather than in the population at large.

Another possibility is that increased environmental awareness has raised the salience of public environmental values, without necessarily bringing a corresponding reduction in utilitarian values. Yet another possibility is that the segment of society that has long been concerned about environmental preservation has become more effective at advancing their

agenda. This uncertainty about the nature and relative priorities of current and changing public values may represent the biggest challenge faced by resource managers seeking to integrate biological and social components in ecosystem management (Driver et al. 1996).

The fact that maintenance of ecosystem integrity and conservation of biological diversity are often cited as goals of ecosystem management by Grumbine (1994) and others (Noss and Cooperrider 1994, Franklin 1993, 1997) implies a need to shift away from the more traditional consumptive --utilitarian-- wildlife values. If maintaining ecological integrity as assessed through biological diversity or some other indicator is an explicit goal of ecosystem management, this suggests that certain values (i.e., ecological values) are prioritized or weighted more heavily than utilitarian values. If so this will shift benefits away from traditional stakeholders and may create more, rather than fewer conflicts directed at the agency (Peyton 1990). This aspect has heightened relevance for this research given that the management of SGA's in the study area has traditionally been focused on the production of game species and the provision of recreational hunting in Michigan. Therefore, it is vital to develop a clear understanding of the value hunters place on benefits like biodiversity. For example, are hunters willing to accept lower populations of game species in exchange for a perceived increase in biodiversity and other ecosystem options?

There is also potential for increased conflict with nonconsumptive nonmembers regarding ecosystem management goals in Southern Michigan. It is sometimes assumed that nonconsumptive user groups like bird watchers are more ecological and less utilitarian in their orientation toward resource allocation (Kellert 1985). It is important to test these

assumptions because there may be instances where conservation of biodiversity and other ecosystem management goals require reduced recreational opportunities for these groups as well as for hunters. If nonconsumptive users are really only seeking enhanced amenities or increased recreational opportunities (Manfredo and Larsen 1993, Martin 1997) rather than enhanced ecological benefits, then resource agencies seeking to broaden their support for conservation may be missing the target with ecosystem management. Likewise, many outdoor users like cross country skiers or off-road vehicle riders who seek amenities on or access to public lands may only have a passing, if not indifferent, interest in ecological or other benefits of wildlife management.

Statement of the problem

The advent of ecosystem management presents many challenges to the Michigan DNR's Wildlife Division not the least of which is understanding and integrating public preferences for management of wildlife resources in Southern Michigan. Three problems are apparent in meeting this new challenge. The first is applying a more holistic, scientific and technical understanding of the complex and dynamic functions of ecosystems to wildlife management. The ability to assist managers on this level may be limited due to our incomplete science and inability to identify all of the needs of species or all of the ecological functions in ecosystems. Ecosystem management will have to proceed in an adaptive management context, treating management prescriptions as working hypotheses from which learning can occur (Hollings 1996).

A second problem that wildlife managers face is overcoming the wide range of institutional and professional-cultural barriers that will serve to hamper adoption of

ecosystem management (Gerlach and Bengsten 1994). These include lack of appropriate training in management of ecological systems and new technologies, lack of funding sources for implementing ecosystem management, and personal attitudes of managers that still reflect a utilitarian or commodity production orientation (Peyton and Langenau 1985, Peyton 1990, Vining and Ebero 1991, Yaffee 1994).

Incomplete scientific data bases and institutional barriers are mentioned here to acknowledge the complexity of implementing ecosystem management. A third problem wildlife managers face--and the focus of this study-- is the need for a framework to integrate sociological and ecological values in implementing ecosystem management (Jensen and Everett 1994, Driver et al. 1996). This challenge includes the need to gain a thorough and empirical understanding of stakeholder values to assist managers in developing ecosystem management planning efforts. Many authors have argued that the integration of social values into ecosystem management is not just merely a challenge but *THE challenge* to maintaining diverse and productive ecosystems into the future (Salwasser 1991, 1992,1994, Bengsten 1994, Brown and Peterson 1994, Driver et al. 1996). The need for a comprehensive system of ecosystem values is widely recognized (Bengsten 1994, Hetherington et al. 1994, Ewert 1996). Bengsten (1994) cites three specific roles that incorporating an accurate understanding of values can serve for managers:

- 1. facilitate the establishment of appropriate ecosystem management goals;
- 2. determine how stakeholders will react to practices that are part of ecosystem management;

3. facilitate the clarification of value systems for stakeholders as part of conflict management and resolution.

Though several wildlife or environmental value typologies already exist (Table 1), none seem congruent with the needs of ecosystem management. A complete review of the conceptual and/or instrumentation shortcomings of current value and attitude typologies is discussed at length in the following chapter.

One particular Wildlife Division initiative has been the designation of a pilot ecosystem-based management area located in Southern Michigan's Clinton, Gratiot, and Saginaw counties. Assessing the relative values of key stakeholders within the Southern Michigan study area will help clarify similarities and differences among stakeholders and provide a basis for avoiding potential conflicts in the implementation of ecosystem management. At the heart of this problem is identifying the extent to which all stakeholders value the less tangible, ecological benefits produced through ecosystem management, and the extent to which they are willing to accept reductions in some of the more tangible benefits in order to achieve those ecological benefits.

Stakeholders of wildlife management are typically those with strong recreational interests in wildlife (i.e., consumptive and nonconsumptive users), landowners who may impact or be impacted by management, and organized special interests (e.g., environmental organizations) (Susskind and Cruikishank 1987, Decker and Enck 1996). Several stakeholders were considered in this research. Management of the three SGAs (Maple River, Gratiot-Saginaw, and Shiawassee River) within the study area currently places a high priority on providing hunting opportunities especially for waterfowl and deer

Table 1. A listing a competing value/attitude typologies regarding nature or wildlife.

Fulton et al. (1996)	Kellert (1980)	Kellert (1996)	Negra & Manning (1997)	Purdy & Decker 1989	Rolston & Coufal (1991)	Xu & Bengsten (1997)
Value Orientations & Basic wildlife beliefs	Attitudes toward wildlife	Values of nature	Social Values of State Parks	Wildlife attitude and value scale (WAVS)	Forest Values	Forest Values
• wildlife use • wildlife rights • recreational experience • bequest & existence • hunting/anti- hunting • residential experience • education • fishing/anti- fishing	aesthetic ecologistic scientistic moralistic humanistic utilitarian domionistic negativistic negutistic	aesthetic ecologistic/ scientistic moralistic humanistic utilitarian domionistic symbolic symbolic negativistic	• aesthetic • recreational • educational • moral/ethical • ecological • therapeutic • economic • solitude • intellectual • historical • scientific • spiritual • cultural • resource	• Traditional/ Conservation • Social benefits • Ecological benefits • Problem Acceptance	• life support • economic • scientific • recreational • aesthetic • wildlife • biotic diversity • natural heritage • spiritual • intrinsic	 life support economic/ utilitarian aesthetic spiritual

hunters¹. The Shiawassee National Wildlife Refuge is managed primarily as a migratory waterfowl refuge with secondary benefits of wildlife viewing and deer hunting opportunities². Thus waterfowl hunters, deer hunters, and bird watchers were selected as three key recreational stakeholders in the management of this area. Due to the growing role of environmental organizations in shaping and monitoring agency polices, environmentalists were included as key stakeholders of this study. Understanding the relative value priorities and differences among these stakeholders will aid managers in determining potential support for ecosystem management goals.

Connection to Stewardship

The ecosystem management approach operationalized for this study begins with the assumption that managers can not simultaneously provide for all of the diverse and increasing demands on ecosystems from a growing human population AND sustain diverse and functioning, native ecosystems. Therefore, ecosystem management is fundamentally about making value choices--some of which will entail sacrifices on the part of one or more stakeholders (Ewert 1990). For example, resource professionals participating in a round table discussion on the future of Wisconsin's two national forests projected that

1

2

The Shiawassee River SGA issues daily permits on a first come first serve basis for morning and evening waterfowl hunts throughout the season; archery and gun deer hunting permits are available in 3 day sessions by application. Waterfowl and deer hunting permittees are charged an access fee. Maple River and Gratiot-Saginaw SGAs do not require permits for hunting with the exception of the opening day of duck season at Maple River.

The Shiawassee Federal Wildlife Refuge issues hunting permits for limited goose and deer hunts throughout the fall. The deer hunting permits are primarily for antlerless only hunting and an access fee is charged.

ecosystem management would likely have negative impacts on both economic development and recreational opportunities (Jakes and Harms 1995). Though such forecasts might raise some concerns about current resource utilization, an integrated ecosystem management approach ought take a long term and realistic view about what benefits managers can provide (Knight 1996), and given the uncertainty inherent with scientific management (Brunson 1996, Hollings 1996), it ought to err on the side of conservation over allocation. Implicit in this discussion of current benefits versus long term ecological sustainability and maintenance of biodiversity is the broader issue of environmental stewardship. Many ecosystem management benefits such as restoration of old growth forests or managing to protect evolutionary pathways exceed the span of human lifetimes. The success of such management goals will require the support of a public that is willing to participate directly and indirectly in their achievement. If hunters and nonhunting wildlife enthusiasts have a stewardship ethic, they ought to be willing to forego some benefits themselves in order to ensure healthy ecosystems for future generations. Therefore, measuring the presence of a stewardship ethic is a critical component of understanding public support for ecosystem management.

Understanding the antecedents of stewardship also has far reaching and important theoretical implications. In resource management there has been a long standing assumption that participating in wildlife-related recreation can promote stewardship for the environment. For example, hunter financial contributions through Pittman-Robertson funding and license sales comprise the bulk of funding for wildlife conservation and management. It is assumed this financial support indicates a value for stewardship of

wildlife and habitats. To date, this assumption has not been widely tested and where it has, results have not established a clear link (Theodori et al. 1998). As ecosystem management broadens the focus of management of featured species and their obligate habitats to ecosystems and their driving forces, it is necessary to understand whether stakeholders value their role in maintaining ecosystems for future generations. It is time to ask whether hunters are indeed "stewards of the environment", or merely stewards of the particular species sought for hunting. Similarly, wildlife viewers who currently enjoy many of the benefits brought about through traditional management practices may also need to accept some level of sacrifice in order to accommodate ecosystem management goals. The need to understand the relationship between value preferences and stewardship is apparent in this challenge.

The goal of this research

The purpose of this study is to provide a framework for understanding human values for ecosystems that can facilitate the integration of human values into an ecosystem management paradigm. A secondary goal of this research is to explore some important causal factors that influence environmental stewardship.

Study objectives

The study objectives are:

- 1. to develop a theoretical model that describes the structure and types of social values of ecosystems that will lend itself to integration into ecosystem management;
- 2. to develop a valid and reliable instrument to measure values theorized in the conceptual typology of values;

- 3. to describe the ecosystem values and relevant ecosystem management attitudes of key stakeholders which have implications for ecosystem management in Southern Michigan;
- 4. to test a causal (path) model that investigates significant antecedents of an individual's level of ecosystem stewardship including their values for consumptive and nonconsumptive wildlife recreation and their beliefs about existing environmental conditions.

CHAPTER 2

REVIEW OF THE LITERATURE

Overview

The following chapter is divided into three major sections. In the first section, I build the case that part of the difficulty in operationalizing "ecosystem management" results from different applications of the concept as it appears in the literature. One application is primarily concerned with achieving a mix of values that ensures the maintenance of biodiversity as the ultimate goal. The second seems to apply the term as a means to achieving a desirable mix of human values irrespective of particular outcomes such as biodiversity. This section concludes by presenting a set of dichotomous principles that serve to distinguish "ecosystem management" from what might be considered "traditional" wildlife management. These principles served as the framework for developing value trade-off questions on the study questionnaire.

The second major section of this chapter reviews the values literature and proposes a conceptual model to serve as a framework for integrating stakeholder values into an ecosystem-based approach to management of public lands in Southern Michigan. This section also defines "stewardship" and discusses its theoretical relevance in the model.

The third section reviews the findings of relevant attitude/values studies that have implications for measuring the ecosystem values and attitudes of the stakeholders considered in this study. Literature pertaining to study methodology (namely Structural Equation Modeling) is reserved for the next chapter.

Ecosystem management

Ecosystem management has been described as everything from a reaffirmation of multiple use (Overbay 1992, Jensen and Everett 1994, Czech and Krausman 1997) to a chance for humans to reinterpret our role to live more in accordance with nature (Grumbine 1992). Similarly, it has been defined as a philosophy (Wallace et al. 1996), a process (Overbay 1992, Lackey 1998), and a product (goals) (Grumbine 1994). Still others (e.g., Super and Elsner 1994) maintain that we have been doing ecosystem management all along (e.g., managing the prairie-pothole region--an ecosystem-- for duck production is ecosystem management [Furtmann 1996]). The waters get muddied even more by the over simplification of ecosystem management as synonymous with increasing biodiversity (e.g., Glenn 1995). With such a wide disparity of thought, it is no wonder fish and wildlife agencies charged with implementing ecosystem management can get bogged down trying to operationalize the term in a manner that is meaningful for field biologists and is acceptable to the public.

Though use of the term appeared earlier (e.g., Wagner 1977), scholarly debate on "ecosystem management" began in earnest in 1992 with a memo issued by then Chief of the U.S. Forest Service Dale Robertson prescribing ecosystem management on all national forest and grasslands. Since 1992, no less than 19 federal agencies and many state resource agencies have sought to adopt ecosystem management despite its nebulous meaning (Ecol. Soc. of America 1995). While there is no shortage of interest and activity surrounding state and regional ecosystem management research and planning, it appears

many ecosystem management initiatives suffer from a lack of clear understanding about what needs are supposed to be addressed (Driver et al. 1996).

The following section summarizes the ecosystem management literature and attempts to illustrate why it is so difficult to explain "what it is". In the title to their essay on the challenges to implementing ecosystem management, Gerlach and Bengsten (1994) ask the question: "If ecosystem management is the solution, what's the problem?" In the proliferating literature on ecosystem management, one can distill two general answers regarding the nature of the problem that ecosystem management is meant to address. One view of ecosystem management is characterized by the writings of Franklin (1993, 1997), Grumbine (1992, 1994), Noss and Cooperrider (1994) and Beattie (1996). It considers ecosystem management as a (potential) solution to an ecological problem, namely the loss of biodiversity. Boyce and Haney's (1997) text highlights many of the current technical applications and landscape considerations that characterize this view of ecosystem management. In this "biodiversity view" of ecosystem management, conservation of biodiversity is the overriding goal and the integration of social objectives is considered as a constraint or limitation to meeting the ecological objectives.

The other view-- what I'll call the egalitarian view-- whose proponents include Overbay (1992), Salwasser (1991, 1992, 1994), Wallace et al. (1996) and Lackey (1998) conceptualize ecosystem management as a (potential) solution to social conflict over competing uses (including non-use) of our natural resources. This application of the term "ecosystem management" becomes a means to an end where processes are utilized to derive a mix of values that is acceptable to a diverse public (Moote et al. 1994). Two

goals which are implicit in the egalitarian view of ecosystem management are socially defined (and accepted) goals and collaborative decision-making (Cortner and Shannon 1993). Thus, process aspects of management are stressed over an adherence to any outcomes related to biodiversity (or other particular outcomes). Again, it is important to emphasize that the two views of ecosystem management are not mutually exclusive, organized divisions within the scientific community, but they do serve to frame the management problem differently. Others have noted the apparent split personality in the literature as well. Grumbine (1992) termed it "scientific" versus "process" ecosystem management. Many others identified the difference in ecosystem management applications as one of anthropocentric versus biocentric concern (e.g., Stanley 1995, Endter-Wada et al. 1998, Freemuth 1996). Whether this difference in applications of the concept is merely one of semantics, a lack of communication, genuine philosophical difference or a co-optation of terms to serve a political agenda, it has led to difficulty in planning and implementation for agencies that have attempted to adopt it (Epperson 1997). Some of the seminal perspectives of the biodiversity view and the egalitarian view of ecosystem management are reviewed next and the fundamental difference in their prioritization of values is described.

Biodiversity view of ecosystem management

The awareness over the loss of biodiversity has been augmented by recent work in conservation biology and landscape ecology research and our enhanced understanding of the spatial and structural habitat requirements of species like grizzly bears (Craighead 1979) and forest interior song birds (Wilcove et al. 1986). Agee and Johnson (1988)

published the first book that contained "ecosystem management" in its title. This work outlined the need for managers to think beyond the boundaries of national parks to that of species with large home ranges that were not isolated and relegated to public lands. Agee and Johnson (1988) did not express specific goals for managing across broad landscapes, but they did describe the need to realign boundaries based on ecological rather than administrative significance. Finally, the authors also suggested several principles necessary in managing ecosystems that include interagency cooperation, better monitoring of ecosystem responses to management, and stronger leadership in setting national policy (Agee and Johnson 1988). Recent volumes by Boyce and Haney (1997) and Baydack et al. (1998) highlight the current approaches in thinking from an ecological perspective.

Grumbine (1994: p. 28) states that "ecosystem management is a response to today's deepening biodiversity crisis." Furthermore, Grumbine (1994) sets forth the most explicit set of goals of any other ecosystem management writer. His five goals are:

- 1. maintain viable populations of all native species;
- 2. represent within protected areas, all native ecosystem types across their natural range of variation;
- 3. maintain ecological/evolutionary processes;
- 4. manage over long enough periods to maintain evolutionary potential;
- 5. accommodate human use and occupancy within these constraints.

Grumbine's goals were based on his synthesis of ecosystem management literature, but his review focused narrowly on publications in ecological journals. An Ecological Society of America committee on ecosystem management produced a position paper

(1995) that parallels much of Grumbine's interpretation of goals. The report states:

"Ecosystem management assumes intergenerational sustainability must be a precondition rather than an afterthought, not only for the maintenance of 'goods' or commodities but also for the critical 'services' that ecosystems provide" (Ecol. Soc. of America. 1995:1).

There have been numerous strategies that have been proposed to maintain biodiversity levels endemic across landscapes including bioreserves (Noss and Cooperrider 1994), coarse filter/fine filter approaches (Haufler et al. 1996), historical range of variability (Morgan et al. 1994, Oliver et al. 1994) and, emphasis use areas (Everett and Lehmkuhl 1996). Franklin (1993, 1997) has argued that the only way to effectively preserve global biodiversity and complex ecological functions is by managing at the ecosystem level. While many ecologists disagree with adopting an exclusive ecosystem approach (favoring instead ecosystem approaches in conjunction with flagship species approaches; see for example Wilcove 1994 or Tracy and Brussard 1994), Franklin's (1993, 1997) rationale is indicative of growing recognition that imperiled species are only as viable as the ecosystems that support them. This observation has been augmented by findings that indicate many types of ecosystems are themselves becoming endangered (Noss et al. 1995). Thus from the "biodiversity perspective", maintenance of biodiversity is not only an explicit goal of ecosystem management (Grumbine 1994), it is the very reason why theory has been developed, debated, and applied to management.

Egalitarian view of ecosystem management

On the other hand, the egalitarian view of ecosystem management has very different goals and roots. "Ecosystem management" and its immediate predecessor "New

Perspectives" evolved with the U.S. Forest Service (USFS) as an attempt to strengthen "the ecological basis for land and resource stewardship" and to create "a better balance between various resource uses and environmental values" (Salwasser 1991: p.567). Five reasons were described by Salwasser (1991) that prompted the policy shift to the "New Perspectives" approach:

- 1. new scientific information about the complexity of ecosystems;
- 2. changing values and expectations of citizens for management of their public lands;
- 3. greater diversity of technical expertise within the agency;
- 4. concern over soil loss, degraded aquatic systems, and native endangered species loss;
- 5. social and ecological effects of management.

Though these driving forces bear some congruence to the goals articulated in the biodiversity view (i.e., number 4), Jones et al. (1994) argued that adoption of ecosystem management by the U.S. Forest Service was intended to resolve continuing social conflict over land management objectives rather than perceived ecological crisis. This conflict includes both stakeholder-agency rifts over management plans and competition between commodity and amenity users (Knight 1996). In an attempt to better manage this social conflict, management agencies are now realigning their historical emphasis on timber (Jones et al. 1994, Super and Elsner 1994) and game species production (Kellert 1995, Knight 1996) to serve a broader range of human values. Bengsten (1994) described this as a shift from multiple use management to multiple values. Implicit in this application of the term ecosystem management is the assumption that there exists a better, if not optimal

way, to divide the resource pie that will be acceptable to diverse stakeholders; and the way to develop that mix is by focusing on decentralized, democratic processes in the implementation of ecosystem management (Wallace et al. 1996). These processes include such things as interagency planning and cooperation (Agee and Johnson 1988, Overbay 1992, Gerlach and Bengsten 1994, Grumbine 1994, Moote et al. 1994, Beattie 1996, Wallace et al. 1996), public involvement in decision making (Salwasser 1992, Cooperrider 1996, Driver et al. 1996, Endter-Wada et al. 1998), monitoring (Overbay 1992, Grumbine 1994), and development of adaptable agencies (Peyton 1990, Gerlach and Bengsten 1994, Moote et al. 1996).

Different Treatment of Values

The ecosystem management literature is split between applications of the term which seek to prioritize different perceived problems. The first application of term ecosystem management—as laid out by Grumbine— is much narrower in scope paying relatively little attention to integration of sociological concerns, aside from acknowledging the constraints of accommodating human desires on maintaining important ecological values (Freemuth 1996). The emphasis on biodiversity gives a priori weight to ecological values by making the assumption that biodiversity is an ecological imperative rather than merely a human preference. Meanwhile, the egalitarian version of ecosystem management is broader and more integrative of human values, but is less adherent to the protection of biodiversity or specific ecological goals (Grumbine 1992). Biodiversity is treated as one among many competing social values for which management seeks to find optimal social acceptance and sustainability among all preferred uses and values. Furthermore, the

egalitarian view of ecosystem management often fails to explicitly link resource allocation questions to ecological sustainability. It is possible to enhance such processes as public involvement and interagency planning without altering traditional management goals or strategies.

This shortcoming of the egalitarian view has led many to be skeptical about the U.S. Forest Service's commitment to ecological stewardship under the banner of both "New Perspectives" or "Ecosystem management", especially those with a biodiversity orientation to ecosystem management. Initial criticism included claims that the policy shift was nothing more than a public relations ploy (Lawrence and Murphy 1992, Alverson et al. 1994). Specific concerns were initially raised that U.S. Forest Service pilot projects conducted under the "New Perspectives" label sought only to protect habitats of common species with utilitarian values (Lawrence and Murphy 1992) and that protecting biodiversity was considered only within constraints of predetermined timber targets (Frissell et al. 1992). Salwasser (1992) countered these claims by suggesting that biodiversity advocates were ignoring the agency's legal mandate to provide multiple benefits and he further cautioned practitioners of conservation biology to address only factual rather than value issues.

This exchange characterizes the disjunct view in the literature about what the goals of ecosystem management are, or whether there are in fact any goals inherent in its approach. Lackey (1998) contends that ecosystem management may or may not emphasize biodiversity, insisting the goals are based on social needs and desires--a view

upheld by several others (Overbay 1992, Salwasser 1994, Moote et al. 1994, Freemuth 1996, Endter-Wada et al. 1998).

While conceptually separating these competing views of ecosystem management may help to clarify some of the debate, there are two caveats that need to be added. First, much of the social conflict that agencies seek to resolve has been generated by groups (e.g., Sierra Club) concerned with biodiversity protection. Therefore, in reality biodiversity figures prominently in both views. Second, it would be an oversimplification to assume that the proponents of each view favor mutually exclusive philosophies relative to environmental protection versus resource use. Some have tried to portray a dichotomous view by describing this philosophical difference in ecosystem management perspective as one of anthropocentric versus biocentric concern (e.g., Stanley 1995, Freemuth 1996, Endter-Wada et al. 1998). This bifurcation falsely assumes that biodiversity advocates promote their view of ecosystem management on behalf of the interests of species and systems alone, rather than as an attempt to ensure healthy, intact ecosystems necessary to support human life and welfare. Similarly, the anthropocentric characterization of ecosystem management assumes that humans can extensively manipulate ecosystems to produce a variety of real and perceived needs without being subject to the biological constraints of the system (Stanley 1995).

Ultimately, neither the biodiversity or egalitarian view (or biocentric versus anthropocentric) is sufficient. A few authors have operationalized the term in a way that strikes the need for a balanced, integrated approach (Driver et. al 1996, Haufler et al. 1996, Endter-Wada et al. 1998). In particular, Haufler et al. (1996) offer an approach to

conservation of biodiversity whereby both ecological and socio-economic concerns are used to determine desired future conditions. This approach includes the development of an ecosystem diversity matrix as a conceptual tool to use in maintaining ecological representation of plant and animal associations within a given land area. While this approach offers a helpful planning tool, the ultimate resolution in the debate over ecosystem management may require a mutually agreed upon philosophical mandate that specifies when and where to protect ecological values that conflict with human needs or perceived needs. In the meantime, the success of ecosystem management (or any resource management paradigm) depends on public acceptance, which depends on successfully integrating values in resource planning and management (Driver et al. 1996, Endter-Wada et al. 1998). This research to assess the values of key stakeholders in a pilot ecosystem management area is guided by that belief.

There are several implications for integrating human values into ecosystem management. First, managers can decide to increase or decrease certain benefits based on public preferences. Second, managers can shift the areas where benefits are provided to better achieve dual objectives of serving human preferences and protecting unique, degraded, or overused ecosystems. Third, managers can identify audiences or targets for education in cases where serving value preferences would conflict with ecosystem sustainability. In sum, integrated ecosystem management will aid in identifying which values can be served where, and it also identifies intervention opportunities for education, values clarification, and attempts to broaden or heighten the stewardship values of stakeholders.

Ecosystem management characteristics

Due to the wide variability in the interactions of biophysical and social forces, ecosystem management activities and outcomes are likely to always be context specific (Crossley 1996). This is a source of frustration for wildlife managers seeking general management models to apply and for researchers seeking to measure the impact of management on social values. The ecosystem management literature provides a litany of management processes and characteristics that give shape to the new paradigm. The most widely cited ecosystem management characteristics are described below to further distinguish it from the contemporary natural resource management paradigm of multiple use.

The following dichotomies represent the types of considerations that managers may confront when developing ecosystem management approaches. Wallace et al. (1996) refer to such choices as "tensions" rather than tradeoffs. It must be clearly understood, however, that implementation of ecosystem management will never employ guidelines that are black and white. For example, ecosystem management does not entail a clear cut choice between single species versus multi-species, or biodiversity management (Wilcove 1994). Considerations of geographic scale, ecological land types, and legal mandates dictate that there will be places where single species management has a role. Yet, ecosystem management is management that makes a generalized shift toward stronger, more explicit consideration of maintaining native species and community diversity. The following paired characteristics illustrate such general strategy shifts where managers

employ one approach over the other more often than not, and more often than past management.

Disturbance vs. control

Ecosystem management recognizes the influence that natural disturbance has had on shaping landscape associations (Crossley 1996). Many ecosystems are now stressed or threatened because managers have actively suppressed the natural disturbances (e.g., fire) that drive the regeneration of the system and changed the scales of when disturbances do occur (Alverson et al. 1994, Crow et al. 1994). Disturbances that occur at varying scales have also contributed to the patchiness and distribution of many plant and animal associations (Botkin 1990). Instead of trying to control or suppress natural disturbances, ecosystem management allows such forces to play an important role in shaping and creating landscape mosaics. Where it is not feasible to restore or allow natural disturbances to occur, managers may try to mimic their activities through activities such as controlled burns, clear cutting, and releasing flood water from dams to imitate the timing and flow rates of natural floods (Winter and Hughes 1997). The challenges are using ones that truly mimic natural disturbances over the appropriate temporal and spatial scales.

Change versus steady state

Concomitant to the notion of disturbance as a change agent is the acceptance of gradual change as important to ensure representative age classes of different community types. Sustained yield management has often favored early successional stages of plant communities or has attempted to freeze local conditions in an attempt to maintain either timber productivity or to sustain high populations of game species (Scott et al. 1995).

Ecosystem management accepts change and uncertainty as necessary outcomes within ecosystems to ensure that a full range of niches remain viable and that natural competition will produce different dominant species over time (Hollings 1996).

Connection versus fragmentation

This principle recognizes that the size and shape of habitat parcels have as much to say about the species composition and diversity as the components within the habitat itself Harris 1984). Conservation biology dating back to MacArther and Wilson's (1967) Theory of Island Biogeography has warned against the insidious threats that habitat islands can pose for many species. Fragmentation of forests can alter micro-climates (Hunter 1990) and leave species such as neotropical songbirds more vulnerable to increased predation and nest parasitism (Brittingham and Temple 1983). Furthermore, fragmentation on a large scale can create meta-populations of species where barriers to genetic exchanges can result in inbreeding depression and leave small populations vulnerable to stochastic events. For all of these reasons, ecosystem management tries to account for the effects of management activities at multiple scales to mitigate the negative aspects instances of forest fragmentation (Scott et al. 1995). Maintaining large blocks of unbroken habitat is a priority. In addition managers seek opportunities to restore or promote the connectivity of patches by establishing corridors. It must be noted that there is not consensus among scientists about the best way to maintain biodiversity using corridors, reserves, or large islands (see DellaSala and Olson 1996, Everett and Lehmkuhl 1996, Noss 1996). But it is generally believed that larger and more contiguous is better than smaller and separate (Meffe and Carroll 1994).

Natives versus exotics

Exotic species have been shown to be a disruptive force on ecosystems, out competing native species and radically altering the overall species composition of the system (Winter and Hughes 1997). This has been true in both terrestrial (e.g., purple loosestrife) and aquatic systems (e.g., the zebra mussel). Therefore, ecosystem management strives to maintain the integrity of ecosystems by favoring management for native plants and wildlife (Grumbine 1992).

Natural productivity versus artificial production

Since ecological sustainability is the goal of ecosystem management, activities that rely on infusion of nonsustainable petrochemical inputs to enhance productivity are inherently contradictory. For example, the use of intensive crop farming to attract wildlife requires more energy input to sustain than would an existing base of native vegetation. Ecosystem management seeks ways to maintain or enhance productivity of socially desirable outcomes like game species through natural production of the system. In theory, ecosystem management strives to protect and maintain the long term net output of ecosystems, while recognizing that the level of output in any given year is subject to ebbs and flows (Crossley 1996).

Species diversity versus preferred species management

Ecosystem management places a priority on maintaining native biodiversity at regional scales (Grumbine 1992, 1994, Scott et al. 1995, Ecol Soc. of America 1995, Beattie 1996). This characteristic is controversial and widely misunderstood. Managing for species diversity does not mean manipulating all habitats at all spatial scales to increase

diversity by favoring edge or early successional species (Scott et al. 1995); nor does it mean the elimination of single species approaches that focus on a rare, unique, or endangered species (Wilcove 1994). Managing for species diversity simply means providing a representative mix of vegetation types in a variety of successional stages across a broad landscape to ensure the existence of viable niches for all endemic species (Haufler et al 1996).

Ecologically based boundaries

It has long been recognized that wildlife species or ecological processes do not adhere to human created political or administrative boundaries (Agee and Johnson 1988, Lackey 1998). Ecosystem management shifts the planning and focus of management to adhere to natural systems such as ecoregions or watersheds in a nested scale approach where management actions are evaluated at several scales (Jensen and Everett 1994).

Long term versus short term

Ecosystem management develops longer planning horizons than traditional resource management to account for multi-generations of species and maintenance of evolutionary pathways (Overbay 1992, Lackey 1998).

Conclusion

There are a variety of human values implicit in these "tensions" or trade-offs (Ewert 1990). The receptivity of the public to these principles will depend in large part on how they perceive the net difference of the associated costs and benefits. Understanding the basis of potential support for emphasizing the long term productivity and functions of ecosystems must start with an understanding of what types of social values need to be

considered in management. The next section summarizes the diverse landscape of public environmental attitudes and values and offers a conceptual model for addressing their integration in ecosystem management.

Values

Before we can improve our understanding of social values and integrate that understanding into ecosystem management, we must first come to some agreement on the nature of values. In the introduction to the book Valuing wildlife: Social and economic perspectives, Steinoff (1987: p. 3) asks the 64 million dollar question, "Is there a universally acceptable and comprehensive system for organizing our thoughts about values?" The answer is, quite simply, "no". The term value(s) has a variety of meanings reflecting differences in technical usage (e.g., function versus worth), disciplinary bias (e.g., economics versus social psychology), theoretical construction (e.g., values as attitudes or beliefs), and stage of process (e.g., held versus assigned). Such diversity of meaning has contributed to confusion over what types of values should be integrated into ecosystem management and how to measure them (Bengsten 1994, Hetherington et al. 1994, Ewert 1996). The morass grows wider when one considers whether human attitudes toward wildlife and wildlife management are based on a unique set of fundamental wildlife values (Kellert and Wilson 1993, Kellert 1996), wildlife value orientations (Fulton et al. 1996), broader environmental value orientations (Stern and Dietz 1994), or generic held values (Schwartz 1992, Axelrod 1994, Belden and Russenello 1996).

The following review of the values literature attempts to deconstruct several of these confusing and competing conceptualizations. It begins with a review of the various types or meanings of the term value that are often invoked in relation to nature or wildlife. Next, a summary of a debate over which type of value is most appropriate to consider for management purposes is discussed. Then, existing environmental or wildlife value typologies are presented and their shortcomings are described. Subsequently, a three dimensional, conceptual model of ecosystem values is proposed to make order out of the values universe. The conceptual model aims to make a theoretical contribution by distilling many of the disparate uses of the term into a comprehensive framework that can assist with the task of integrating human values into ecosystem management.

Different meanings for value

Held values versus assigned values

Brown and Manfredo (1987, p. 12) said "There are values about things and values for things". The former use of the term implies that values exist as fundamental and independent precepts within one's cognitive structure. In the psychological literature, these are "held values" (Brown 1984) which are defined as an enduring conception of good that can be classified as modes of behavior, end-states of existence, or abstract ideals (Rokeach 1968, 1973, Bem 1970).

In addition to held values, Brown (1984) identified two other realms of value: the object realm and relational realm. The relational realm recognizes the process of valuing where "value arises from a preference relationship between a subject and object" (Brown 1984: p. 233). Finally, the object realm is focused on the end result of the valuation

process, the assigned value. Brown (1984: p. 233) defined assigned values as "the expressed relative importance of an object to an individual or a group". This is the "values for things" (Brown and Manfredo 1987: p.12). In other words, the relational realm deals with the relative expression of values such as an individual *preferring* hunting to fishing, and assigned value would be the *absolute expression* of value for hunting through some economic or sociological measure³. Additional confusion can be created by the inclusion of three additional non-preference uses of the term. These other value relationships are obligatory/normative, functional, and intrinsic.

Normative/Cultural Values

Obligation is defined as a relationship of social norms. Obligatory or normative values often derive from the philosophers in society as guiding codes of morality (Andrews and Waits 1980) and are often dogmatically advanced by proponents (Hetherington et al. 1994). This type of value has elsewhere been referred to as cultural values (Kellert 1980, Brown and Manfredo 1987, Sagoff 1988). Cultural or obligatory values are the held values aggregated in society (Kellert 1980) and are inferred from collective behavior (Andrews and Waits 1980).

Functional values

Functional values are the purely technical relationships that occur between entities and exist independent from human recognition (Andrews and Wait 1980, Hetherington et al. 1994, More et al. 1997). For example, biodiversity may perform a functional value for

For an alternative perspective, More et al. (1997) limit the expression of assigned value to economic indicators only.)

ecosystems in sustaining resistance to and resilience from disturbances (Ecol. Soc. of America 1995) whether or not humans recognize or assign value to such a functional role. However, it is important to remember that humans can have preference for (maintaining) functional relationships (Brown 1984). Indeed, investigating the types and extent to which ecological functions are valued by people is an important objective of this research.

Intrinsic value

The last type of non-preference value relationship is intrinsic value (Rolston 1985, Brown and Manfredo 1987, Rolston and Coufal 1991, Bengsten 1994, More et al. 1997). An object is said to have intrinsic value when it possesses value in and of itself, regardless of any instrumental value for humans or non-human entities. Some environmental philosophers (e.g., see Rolston 1985, Naess 1986) have suggested that species or ecosystems possess intrinsic value, apart from individual preference or functional importance. People who ascribe intrinsic value to species, ecosystem, or particular environmental attributes (e.g., old-growth) believe society is obligated (yes, granting intrinsic value can lead to obligatory value) to protect species or ecosystems "for their own sake" (Naess 1986). It remains open to question whether value can be said to exist in the absence of a valuer. It may be a moot debate, as Brown and Peterson (1994), point out because the act of acknowledging or assigning an object such as spotted owls or ecosystems intrinsic value is in itself an expression of individual preference. While debating the existence of intrinsic value is a job best left to environmental philosophers. what is important is capturing the extent to which people do value species, biodiversity

and ecosystems "in and of themselves". The model to be described subsequently assumes that "assigned intrinsic value" will be captured by measuring environmental stewardship.

The debate

The selection of the appropriate type or types of values raises important methodological and philosophical issues. A recent debate by Bengsten (1994) and Hetherington et al. (1994) underscores the difficulty in developing and agreeing upon a comprehensive values framework to assist land and resource managers in planning and implementing ecosystem management. Bengsten (1994) argues that the traditional approaches to understanding values have placed too much emphasis on preference based measures to the exclusion of other types of values including functional, normative, and intrinsic values. Instead of limiting ecosystem values research to individual preference, he argues for an approach that employs multiple methods in order to assess incommensurate value types "to provide a richer more complex understanding of values than one dimensional rankings" (Bengsten 1994: p. 525).

Hetherington et al. (1994) rebuke Bengsten's call for methodological pluralism as epistemological relativism, or equating opinion with fact. Specifically, they reject the proposition of equating normative, intrinsic, or functional values' measures with preference based values' measures. Instead they pose the research challenge as better understanding human preferences for ecosystems by establishing the construct validity between assigned values and postulated held values (Hetherington et al. 1994). Accordingly, these authors emphasize the importance of critically developing valid and reliable measures of preference based measures.

Though Bengsten's approach threatens to mix value types including categories (e.g., intrinsic) that may be inherently unmeasurable, his point about the failure of utility based measures to capture the deeper importance of ecosystems and their many benefits is well made. In general, resource agencies and academicians have done a poor job accounting for the so called nonmarket values (Repetto 1992, Brown and Peterson 1994) and the deeper spiritual meanings that people associate with natural landscapes (Jakes and Harms 1995, Williams and Patterson 1996). It will become especially important to understand and accommodate these values as the implementation of ecosystem management shifts the production of benefits from a commodity orientation to an emphasis on ecosystem sustainability.

The disagreement about the appropriate structure of the value concept has philosophical underpinning as well. Sagoff (1988) argues the term value ought to be reserved for community beliefs about what is right or best, rather than equating the term with preferences. Sagoff condemns the use of preferences in determining public policy because public preferences may lack moral equivalence and instead describe individual wants that may be "sadistic, envious, racist, or unjust" (1988: p. 102).

Are there such things as nature-specific held values?

Brown's value classification scheme begs the question, "Which realm or realms is most appropriate for the study of human values for ecosystems?" Many scholars have treated the research into human natural resource values as a search for distinct categories of held values (Stern and Dietz 1994, Kellert 1996, Xu and Bengsten 1997). For example, Xu and Bengsten describe four categories values held for forests: life support,

economic/utilitarian, aesthetic, and spiritual. While these categories may indeed describe important aspects sought by man through nature, they seem to describe categories of preferences or potential benefits rather than held values--i.e., abstract ideals, end states, or modes of conduct-- as defined by Rokeach (1968), Brown (1984), and Schwartz (1992). This habit of calling categories of objects/attributes "held values" is built on the assumption that assigned values are thought to be indicators of latent held values (Brown 1984). While this may be true, it is problematic to assume that people have a set of "fundamental, evaluative beliefs" specific to the environment. More than likely assigned values for wildlife or ecosystem attributes are not based on individual and corresponding held values, but rather a set of held values that also serve as a foundation for our likes and dislikes about a variety of things.

The biophilia hypothesis has even suggested that our held values for the natural environmental are biologically evolved and necessary for our continued well being (Kellert and Wilson 1993, Kellert 1996). Yet, Rokeach (1973) postulated that held values were few in number (36) and natural resource specific values were not among his list. Schwartz (1992) has further reduced the list of held values to ten in cross cultural studies, and again discrete natural resource categories are notably absent (Fulton et al. 1996).

A study by Stern and Dietz (1994) illustrates the problem with establishing the existence of environmental held values. The authors examined the role of dominant held values in predicting choices among college students when confronted with environmental-economic trade-offs. They attempted to classify subjects into one of three dominant value types: egotism, social-altruism, or biospheric. Several studies had replicated the existence

of the first two categories as kinds of held values, and the authors employed established measures for these constructs. Stern and Dietz also tried to develop a set of items that would indicate the presence of a biospheric value where the health of the environment itself--apart from human benefits-- is the focus of concern.

Confirmatory factor analysis results failed to differentiate a hypothesized biospheric value orientation from the social-altruistic value among students who opted for environmental protection in the choice experiment. In other words, their environmental support could be explained by general concern over the welfare of others (humans) in society, rather than concern for the sake of the environment itself. The authors concluded that a biospheric (held) value theorized in the environmental ethics literature did not appear to exist (yet) in the general public (Stern and Dietz 1994).

Thus in human dimensions research and application, there appears to be a significant inconsistency between the characterization of wildlife values as held values—fundamental cognitions—versus categories that describe basic human preferences for the range of benefits that ecosystems provide us. Andrew and Waits (1980) recognized this problem and dismissed the existence of held values entirely insisting that values exist not as cognitions but *only* as relationships of subject to object, in other words, as preferences (Brown 1984). Failure to acknowledge this theoretical gap between values as "cognitions" and values as "preferences" is one of the fundamental sources of conceptual confusion over the use of the term. For example, though an individual may very strongly *value* opportunities to view wildlife, it does not make sense to describe this as a "wildlife appreciation" held value on the same par with ideal abstracts like freedom, equality, or

universalism. While researchers may find it appealing that persons possess a set of unique held values about the natural world, it is more practical from a management perspective, if not theoretically more defensible, to describe what benefits are valued (object realm) relative to each other (relational realm). The ecosystem values model proposed subsequently takes this approach. It will define categories of benefits that are valued rather than attempting to establish categories of held values about nature or wildlife. Rival categories of nature/wildlife values

In addition to trying to sort out the appropriate psychological or philosophical form of values, much of the work has simply centered on coming up with handles to describe the "things" about ecosystems that humans ultimately value. As stated earlier, many authors have not clearly delineated the supposed cognitive structure of their value typologies. In some cases, the terms attitudes or beliefs have been used instead of values. This reflects differing schools of thought relative to the distinction of those constructs. Nonetheless, the following typologies are reviewed in order to gain insight into how others have attempted to categorize the benefits of nature that humans value.

Kellert's attitudes

Probably the most widely cited classification of human attitudes regarding animals is Kellert's (1980) attitude typology which has been applied more broadly, and perhaps inappropriately to wildlife and nature as a whole. The ten basic attitudes Kellert described are labeled: naturalistic, aesthetic, ecologistic, scientistic, moralistic, humanistic, utilitarian, dominionistic, negativistic, and neutralistic. In his 1996 book, *The Value of Life*, Kellert argues that these ten categories represent (held) values for nature on the whole. He also

modifies the typology slightly by adding a "symbolic" value domain and also by combining the "ecologistic / scientistic" domains, as well as the "negativistic/ neutralistic" domains.

The basic values (Kellert 1996: p. 38) and their definitions are as follows:

Naturalistic: direct experience and exploration of nature

Ecologistic/Scientistic: systematic study of the structure, function and relationship of nature.

Utilitarian: practical and material exploitation of nature

Aesthetic: physical appeal and beauty of nature

Humanistic: strong emotional attachment and "love" for aspects of nature.

symbolic: use of nature for language and thought.

Moralistic: spiritual reverence and ethical concern for nature

Dominionistic: mastery, physical control and dominance of nature

Negativistic: fear, aversion, and alienation for nature.

Though the Kellert typology contributed to our understanding of human attitudes toward wildlife, it is insufficient when applied as a general model to describe ecosystem values. While the measurement instrument has produced consistently reliable measures of these attitudes, several scales lack validity. Most notably, research conducted on the attitudes of Bureau of Land Management employees produced low utilitarian scores which goes against intuitive wisdom. One would expect valid scales to produce high utilitarian scores for BLM managers whose very careers are dependent on producing utilitarian benefits (Peyton and Langenau 1985). Examination of the scale items shows that certain items force a choice between use of wildlife and destruction of habitat. One example is the

item: "I see little wrong with filling a wetland if the land can be used to produce more jobs and income" (Kellert 1980). This tradeoff between short and long term use of habitat likely depresses true utilitarian score where concern over future resource use is also a strong individual value.

Recently, Yarrow and Guynn (1997) attempted to apply Kellert's typology to a study of attitudes toward ecosystem management. Predictive validity was again a problem. Curiously, a sample of members of The Wildlife Society indicated that their strongest attitude toward ecosystems was anti-scientistic! Though this result is highly suspect, it is difficult to fully evaluate given that validity and reliability assessments were not reported for the adapted measures by the authors.

Beyond the measurement problems, the Kellert domains do not transfer well as distinct categories of valued attributes. In other words, the Kellert typology becomes awkward when applied in the object or relational realms. For example, what would be an example of a moralistic resource management benefit⁴? What is negativistic benefit? Even the categories that more aptly describe benefits like utilitarian do not differentiate well between the kinds of benefits a person with a high utilitarian value might seek. Bird watchers may be just as utilitarian as deer hunters, yet the nature of the attributes or outcomes they value is quite different.

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I use the word "benefits" interchangeably with "objects" or "products" (e.g., recreational opportunities). In the leisure and recreation literature, "benefits" refer to a broader class of individual and social goods that are the ultimate results of participation in recreation, rather than in the opportunities themselves (Driver et al. 1991)

Several other problems exist with the domain constructs themselves. First, the dominionistic domain as it is defined suggests a value that may be an extreme form of utilitarianism rather than a mutually exclusive category of value. Second, symbolic value may be just a particular application of aesthetic value. Third, the term moralistic as it is defined equates animal rights philosophy with spiritualism. Clearly, the two ideas can be exclusive of one another. Fourth, the definition of ecologistic/ scientistic value focuses on the potential benefits derived from educational aspects of ecosystems, while ignoring the benefits that humans might value from the structural, functional, and interdependent relationships within ecosystems (Lui et al. 1997). Fifth, one could ultimately argue that most of the value domains described by Kellert are utilitarian in the broad usage of the term. Whether one "uses" or "exploits" nature for wild game, timber products, or a source of wonder and spiritual renewal, the benefits sought all serve some form of utility for human well being. Even baseline ecological services (e.g., flood control) that may go unrecognized provide utilitarian benefits for humans.

Forest values

In another typology, Rolston and Coufal (1991) proposed ten categories of forest values: life support, economic, scientific, recreational, aesthetic, wildlife, biotic diversity, natural heritage, spiritual, and intrinsic. Again category overlap is a problem for domains like wildlife and biotic diversity, where the former is an element of the latter. The scheme also mixes preference, functional, and intrinsic value relationships.

State Park Values

In a similar approach, Negra and Manning (1997) combined several existing nature

value typologies to generate an exhaustive list of social values for Vermont state parks (though it presumably has broader applications). Their list included: aesthetic, recreational, educational, moral/ethical, ecological, therapeutic, economic, solitude, intellectual, historical, scientific, spiritual, cultural, and resource.

Wildlife Value Orientations

Still other approaches to classifying the range of nature related human values have been suggested (Table 1). Fulton et al. (1996) used a domain sampling technique with Colorado Division of Wildlife personnel to derive eight categories of basic wildlife beliefs (note earlier discussion where authors equated values as beliefs). The eight categories of basic beliefs are: 1) wildlife use, 2) wildlife rights, 3) recreational wildlife experience, 4) bequest and existence, 5) hunting/anti-hunting, 6) residential wildlife experiences, 7) wildlife education, and 8) fishing/anti-fishing. This classification is also insufficient for application to ecosystem management. Two weaknesses of these categories are the considerable overlap between domains and the narrow focus on fish and wildlife as objects of value versus a broader look at the context or environment in which they occur. The former problem is common to most wildlife classification schemes, but the latter one presents particular problems for integration with ecosystem management.

More useful for the purpose of this study are the latent value orientations that emerged from the factor analysis of measurement items of the eight basic beliefs. The authors employed a structural equation model approach to test the predictive capacity of two latent orientations—consumptive value and appreciative value—on a respondent's intention to go hunting or take wildlife viewing trips (Fulton et al. 1996). Though my

study employs different measurement items, the consumptive and appreciative theoretical constructs are useful for describing basic ecosystem preferences and are integrated in the ecosystem values model proposed below.

Understanding three critical dimensions: A proposed ecosystem values model.

Driver (1985) argued there is a need for wildlife managers to establish a clearer link between the products of wildlife management (e.g., ecosystem services, recreational opportunities, scenic beauty) and public values for those products. Given the competing, conflicting and inconsistent value classification schemes mentioned above, none offer a workable framework for the study of human ecosystem values. I propose a new model that integrates past work and attempts to avoid many of the inconsistencies and measurement problems that plague rival typologies. The following section describes a conceptual model— a three dimensional "values cube" to serve as a framework for this research and to better organize our understanding of the seemingly incommensurate classifications of wildlife and nature related values found in the literature. The model is an attempt to propose a pragmatic, workable description of the fundamental nature of ecosystem values (in response to the debate between Bengsten [1994] and Hetherington et al. [1994]). Development of the values cube model was guided by the three following questions.

- What are the types or categories of benefits that people value from ecosystems?
- •To whom do these benefits accrue?
- When do the benefits accrue?

Six categories of valued benefits

The first dimension of the proposed ecosystem values model modifies some of the categories enumerated by Rolston and Coufal (1991). "Life support", (Rolston and Coufal 1991, Xu and Bengsten 1997) provided by maintaining a healthy environment, sustainable resources, and ecological services, is the keystone of ecosystem management (Franklin 1997) and thus an integral category for the model (Figure 1). In the present model, "life support" benefits comprise a category called "ecological dependence" which is defined as the importance an individual places on the maintenance of ecological processes, services, and interconnected food webs that are assumed necessary to sustain human life.

Producing recreational opportunities has been part and parcel of the wildlife management profession since its beginning and competing recreational uses are often at the heart of value conflicts. There are a wide diversity of recreational benefits sought by the public ranging from a desire for broad amenities to a narrow focus resource-specific attributes. Three categories pose the greatest implications for wildlife managers and comprise the value categories two through four in the model.

Traditional consumptive recreation is focused on opportunities to hunt and fish for "game species" of wildlife. The "consumptive recreation" value is defined as the importance placed on managing ecosystems to provide for and enhance fish and wildlife species for recreational hunting.

The "nature appreciation" value subsumes Rolston and Coufal's (1991) aesthetic and spiritual categories and integrates Kellert's naturalistic (1980, 1996) domain as well.

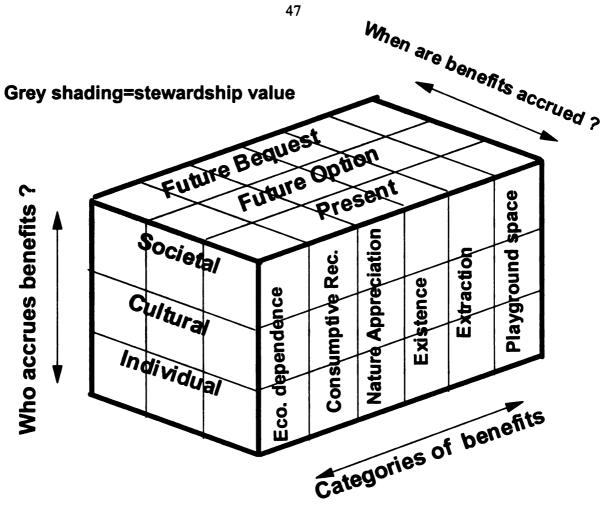


Figure 1. A conceptual model of the 3 dimensions of ecosystem values

The integration of spiritual values in this category is not meant to diminish it's potential importance (Williams and Patterson 1996). Instead, the spiritual benefits that people may value from nature can be thought of as a deeper or more intense form of nature appreciation. The danger remains that assessment of this value can be obscured if research ignores the potential spiritual values of place versus the individual attributes that comprise a place (Williams and Patterson 1996). Ultimately, decisions about consolidating versus splitting categories were guided by what implications such decisions would mean for wildlife managers.

Nature appreciation is thus defined as the importance placed on ecosystems and its biotic inhabitants as sources of aesthetic beauty, wonder, spiritual renewal, or simple pleasure experienced through direct or indirect means.

The final category of recreation benefits I have named "recreational playground space". This describes the many forms of outdoor recreation that provide benefits that are non-wildlife and non-naturalistic specific. For example, recreations such as riding mountain bikes, off road vehicles, jet skis, and snowmobiles are increasing in popularity, and creating more allocation conflicts and demands for space on public lands. In this category, the object of the value is space to operate or "play" with certain equipment, irrespective or incidental to specific environmental or wildlife attributes of a particular setting. As an example, preferences for specific types of outdoor settings among mountain bikers have been shown to be related to landscape factors that enhance the physical challenge of the activity (e.g., steep climbs), rather than aesthetic or ecological attributes (Hopkins and Moore 1994).

The implication for management of this value category is a potentially large class of "non-consumptive" users who ultimately may be indifferent toward nature-dependent benefits, though they have high potential for degrading natural values sought by others. "Play space" is defined as the importance placed on having available and accessible space to engage in leisure recreation whereby a machine or exercise is the focus of the behavior.

The fifth category represents a special class of non-use appreciation. "Existence values" are the satisfaction one receives from simply knowing that wildlife or an ecosystem exists (Cocheba 1987, Pearce and Moran 1994). In a strictly technical sense, the term "existence value" is a willingness to pay for the perpetuation of some object regardless of opportunity to utilize or experience it directly. Its usage in the present model is not constrained by type of measure (i.e., willingness to pay), but instead refers to the inherent cognitive satisfaction of knowing that species and ecosystems are being maintained.

The sixth category is "economic extraction" which taps the commodity extraction benefits of managing ecosystems. Humans can value both the direct products produced from ecosystems such as food, minerals, fuel, and timber and also the indirect⁵ economic benefits derived from jobs and industries that focus on exploitation of resources in a broader sense. It should be noted that the two categories of valued economic benefits described here should not be confused with economic valuation of resources as others

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Originally the direct and indirect economic benefits were proposed as separate categories of individual value, but factor analysis of pilot measurement items failed to produce a satisfactory 2 dimensional construct.

have done (Kellert 1980, Brown and Manfredo 1987). For example, Rolston (1985) treats market price and individual preference as distinct types of value. This seems to confuse what is valued with how value is expressed or indicated. This study treated economic values as specific desired outcomes (e.g., timber, job creation, tourism development) rather than economic expenditures.

Who accrues benefits?

The nature of the six categories of ecosystem values can be clarified further by asking the question: to whom do these benefits accrue? The answer to that question becomes the second dimension of the ecosystem values model. In their own model of social values, Brown and Manfredo (1987) specify four strata of social values exclusive of economic values. They organize these strata as cultural values, societal values, psychological values and physiological values. Cultural values are defined by authors as the held values--thoughts and ideas-- that make up a culture (e.g., wildlife have rights). Societal values are those values that promote healthy relationships among people living in a society (e.g., family togetherness from shared experiences). Psychological values are the satisfactions that an individual perceives from an object of value. Physiological values are the health benefits one may receive from engaging in activities in pursuit of some object (e.g., exercise from hiking). Physiological value as the authors have described is trivial unless recognized by the individual in which case they become indistinguishable from psychological values. Regardless, the strata become more useful when tweaked slightly to describe who accrues the benefits. By combining the last two subcategories as individual benefits, one can see that values accrue at three different aggregations: cultures, societies,

and individuals. These three levels comprise the second dimension of the ecosystem values model (Fig. 1).

When do benefits accrue?

The proposed ecosystem values model contains a third axis that addresses the temporal dimension of values, that is, when are benefits accrued? This becomes a critical question when trying to assess public attitudes toward ecosystem management given the long term thinking inherent with the concept. Obviously, individuals, cultures, and societies can value ecosystems and their associated products in a present time context, and the model reflects this layer. Moreover, economists describe two types of future oriented values: option and bequest. Option values are "the risk aversion premium individuals are willing to pay for retaining an option for future use of a species" (Cocheba 1987: 277). Bequest values are the satisfaction of preserving a class of benefits for future generations to enjoy. Both of these classes of benefits are typically assessed through conventional economic evaluation measures like willingness-to-pay measures, but should not be theoretically bound to monetary expression of worth. Both of these classes of value are added to the present time to illustrate the three temporal dimensions of ecosystem values. Stewardship: Conceptual and philosophical foundations

The final expression of value depicted in the model is that of a <u>stewardship ethic</u> which is indicated by the light shading in Figure 1. Stewardship is defined here as a deeply held moral obligation to act in ways that conserve a baseline ecosystem in order to achieve

sustainable benefits for current and future others ⁶. In short, the stewardship value is the form of an environmental ethic. A distinction should be clear that makes stewardship different than the six preference based values already described in that it is a normative based value.

The importance of stewardship as a variable in the model demands a slight digression to review both the philosophical and theoretical underpinnings of the term. In a Sand County Almanac, Leopold (1949:240) spoke eloquently about developing a land ethic where man's role is transformed from conqueror of the biotic community to "just plain member and citizen of it." He further establishes a benchmark by which individuals' actions may be evaluated in relation to their environment:

"A thing is right when it tends to maintain the integrity, stability, and beauty of the biotic community, it is wrong when it tends otherwise" (Leopold 1949:266.)

It has been suggested that Leopold's land ethic provides society with a broad foundation for environmental stewardship as the human enterprise confronts various environmental threats, including issues of sustainability (Knight 1996). While Leopold's maxims are certainly poetic and thought provoking, they are far from conceptually clear as to what would qualify as environmental stewardship.

Stewardship as moral norm

The definition of stewardship proposed earlier posits the existence of a fundamental value that guides one's environmental conduct. In that sense, it may differ in

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[&]quot;Others" is deliberately broad enough to apply to non-human others to account for humans who ascribe intrinsic value to species and ecosystems.

type from the other values described in the model in two ways. One, the stewardship value may come closer to what Rokeach (1973) called a terminal held value. Second, and more importantly, like Leopold's land ethic, it serves as a moral norm rather than an expressed preference (Sagoff 1988). Schwartz (1970:128) identified three distinct dimensions or attributes of moral decisions:

First, moral decisions necessarily lead to interpersonal actions having consequences for the welfare of others. Second, decisions are classified as moral only when the decision maker is the responsible agent--a person who has chosen an action knowingly and willingly when he could have done otherwise. Finally, the actions resulting from moral decisions and the agent held responsible for them are evaluated as good or bad according to the consequences the actions' have for others' welfare. Cultural specifications of what constitutes good or bad interpersonal behavior, i.e moral norms are the reference point for these evaluations.

Schwartz (1970) further distinguishes moral norms from social norms which he calls "non-internalized" references. In other words, whereas social norms theoretically influence one's behavior based on the expectations of significant others (Ajzen and Fishbein 1977), moral norms are based on personal standards of right and wrong.

Thogerson (1996) points out that social norms that initially guide many environmental behaviors may eventually become moral norms if they become integrated into one's personal value system.

Reframing stewardship as a moral norm with altruistic motivations (i.e., taking action to benefit others) establishes a more stringent criterion for what behaviors qualify as examples of stewardship than are often used. Several examples are warranted to justify this distinction. In the parlance of natural resource management, stewardship often refers to the institutional mission to conserve and sustain wildlife and ecosystem in the public

trust (e.g., MDNR mission statement). In this sense, stewardship can be thought of as a cultural value. Thus agencies tend to take on the responsibility and duty of maintaining the resource on behalf of the public. The professional-cultural emphasis on resource stewardship is mentioned to distinguish it from the personal obligation that is described in this study.

As a further point of clarification, the term stewardship is inappropriately applied to situations where individuals are merely acting in their own self interest, rather than based on perceived moral obligation. Three important examples come to mind. First, farmers who receive government cash payments for placing lands in the Conservation Reserve Program have been described as practicing land stewardship. Gaining behavioral compliance through financial incentives is theoretically based in economic models of subjective utility where individuals are motivated by the desire to maximize private utility (Thogerson 1996). Farmers in this case may merely be maximizing self interest, rather than acting out of sense of moral obligation for others. This is an important distinction because Thogerson (1996) found that financial incentives for participation in recycling programs did not lead to development of moral norms in participants, but rather the old behaviors (noncompliance with recycling) returned after financial incentives were discontinued.

Second, hunters and anglers are often afforded the label of stewards based on their financial support of fish and wildlife agencies through both the purchase of licenses and

revenue generated from an equipment surcharge established through federal legislation? This credit likely stems from the fact that sportsmen lobbied for the funding that subsequently restored many species of wildlife and their habitat from perilously low levels (Gray 1992). While most sportsmen may hold positive attitudes about supporting fish and wildlife management through the current funding structure (Duda 1993), payment of involuntary taxes falls again somewhat short of environmental stewardship. This is not evidence to suggest that hunters and anglers are not stewards. But they do not qualify as such on the basis of adhering to the legal requirements of obtaining a license for pursuit of fish and game. In fact, critics of the current funding system argue that financial support of fish and wildlife management by hunters and anglers is merely a way to make sure that agencies remain beholden to narrow consumptive interests.

The third example presents an interesting "gray area" which illustrates the slipperyness of the stewardship concept. Suppose members of a local chapter of Ducks Unlimited or an Audubon Society donate time and money to restore waterfowl habitat in a local wetland in the hopes of enhancing their future hunting or bird watching opportunities. But suppose also that these same individuals drive gas guzzling cars, do not recycle, run businesses that pollute the environment with dangerous toxins, and advocate business and residential development of upland forests to enhance economic growth. Are these people environmental stewards, stewards of the waterfowl resource, neither, or both? The

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The major pieces of legislation are The Federal Aid in Wildlife Restoration Act (Pittman-Robertson) of 1937 which established an 11% surcharge on guns and ammunition; and the Federal Aid in Fisheries and Aquatic Restoration (Dingell Johnson) of 1950 which placed a 10% tax on fishing equipment (Gray 1992).

example may be contrived, but it gets to a fundamental question of whether there is such a thing as *global environmental stewardship* versus issue or context specific stewardship, which Negra and Manning (1997) termed "utilitarian conservation".

Though the social psychological and environmental education literatures are replete with studies of environmental attitudes and behaviors, attempts to define and operationalize stewardship have been surprisingly lacking. The approach that may come closest is Dunlap and Van Liere's (1978) New Environmental Paradigm (NEP). The NEP is said to describe a revolutionary world view about the nature of the earth and mannature relationships, or what Stern et al. (1995) later called a sort of "folk ecology". An inspection of the items used to tap the NEP reflect a series of rather primitive and abstract beliefs about ecology, but the scale stops short of measuring individual actions or intentions regarding the environment.

Negra and Manning (1997) developed a complicated multi-factor typology of environmental ethics. They define stewardship as "ethics that bridge the gap between anthropocentrism and biocentrism by recognizing the moral status or spirituality of nonhuman entities" (Negra and Manning 1997: p.15). The definition parallels Merchant's (1997: p.29) call for a "partnership ethic" whereby "the greatest good for human and nonhuman communities is their mutual living interdependence". But in use of the "moral" connotes rights for individuals rather than obligations derived from awareness as I have used in the definition of stewardship as a moral norm. This clarification is critical because requiring the recognition of moral status of non human entities (i.e., bestowing rights) is

an overly narrow interpretation of stewardship that extends the land ethic far beyond what Leopold intended.

Empirical findings

Rather than defining and measuring stewardship, the majority of research has focused on establishing a relationship between measures of general *environmental concern* and various so called *environmentally responsible behaviors* (e.g., car pooling, recycling, "green" consumerism, etc.). Overall, this body of research has typically found weak associations between an individual's environmental attitudes and behaviors (Guagnano et al. 1995, Mainieri et al. 1997). Additional research has examined the consistency among individuals across different types or categories of responsible environmental behavior. If people truly embraced a land ethic as Leopold championed, we would expect them to adopt an environmentally responsible lifestyle and exhibit a fair amount of behavioral consistency. Yet, results have typically produced a pattern of low, positive correlations among different types of behaviors which could be said to reflect stewardship (Tracy and Oskamp 1983, Oskamp 1995, McKenzie-Mohr et al. 1995). These findings cast doubt on the presence of a global environmental stewardship.

There have been several plausible explanations offered to account for the discouraging pattern of findings. Van Liere and Dunlap (1981) point out that wide variation exists in the way the independent variable--general environmental concern (GEC)-- has been measured, which raises questions of validity. GEC has been alternatively operationalized in studies as "perceived seriousness of environmental problems", "knowledge of issues", "support for reforms", and "actual involvement in

environmental behaviors". Further, Van Liere and Dunlap empirically established that several commonly used scales for GEC were not equivalent. That is, the scales measure different latent constructs.

Another possibility for the low correlations may be that the attitudes and behaviors in environmental studies have typically differed in their degree of specificity (Mainieri et al. 1997). Ajzen and Fishbein (1977) pointed to the need to address the specificity issue when testing attitude-behavior correlations. It has been shown in attitude research that general attitudes do not predict specific behaviors well, and vice versa (Schuman 1972).

Finally, researchers have found important moderating variables that may attenuate the relationship between environmental attitudes and behaviors including effort, financial cost, convenience, and perceived self efficacy (Hines et al. 1987, McKenzie-Mohr et al. 1995, Mainieri et al. 1997, Schultz and Oskamp 1997).

Association between outdoor recreation and stewardship

Dunlap and Heffernan (1975)--now referred to as "the Dunlap-Heffernan" thesis-investigated the relationship between participation in different types of outdoor recreations
and environmental concern. Using regression analysis, they found significant, but weak,
positive correlations between participation in select outdoor recreations and environmental
concern. The authors found somewhat stronger support for the hypothesis that the
positive relationship was stronger for "appreciative" recreations (hiking, camping, and
visiting scenic areas) than for consumptive recreations (hunting and fishing). Since then,
several other researchers have attempted to replicate Dunlap and Heffernan's study and
have produced inconsistent results (Theodori et al. 1998).

Most recently, Theodori et al. (1998) looked at the issue among Pennsylvania residents. Their study differed from previous attempts to measure this relationship because they utilized measures of behavior rather than attitude for the dependent variable-environmental concern (Table 2). They also improved upon previous work by confirming the presence of consumptive and appreciative recreations though a factor analysis rather than by a priori assignment. Ultimately, they found significant associations between all

Table 2. Measures of environmental concern used by Theodori et al (1998).

7 items^a measuring "environmental concern"

Have you engaged in any of following behaviors during the past year:

- 1. contributed money or time to an environmental or wildlife conservation group;
- 2. stopped buying a product because it caused environmental problems;
- 3. attended a public hearing or meeting about the environment;
- 4. contacted a government agency to get information or complain about an environmental problem;
- 5. read a conservation or environmental magazine;
- 6. watched a television special on the environment;
- 7. voted for or against a candidate based on his/her position on the environment

eight activities that were investigated. The strongest zero-order correlation with environmental concern was found between birdwatching (R=.262), while hunting produced the weakest correlation (r=.074) (Theodori et al. 1998).

Empirical findings on public environmental attitudes

The following section summarizes findings related to environmental or wildlife related studies of public values, attitudes, and preferences that pose implications for the current study. The empirical findings that are presented in this review are organized by

Positive responses were scored (+1) and summed into a scale score.

moving from general environmental attitudes to research specifically addressing ecosystem management. Nested within this continuum are summaries of results relevant to key stakeholder groups in this study.

General Environmental Attitudes

Recent national and international surveys have revealed broad public concern for environmental protection (Times-Mirror 1992, 1994, 1995, Belden and Russenello 1996, Dunlap and Mertig 1997, NTEEF 1997). About seven in ten Americans describe themselves as being pro-environmental. In 1995, about one in five (21%) described themselves as "active environmentalists", while another 51 % reported that they are "sympathetic toward environmental concerns, but not active" (Times-Mirror 1995.) In terms of self-reported environmental knowledge scores, only 10 % report knowing "a lot" about environmental issues. The majority-- 54%--claim to "know a fair amount", 32 % know "only a little", and 4% know "practically nothing".

In 1992 the Roper Organization reported the results of a cluster analysis that identified five discrete segments of the American public based on measures of environmental attitudes and behaviors. "True-blue greens" made up 11% of the survey sample and are characterized as having positive environmental attitudes and very likely to engage in several environmentally responsible behaviors including volunteering, recycling, and donating money to environmental organizations. The next tier were the "greenback-greens" (11%). Individuals in this cluster held positive environmental attitudes and were the most likely of any group to donate money to an environmental organization. The middle segment representing 24% of Americans--"the sprouts"--

espoused positive attitudes, but were less likely to engage in responsible environmental behaviors, especially if confronted with personal costs. The remaining two clusters (52 % of the sample) ranged from neutral to anti-environmental in their attitudes and behaviors.

While support for the environment is impressive in an absolute sense, it still remains a "second tier" issue for most Americans when compared to other issues such as crime and the economy (Belden and Russenello 1996; Times-Mirror 1994). Meanwhile, most Americans (67%) believe that protecting the environment and growing the economy are not mutually exclusive goals. When asked whether the environment or the economy should receive priority when a reasonable compromise can not be found, 63 % sided with the environment and 23 % opted for economic development in a 1995 survey (Times Mirror 1995). Conversely, when asked whether all endangered species should be protected at any cost, 67 % of respondents thought the costs should be considered while 23 % said that all species should be protected regardless of cost (Times-Mirror 1995).

While attitude trends toward the environment remained stable in the 1990's, results suggest growing cynicism about the ability of government, industry and other institutions to provide solutions to environmental problems. For example, in 1995 only 43 % of the public thought government should do more to regulate pollution-a decline of 20 percentage points in two years. The authors of the Times-Mirror (1995) report suggest that this indicates a shift toward individual self-reliance and responsibility to protect the environment, noting that both volunteering and interest in volunteering on behalf of the environment have increased. It is important to keep in mind that the backlash may not

represent cynicism about environmental protection per se but rather a broader antigovernment sentiment (Times -Mirror 1995).

The attitudes of Michigan residents toward environmental protection are similar to the Times-Mirror national study, but may be more supportive of governmental regulation, especially with regard to land use planning and reduction of urban sprawl (Hembroff 1995). Sixty-three percent of Michigan citizens in 1995 thought that environmental protection and economic development could go hand in hand, while 36 % thought they were in conflict. Of those 36 percent, 70 % said they would rather support policies that protect the environment (Hembroff 1995).

High public support for environmental protection should translate into support for ecosystem management to the extent that the public makes the association between the need to maintain ecosystem services as a pre-requisite to maintaining environmental health.

Stakeholder attitudes and values

Recreational trends

I begin with a general description of the national trends in participation in consumptive and nonconsumptive recreation and what those trends may suggest about changing societal values. Based on the National Survey of Fishing, Hunting and Wildlife Associated Recreation, over 108 million Americans participated in some form of wildlife recreation in 1991 (USFWS 1993). Overall, 14.1 million people hunted, 35.6 million fished and, 76.1 million participated in some nonconsumptive activity for which enjoying wildlife was the primary purpose. It is important to note that there is significant overlap

between consumptive and nonconsumptive nonmembers. Results from the national survey indicate that 57 % of hunters also engaged in some form of nonconsumptive wildlife activity such as feeding or viewing, while 26 % of nonconsumptive users also hunted.

Taken together consumptive and nonconsumptive wildlife recreation generate about \$59 billion dollars of economic expenditures annually.

While levels of wildlife participation and its substantial economic impact provide some indication of the value of wildlife recreation to Americans, trends in participation may provide clues as to shifting values and demands for resource use (Decker and Enck 1996). According to several recent studies, demand for nonconsumptive or nature appreciation activities is rising dramatically while participation in hunting and fishing have stagnated or declined slightly (USFWS 1993, USFS 1995, Wight 1996 and USFS 1997). Perhaps the most striking example is the 155 % increase in birdwatching reported between 1983 and 1994 (USFS 1994-95). Over the past ten years birdwatching has been the second fastest growing leisure activity in the U.S. (Adams et al. 1997).

Other outdoor activities with large increases during the same period include hiking (+93.5 %), backpacking (+72.7 %), downhill skiing (+58.5 %) and primitive area camping (+58.3%). Hunting (-12.3%) and fishing (-3.8) exhibited modest declines (Cordell et al. 1997). In addition to increases in wildlife related nonconsumptive activities, there have also been increases in participation in biking, boating, off road vehicle use, and personal water craft use (jet skis) (Cordell et al. 1997). It appears that increasing levels of participation by younger cohorts, dubbed "Generation X", are primarily responsible for increases in these "play space" activities (Cordell et al. 1997).

It has been suggested that the general shift from consumptive toward appreciative recreation activities in the U.S. is one indicator of changing societal values that are more preservationist and less utilitarian (Kellert 1995, Knight 1996). Birdwatchers--as an example-- have been described as being "low" on utilitarian attitude scores (Kellert 1985). It is premature to infer the values of society or of recreational stakeholders based on participation trends in certain categories of activity.

An alternative to the "values shift" hypothesis to explain current participation trends is demographic shifts that influence opportunity and recruitment into activities (Murdock et at. 1992). Models that link general demographic trends in the U.S. population with participation in outdoor activities suggest that participation in traditional consumptive uses will continue to decline unless recruitment patterns change (Murdock et al. 1992). Increasing urbanization--affecting both the number and convenience of hunting opportunities-- and increases in the number of female headed households are believed responsible for the decline in hunting which is traditionally a male dominated and rural activity (Witter 1990, Heberlein 1991, Dann and Peyton 1996). Participation in nature appreciation activities have been demographically associated with urban, well educated, and upper income individuals (Wight 1996, USFWS 1993, Witter 1994). These patterns of recreational demand and associated demographic changes pose tough challenges for public land managers with regard to ecosystem management planning.

Relevant attitudinal studies of stakeholders

Hunters

The motivations and satisfactions of hunters have been widely studied. Duda

(1993) provided an extensive review of research to identify reasons people hunt. Hendee (1974) proposed a multiple satisfactions approach that recognized that hunters (and other wildlife related recreationists) seek multiple benefits from participation in their respective recreations. In other words, hunter success (i.e., game bagged) is not the only factor leading to satisfaction, and indeed may be a comparatively minor one. While we know quite a lot about what people seek from hunting, we know surprisingly little about what hunters value from ecosystems. A brief examination of hunter motivations may provide some clues as to how they may value the different ecosystem benefits proposed in the model.

Kellert (as cited in Duda 1993) divided hunters into three types based on differences in their attitude profiles. Nature hunters (11%) were characterized by their high ecologistic and naturalistic attitudes, whereas meat hunters (43%) and sport hunters (37%) exhibited high utilitarian and dominionistic scores respectively. These categories have implications for the ecosystem benefits model. Given the labels of the latter two types of hunter--meat and sport-- one would certainly expect strong values for consumptive recreation. Nature hunters, however, may place a higher value priority on ecological dependence. Kellert (1996:71) hypothesized what makes "nature hunters tick:

Nature hunters seek an active role in natural surroundings, and hunting represents a compelling opportunity for pursuing this interest. Exercising their role as predator offers nature hunters a chance for intimate experience of the complexity of ecological relationships and dependencies within a natural context.

Whether or not this segment of hunters develops a value for ecological dependence, at the

very least, their attitudes may lead to "a vivid appreciation and awareness of nature's many details and processes" (Kellert 1996:71).

Decker and Connelly (1989) categorized hunters based on motivations for hunting. They found that nearly three quarters of New York deer hunters could be classified into one of three types of primary motivations. Achievement hunters (11%) were those who placed the most importance on opportunity to fill their tags, obtain venison, or shoot a trophy animal. Appreciative hunters (65%) were those who placed the greatest importance on the opportunity to get outdoors, observe nature, and relax. Affiliative hunters (24%) placed the highest importance on group camaraderie of the hunting experience and the opportunity to spend time with friends and family (Decker and Connelly 1989). Decker and Connelly (1989) found that appreciative deer hunters were more likely to be older, while achievement oriented hunters were younger than the other two segments. Ringelmann (1997) found similar categories among waterfowl hunters, but a slightly different distribution. In Ringelmann's study (1997), there were nearly equal proportions of appreciative and affiliative waterfowl hunters; achievement oriented hunters were still the vast minority.

Decker and Connelly's hunter motivations have three implications for this research. One, hunters--both deer and waterfowl-- are likely to place high value on nature appreciation benefits. Two, at least some hunters will value consumptive recreation benefits of management more than anything else. Three, the finding that appreciative hunters tend to be older lends some support to the stage development hypothesis which suggests that hunters' primary motivations change as they get older, culminating in a

sportsmen's stage where participation in conservation and stewardship may be the biggest motivation (Jackson and Norton 1980).

Nonconsumptive recreation: wildlife viewing

Though still lagging behind our understanding of the motivations of consumptive users, the literature examining the preferences of nonconsumptive recreationists is beginning to expand. According to Duda and Young (1994), the number one reason for participation by wildlife viewers is the opportunity to "see beauty in nature". Surveys indicate participation in wildlife viewing crosses demographic lines of age, gender, race, and economic status, but there is a clear relationship between participation and level of education. As level of education increases, so does the likelihood of one's participation in wildlife viewing (Duda and Young 1994).

Several studies have identified different segments of nonconsumptive wildlife viewers (Manfredo and Larsen 1993, McFarlane 1994, Martin 1997). For example, McFarlane's (1994, 1996) study of Canadian bird watchers and Martin's (1997) research on Montana tourists both segmented users based on degree of specialization posed in Hobson Bryant's (1977) theory. Alternatively, Manfredo and Larsen (1993) developed four segments of users from cluster analysis of desired "experience-based" outcomes of wildlife viewers. These ranged from high-involvement users to viewing generalists.

Martin (1997) found that wildlife viewing specialists and novices were significantly different in their preferences for site amenities and types of wildlife sought. Though specialists and novices both indicated a strong desire to see large mammals and birds of prey, specialists were substantially more interested in seeing songbirds, reptiles and

amphibians, small mammals, and waterfowl. Manfredo and Larsen (1993) found similar species preferences among all categories of wildlife viewers, with one exception: only high involvement users indicated a strong preference for viewing large mammals such as big horn sheep and antelope. However, the lower preference for viewing these large mammals expressed by less involved viewers may have been caused by perceived difficulty in accessing habitats where those species are prevalent.

Specialists in Martin's (1997) study also differed from novices in the preferences for site development. Novices were much more likely to desire facilities such as gift shops, rest rooms, and picnic areas than were viewing specialists. It has been hypothesized that site development will decrease use among wildlife viewing specialists who seek more "natural" environments in which to observe nature (Duffus and Dearden 1990).

Birders

The group of nonconsumptive users that has received the most research attention is bird watchers (birders). This is likely the result of the long, recognized history of birding as pastime, the significant amount of economic expenditures it provides, and it's rapid growth in participation (Adams et al. 1997). Birders may represent a unique type of wildlife viewer in that they exhibit a particular fascination with avifauna and have been shown to be more ecologically knowledgeable than other segments of society (Kellert 1985).

McFarlane (1994) adapted Decker and Connelly's (1989) primary motivation categories in her investigation of bird watchers in Canada. In addition to achievement,

affiliative, and appreciative motivations, a fourth category--conservation-- emerged in a factor analysis of survey results (McFarlane 1994). Unlike hunters, no birder had a primary affiliative motivation. Most interesting for the purpose of my study, however, are the implications of the relationship between level of birding specialization and primary motivation.

McFarlane (1994) classified birders into four levels of specialization based on past experience, economic commitment, and centrality to lifestyle measures. The four levels of birders--casual, novice, intermediate, and advanced were then compared based on their primary motivations. Two aspects of the results are particularly interesting. One, there was a tendency of specialized birders to be achievement-oriented in their motivations. Two, conservation decreases as a primary motivation as specialization increases (McFarlane 1994). This evidence is contrary to both specialization and stage development theory where one would expect support for conservation of the valued resource to be highest among the highly specialized and the most experienced (Bryant 1977, Jackson and Norton 1980). The implications for the current investigation are that some birders, indeed the most ardent, may tend to have lower stewardship value.

Adams et al. (1997) compared the recreational motivations and attitudes toward wildlife management of Texas bird watchers and waterfowl hunters. Similar motivations emerged between the two users and also parallel findings of previously reviewed motivational studies. The top two reasons given for birding were "to be close to nature" and "fascination with birds". Hunters listed "to be close to nature" and "to be with friends" (Adams et al. 1997). To the extent that recreation motivations reflect one's

values, this finding suggests that both waterfowl hunters and birders in the present study may both place high importance on "nature appreciation".

While hunters and birders may share some of the same motivations, Adams et al. (1997) found significant differences between the two groups on all nine survey questions concerning beliefs about wildlife management. Similar to findings of Witter and Shaw (1979) birders were far less likely to agree that the opinions of non-hunters were considered by wildlife managers than were hunters. Birders were also less likely than hunters to agree that hunting was necessary as a management tool and that nongame species received enough attention in management decisions. Finally, hunters were less likely than birders to think that management primarily benefitted game species, that endangered species protection should be protected if it leads to job losses, and habitat protection should supersede property rights (Adams et al. 1997).

Environmentalists

National environmental organizations like the Sierra Club have increasingly relied on the courts to challenge traditional resource management policy and planning, especially the impacts of timber harvest on wildlife species and biodiversity (Yaffee 1994, Woiwode 1998). Yet, dissatisfaction may not only be with forestry managers. In Michigan, the Sierra Club has threatened lawsuits over the management of state game areas unless environmental impact statements are conducted to assess the effects of current practices on biodiversity (Woiwode 1998). The legal challenges of environmentalists are a significant driving force in the shift to ecosystem management (Jones et al. 1994).

Several studies have shown that economic, commodity, or utilitarian values for

resource management are low among environmentalists (Kellert 1980, Vining and Ebero 1991, Reading and Kellert 1993, Xu and Bengsten 1997). The forest management preferences of environmentalists have been shown to be linked to aesthetic, amenity, and spiritual values (Vining and Ebero 1991, Xu and Bengsten 1997). Kellert (1980) found that members of environmental protection organizations had the highest ecologistic attitude scores among 15 segments of the population.

At issue is the relative priority of value preferences of environmentalists for the benefits categories in the present model. Vining and Ebero (1991) compared national environmental organization members with those of the general public and resource managers on benefit preferences for national forest lands. Surprisingly, environmentalists tended to be more like the general public (non-organization members) than were resource managers in management benefits. Overall, environmentalists assigned higher importance to scenic beauty, wilderness, and wildlife habitat than to recreation, which suggests that environmentalists' ecosystem values may not directly reflect personal use benefits.

Attitudes toward Ecosystem Management

Fan and Bengsten (1997) reported that 75 % of public attitudes were favorable toward ecosystem management, and that favorable public attitudes had been increasing over the five year period from 1991 to 1996. Their findings were based on a nationwide content analysis of mass media coverage of ecosystem management in the most generic and abstract expressions. Descriptions of ecosystem management from media texts were coded and judged to be positive or negative descriptions of the term. Using newspaper, radio, and television accounts as proxies for attitudinal evaluations presents a serious

methodological shortcoming. As an example, the adjective "broad based"--used to describe ecosystem management-- was judged to be favorable (Bengsten and Fan 1997), yet one could make a case that such description could be construed negatively as well.

Another problem is that Fan and Bengsten (1997) make the assumption that all media accounts of "ecosystem management" were equally valid. No attempt was made to control for variability in the accuracy or level of sophistication of the concept descriptions.

Three recent studies have assessed public attitudes toward ecosystem management in a select geographic area. Reading et al. (1994) looked at attitudes and ecological knowledge levels of residents of the Greater Yellowstone Ecosystem (GYE). Overall, residents expressed an understanding of the need to undertake "coordinated management" of the region for species like grizzly bears and elk, but many feared that ecosystem management would lead to increased government control of private lands and would negatively impact the region's economy. Of particular interest, Reading et al. (1994) found no differences between hunters and non-hunters on a ecosystem management attitude scale or ecological knowledge scale. However, hunters were significantly more utilitarian and libertarian in their attitudes than non-hunters. Reading et al. (1994) also found members of conservation or wildlife organizations ⁸ (e.g., World Wildlife Fund) were significantly more knowledgeable and supportive of ecosystem management than non-members. Finally, several demographic variables were related to attitudes toward ecosystem management. Young, female, high income, and well educated respondents

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The authors did not specify whether hunters and environmental organization members were treated as mutually exclusive groups.

were more likely to endorse ecosystem level management for the Greater Yellowstone Ecosystem.

Jacobson and Marynowski (1997) reported results of an ecosystem management attitude study that had three similarities to this study of Southern Michigan. One, Jacobson and Marynowski (1997), like Reading et al. (1994), assessed public attitudes toward ecosystem management in a specific place: in their case, Florida's Eglin Air Force Base. Second, Jacobson and Marynowski investigated attitudes of both consumptive and nonconsumptive users who recreate on Eglin's 110,000 ha complex. Three, respondent attitudes toward ecosystem management were measured using items that a) addressed specific management objectives on a 5 point Likert scale (ranging from strongly disagree to strongly agree options) and b) implied trade-offs in the production of benefits. Ecosystem management items from the Florida study are listed in Table 3.

The Jacobson and Marynowski study also differs from my research in several important respects. First of all, the authors offer no theoretical framework for their operationalization of ecosystem management. Ecosystem management was one of four

Table 3. Measurement items used by Jacobson and Marynowski (1997) to measure public attitudes toward ecosystem management in Florida.

Ecosystem management attitude scale items (5 point Likert scale: strongly agree to strongly disagree)

- •Eglin managers should have a broader focus than game animals alone.
- •Eglin managers should focus on whole forest ecosystems rather than specific species.
- •Recreational impacts to Eglin's native plants and animals should be limited.
- •Eglin mangers should have a broader focus than the conservation on native pine forests alone.

attitude areas surveyed by the authors. The three others included attitudes toward 1) native and endangered species; 2) fire ecology; and 3) forest resources. These four content areas are not mutually exclusive. The latter three are all to some extent subsets of ecosystem management.

The second problem lies in the items purported to measure the four attitude constructs. The authors do not specify whether the items were developed for each scale a priori or whether they were grouped via the subsequent use of factor analysis. A visual inspection of the items (see Table 2) suggests the latter approach was taken. For example, the item "Eglin is important in the southeast for native plants and animals" is reported under the fire ecology composite. Intuitively, one would expect such an item to load on the native and endangered species attitude scale. More problematic is the inclusion of the item: "The number of people allowed to use Eglin should be limited" with the native and endangered species composite score, despite no substantive reason for doing so. Further analysis of the scales is not possible because the authors fail to report either the factor loadings of each item from the factor analysis or reliability tests done on composite scale scores. In short, given the lack of rigor in the measurement of attitudes, the following interpretation of their results must be viewed with caution.

Jacobson and Marynowski surveyed both residents surrounding Eglin Field and recreational users including hunters, anglers, hikers, canoeists, bicyclists and wildlife viewers. Results were reported for hunters, anglers, and general recreationists (i.e., nonconsumptive users), but it is unclear how the authors may have handled dual users (those who participated in both consumptive and nonconsumptive activities.) In addition

to the attitude measures discussed previously, knowledge levels were also assessed using ten true-false items covering natural history features of the plant and animal communities found at Eglin.

Overall, attitudes toward ecosystem management were found to be neutral to slightly positive. Mean scores (on a scale of 1 to 5 where 5 was very supportive) for nonconsumptive users (3.6), anglers (3.4), and hunters (3.0) exhibited significant differences on the ecosystem management composite (F=17.69, p=.0000). Highly educated, higher income, and urban respondents expressed higher levels of support for ecosystem management, replicating the findings of Reading et al. (1994) in the GYE.

Significant differences were also found between hunters and nonconsumptive recreationists on two other attitude composites as well. Nonconsumptive recreationists (3.3) were slightly more positive than hunters (3.2) in their attitudes about endangered species (F=4.55, p=.01). Hunters were substantially more positive in their attitudes toward fire ecology than the more neutral nonconsumptive users. Hunters averaged 3.5 compared to 3.2 for nonconsumptive users (F=3.91, p=.02). No significant differences were found between recreational users in their attitudes toward forest resources.

While not addressing ecosystem management per se, some other recent attitude studies have implications for the kinds of ecological objectives that are part and parcel of ecosystem management. Belden and Russenello (1996) conducted a nationwide study on behalf of the Nature Conservancy to assess public values for biodiversity. They found that only 20 % of Americans had even heard of the term, and fewer yet knew what it meant.

Once biodiversity was defined for them, three quarters of the respondents expressed broad

support for its conservation. However, that support was cut almost in half when costs such as economic development were introduced. Most relevant for this study is that a cluster analysis of the sample indicated that a group dominated by hunters (referred to as "Disconnected sportsmen") were least supportive of biodiversity conservation, especially when it threatened private property rights. This private property backlash against environmental protection has also been noted in other national surveys (Times-Mirror 1995).

In a regional study of attitudes toward salmon restoration, Smith et al. (1997) found that Oregon coastal residents placed more importance on production of salmon than on genetic variation in the salmon stocks. In other words, most residents did not make the connection between hatcheries and the decline of wild fish, and viewed salmon production as more important than genetic integrity. These results are similar to a study of Lake Michigan anglers who preferred higher numbers of available fish over fewer, but wild strains of salmonids (Peyton 1990).

Furthermore, most residents identified the need to reduce predators (such as marine mammals and cormorants) as an important salmon restoration strategy (Smith et al. 1997). The predator reduction strategy was supported more than improving forest or agricultural management practices or reducing the negative effects of hatchery raised fish. These findings along with the Belden and Russenello (1996) study suggest that while the public may express support for benefits like biodiversity or restoration in principle, many people remain focused on, and in fact opt for, narrow preferences like single species or economic development over broader ecological objectives.

State Game Area Users

In 1993 a longitudinal study to develop user profiles of state game area recreationists was initiated in Southern Michigan. The study was scuttled after two years due to some methodological problems with data collection, which involved year long site intercept interviews (Maureen McDonough, Dept. of Forestry, pers. comm.).

Consequently the results of the study must be interpreted cautiously (McDonough 1995).

Nonetheless, the findings suggest some potential implications for the current study.

Five state game areas were selected for the study, including the Shiawassee River State Game Area. The two most common activities reported on the five areas were hunting (46 % of all use) and fishing (14.1 %). Activities like birdwatching, nature study and cross country skiing were reported by very few of the respondents. Seven in ten users in the sample pool reported having hunted on the area where they were contacted at least once during the course of that year (McDonough 1995).

The reader needs to bear in mind that the reported results were not segmented by type of user, and were heavily weighted toward hunters. The survey included numerous questions about wildlife management practices on the state game areas. Most notably, there was strong support for traditional game species management practices. Overall, a majority of respondents felt the following practices were important: maintaining wildlife food plots (92%), regulating water levels for waterfowl (84%), emphasizing game species over nongame species (66%), and timber harvesting (58%). Only 45% felt it was important to create wildlife travel corridors or use fire as a management tool (McDonough 1995).

When asked about benefits that state game areas provide, "conserving natural areas for future generations" (82%) and "protecting water quality" (81%) were the top rated responses. The number of people who thought that "providing hunting opportunities" and "protecting rare/endangered species" were important benefits was approximately equal (65 %). Fewer respondents thought that providing scenic beauty (55%), nature study (39%), providing recreational variety (37 %) or enhancing local tourism (32 %) were important benefits (McDonough 1995).

Summary

The preceding section offered an overview of research findings that suggest a basis for developing hypotheses to guide investigation of relative values stakeholders may hold for benefits described in the three dimensional, conceptual model. Overall, it is clear that no previous studies have conceptualized or operationalized public ecosystem values in manner congruent with this study. Most notably is that stewardship has thus far been poorly defined and no studies have explored its relationship to other preference based or assigned values. The implication of the research that was reviewed above is that stakeholders are likely to place at least some importance on multiple benefits, but may have a top priority. The results of this literature review was used in conjunction with focus group findings from preliminary stages of this research to design the research question and associated hypotheses presented below.

Research questions & hypotheses

Question #1: Do the measurement items form reliable and valid measures of the theoretical ecosystem values constructs?

Hypothesis, 1-8: Measurement hypotheses⁹.

Question #2: What are the absolute and relative value priorities for exclusive stakeholder groups (hunters, birders, and Sierra Club members) and how do they differ?

Hypothesis, 9: Consumptive recreation will be the highest rated ecosystem benefit for pure hunters.

Rationale for H. 9:

Past research has demonstrated that hunters are motivated by a variety of social, environmental, and achievement goals and that segments can differ in the priorities they place on those goals (Decker and Connelly 1989; Ringlemann 1997). However, it seems logical that hunters would place the highest value on consumptive recreation since that value is part and parcel of the activity that defines them as a sub-culture of society. Focus group results also support this hypothesis

Hypothesis, 10: Nature appreciation will be the highest rated ecosystem benefit for Audubon members.

Rationale for H.10:

McFarlane (1994) found support for this hypothesis in her study of the motivations of Alberta birdwatchers. Kellert (1985) also found aesthetic appreciation of birds as a primary motivation for birders in the U.S. Focus group results also support this hypothesis that birdwatchers place a highest value on the opportunity to observe and study birds and other wildlife. It is plausible that birders may have an equally high value for ecological dependence given the fact that they tend to have a higher degree of ecological understanding (Kellert 1985) than many other wildlife recreation groups.

Hypothesis_a 11: Ecological dependence will be the highest rated ecosystem benefit for SC members.

Rationale for H. 11:

This hypothesis is based on the assumption that many people who join environmental organizations are motivated by the cause (perceived need to protect the environment) rather than interests in any direct recreational experience with

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Hypotheses 1-7 were excluded to avoid redundancy. Each posits that items used to measure the six ecosystem values and the stewardship value are reliable indicators. Hypothesis, 8 states the items are valid indicators of the seven constructs.

wildlife or nature. Since environmental organization members typically receive negative information about the state of the environment from organization newsletter and magazines, one would expect their ecological dependence value to be reinforced through these communication channels. Once again, focus group result suggest environmental organization members value ecological dependence over nature related recreation values (consumptive, appreciative, or play space).

Hypothesis, 12: Hunters will place less importance on ecological dependence benefits than will Audubon members and SC members.

Rationale for H. 12:

Hunters typically have lower ecological knowledge levels than the other two groups (Kellert 1980). Since ecological dependence value is dependent on possessing and understanding certain beliefs about the constraints of natural systems for human well-being, I suspect most hunters are deficient in their understanding of this dependence.

Hypothesis_a 13: Hunters will place more importance on the consumptive recreation and exploitive benefits than either birders or SC members.

Rationale for H. 13:

The fact that hunters should have a higher value for consumptive recreation than those who don't hunt is obvious. Several studies have demonstrated that hunters possess a greater tendency toward utilitarian or economic uses of nature than do other groups (Vining and Ebero 1991, Reading and Kellert 1993). This likely stems in part from the higher likelihood for hunters to live in rural or resource dependent communities than other stakeholders (Times-Mirror 1994, Belden and Russenello 1996).

- Hypothesis_a 14: SC members will have the highest mean scores for ecological dependence benefits of all stakeholder groups.
- Hypothesis_a 15: SC members will score higher on the stewardship value than other stakeholder group.

Rationale for H. 14 and H. 15:

Sierra club members will place a higher value for stewardship than other groups because it is the value domain that defines who they are. While other groups (e.g., bird watchers) may also rate highly on this value, their recreational self-interest will be their primary value priority.

Question #4: Do the priorities placed on ecosystem benefits differ within or between stakeholders based on any of the following factors: site-use, hunting preferences, or recreation participation patterns.

Hypothesis_a 16: The greater the number of nonconsumptive wildlife recreations that hunters participate in, the higher the value they will place on existence, ecological dependence, and nature appreciation benefits.

Rationale for H_a 16: While it seems obvious that nature appreciation values would be positively related to the number of nonconsumptive recreations one participates in, multiple activities should also indicate a broader understanding the importance placed on ecosystems and wildlife.

Hypothesis_a 17: Consumptive recreation value of hunters will increase based on the number of types of hunting one participates in.

Rationale for H. 17:

This hypothesis is based on the assumption that breadth of hunting types can be taken as sort of a rough surrogate for hunting importance. In other words, individuals who participate in many types of hunting during the course of a year ought to be more committed to the sport of hunting than someone who only does one type of hunting. If this is true, one would expect these more committed hunters to place a higher value on managing ecosystems for consumptive benefits than more casual hunters. Caution is advised with this hypothesis because it is plausible that a small number of species-specialists hunters (e.g., waterfowl-only hunters) may be highly committed (Ditton et al. 1992) even though they only do one type of hunting.

Hypothesis, 18: Waterfowl hunters (as defined by favorite type of hunting) will have higher ecological dependence and nature appreciation values than do gun-deer hunters.

Rationale for H. 18:

This hypothesis arises from results of focus groups held in the preliminary stages of this research. The specialized nature of waterfowl hunting suggests that participants may have a more refined sense of ecological communities because of their need to identify more select habitats in order to be successful than do deer hunters whose prey is a wide ranging generalist. In other words, waterfowlers tend to be more plugged into the natural environment and this awareness should lead to a greater value placed upon natural settings and processes.

Hypothesis_a 19: Participation in nature study as a favorite activity will be positively related to both nature appreciation and ecological dependence for both hunters and non-hunters.

Rationale for H. 19:

Nature study as recreation suggests that participants either bring to the activity or develop some degree of environmental sensitivity and environmental knowledge. This awareness ought to be associated with a greater value for healthy functioning ecosystems (Hines et al. 1987).

Hypothesis_a 20: The ecological dependence and existence values will be higher for environmental organization members than for nonconsumptive nonmembers.

Rationale for H_a 20: The basis for this hypothesis lies in the underlying motivations for inclusion into the two stakeholder groups. Nonconsumptive nonmembers are defined based on recreational activity that may or may not include environmental awareness or concern. We would environmental organization members to be an indicator of stronger ecosystem values.

Hypothesis, 21: Birders who belong to environmental organization will have higher ecological dependence, nature appreciation, and existence values than will non-organization birders.

Rationale for H₂ 21: Kellert (1985) found that participation in birdwatching was partially a function of personal fascination with birds. McFarlane (1994) found specialized bird watchers to be especially focused on achievement aspects of the activity, and less concerned with conservation motivations. This hypothesis suggests that while nonmember birders may possess strong nonuse related values, those birders who are also environmental organization members should place a higher priority on these categories.

Hypothesis_a 22: There will be no difference in the priorities placed on the valued ecosystem benefits by study site users and nonusers among both hunters or non-hunters.

Rationale for H. 22:

While one might expect differences to exist toward specific attitudes and values of on and off site users in some local area, measuring fundamental values within any select population (e.g., hunters) ought to yield similar results (Ajzen and Fishbein 1977).

Question # 5: How do stakeholders differ in their perceptions about current ecosystem attributes in Southern Michigan?

Hypothesis, 23: Hunters will perceive fewer deer, waterfowl, and places to go hunting than will non-hunters.

Rationale for H. 23:

Hunter evaluation of the current amount of these attributes will be influenced as much by their desire for those attributes as by their objective opinion about actual amounts.

Hypothesis_a 24: Audubon and SC members will perceive less than adequate levels (i.e., "too few exist") of songbirds, frogs and amphibians and wildlife diversity than hunters and non-member, non-hunters.

Rationale for H. 24:

Environmental organization members are more likely to be influenced by information rather their own experience and evaluation of current conditions. Therefore they will likely rate songbirds, frogs, and diversity as lacking due to recent publicity about the decline of those attributes that have appeared in the media and in organization communications.

Hypothesis, 25: Waterfowl hunters will perceive fewer ducks than will deer hunters; and deer hunters will perceive fewer deer than will waterfowl hunters.

Rationale for H. 25:

Similar to the rationale in support of hypothesis 23, specific types of hunters will likely advocate for own self interest. Those who specialize in specific recreations are likely to demand more of those resource specific attributes that drew them into the activity (Ditton et al 1992).

Hypothesis_a 26: Public land hunters will perceive fewer places to hunt, fewer deer and fewer ducks than will non-public land hunters.

Rationale for H_a 26: Assuming that selection and use of a hunting area is partially a function of access and availability, hunters who use public lands regularly probably do so because they have few or no options to hunt private lands. Since public land hunters are also more likely to experience crowding than hunters on private lands, they will be more sensitive to competition for hunting opportunities including the types of game species sought.

Hypothesis, 27: There will be no perceived differences in abundance levels of all wildlife attributes among non-hunters who visit public lands and those who do not.

Rationale for H_a 27: Since nonconsumptive users tend to be less focused on specific attributes (with the exception of specialist who may wish to observe or study certain species), use of a particular area is less likely to affect their evaluation of conditions (Martin 1997).

Question #6: What factors are related to support for the "ecosystem management" options presented in the hypothetical trade-off scenarios?

Hypothesis_a 28: Hunters will be less supportive of ecosystem management options in the tradeoffs than non-hunters.

Rationale for H. 28:

Ecosystem management studies done in other geographic locations have shown that hunters tend to be neutral to moderately negative in their attitudes toward "ecosystem management" expressed at a broad conceptual level (Reading et. al. 1994) or as a set of concrete strategies (Reading and Kellert 1993, Jabcobson and Marynowski 1997).

Hypothesis, 29: SC members will be more supportive of ecosystem management options than either of the other exclusive stakeholder groups.

Rationale for H. 29:

It is likely that environmentalists would be most supportive of management that shifts its focus to producing benefits within a framework of long term sustainability of ecosystems.

Hypothesis_a 30: Hunters who use the study site public lands will be less supportive of ecosystem management than other hunters.

Rationale for H₂ 30: Implementation of ecosystem management poses the most risks to the current users of the study site areas. Therefore it stands to reason that those users would be most wary of changes from the status quo, especially if the benefits to them are unclear.

Hypothesis_a 31: Most of the nonhunting, non-organization member respondents will be undecided about (most) ecosystem management trade-off options.

Rationale for H. 31:

It is likely that most people will be largely unfamiliar and perhaps unprepared to evaluate complex trade-offs inherent in ecosystem management. Therefore, it is reasonable to expect a large portion of undecided opinions from users who have not had much opportunity to be exposed to communication about the goals of ecosystem management.

Hypothesis, 32: Support for ecosystem management trade-offs will be higher among urban residents, females, and college educated individuals for both hunters and non-hunters.

Rationale for H_a 32: This hypothesis is based on the assumption that those who people whop typically express the most environmental concern will be able to recognize ecosystem management as a means to achieving environmental health.

Question 7: Which factors best predict the presence of an individual's stewardship ethic?

- Hypothesis_a 33: (SEM Path model) Hunters' value for consumptive recreation will directly and positively influence their nature appreciation and ecological dependence values; nature appreciation will also directly and positively influence one's ecological dependence value; ecological dependence value will directly and positively influence stewardship(Figure 2).
- Hypothesis_a 34: (SEM Path model) Non-hunters' value for nature appreciation will directly and positively influence their ecological dependence values and existence values; their existence value and ecological dependence value will positively directly influence; ecological dependence value will directly and positively influence stewardship (Figure. 3)

Figure 2. A Hypothesized path model of hunter stewardship

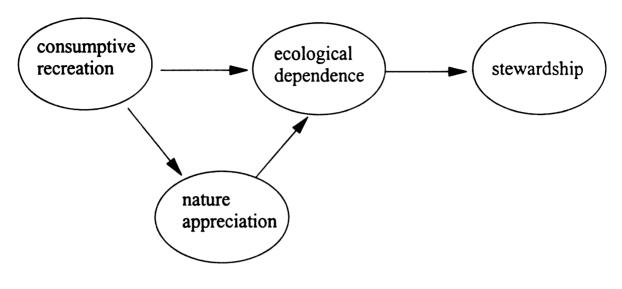
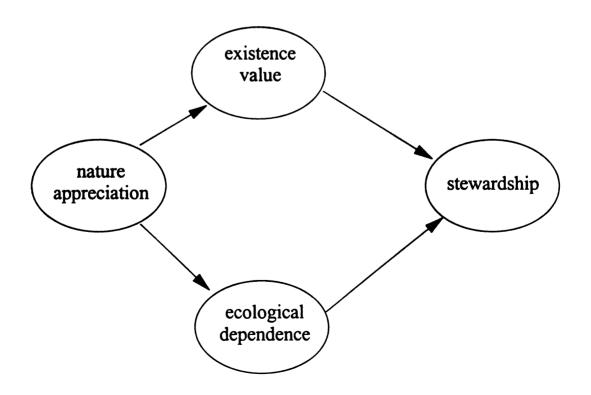


Figure 3. A hypothesized path model of non-hunter stewardship.



CHAPTER 3

METHODS

Study area

Stakeholder ecosystem values and their attitudes toward ecosystem management were investigated in a two-tier area of Mid-Michigan (Figure 4). The core area for this research corresponded with the MDNR Southern Michigan Ecosystem-Based Management study site that included Clinton, Gratiot, and Saginaw counties (indicated in dark shading on the map in Fig.4). Second tier counties immediately adjacent to the three county pilot study area comprise the expanded data collection area. These counties include Isabella, Bay, Midland, Tuscola, Genesee, Shiawassee, Ingham, Eaton, Ionia, and Montcalm.

The pilot ecosystem-based management area features three managed state game areas, a federal wildlife refuge, and extensive acreage of private, agricultural lands. The area was selected because it has three features that present unique opportunities to do ecosystem management in Southern Michigan. First, the physical proximity and linear configuration of the public lands in the area offer the potential to model the effects of changing landscape patterns. Second, the combination of state and federal ownership in the area presents opportunities for interagency cooperation and development of holistic management strategies. Third, the interspersion of private lands offers opportunities to pursue cooperative agreements with willing private landowners in the management area, including potential development of wildlife corridors. It is important to acknowledge that

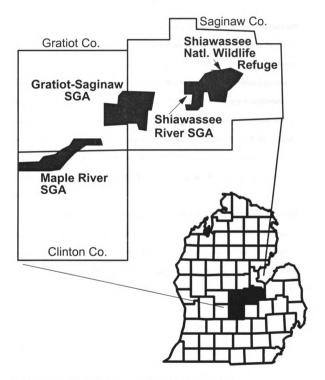


Figure 4. Ecosystem-based management core study area.

the pilot area lacks an important criterion of ecosystem management in that the boundaries are not ecologically based. Indeed, the pilot study area contains parts of two different subregions in Albert's (1995) classifications of ecoregions of the Midwest (Figure 5).

The Lansing sub-subsection (VI.4.1) covers all of Clinton county and a portion of Gratiot county. Albert (1995: p. 119) describes this area as "medium-textured ground moraine; beech-sugar maple forest, and hardwood swamp". Common pre-settlement vegetation included black maple, basswood, red oak, and ash. Swamp forest and wet meadows contained American elm, red ash, and swamp white oak. Most of the original forest has been converted to agriculture and pasture lands. One of the rarest plant communities in the state--the inland salt marsh occurs along the Maple River (Albert 1995).

The Saginaw Bay Lake Plain subsection (VI.6) is described as "glacial; lake plain and reworked till plain, mesic to wet-mesic forests, swamp forests, wet and wet-mesic prairie, and emergent marshes" (Albert 1995: p.127). Historically this area was quite diverse in its composition of coastal marshes and wet prairies. The wet prairies contained true prairie grasses like big blue stem, Indian grass, and cord grass. Many of these areas have been ditched and farmed. Upland conifer stands were dominated by white pine and eastern hemlock. Lowland conifer swamps characterized by tamarack were also common. Logging and agriculture have transformed the landscape. Numerous rare plants and animals can be found in what is left of original glacial plain marshes (Albert 1995).

The rationale for expanding the survey sampling area to 13 counties was to increase the likelihood of obtaining large enough sample sizes for certain stakeholders

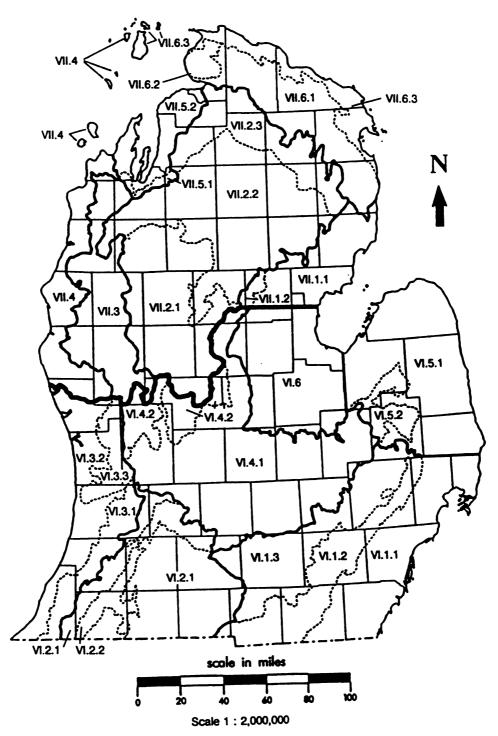


Figure 5. Ecoregion classifications for the lower penisula of Michigan from Albert (1995).

(e.g., bird watchers) that may be hard to capture in a three county range given available databases. The second reason for surveying a broader area is that many recreational users such as waterfowl hunters likely travel greater distance from home to pursue waterfowl hunting¹⁰ on the state game areas (Al Stewart, MDNR, pers. comm). Sampling in adjacent counties allowed me to test hypotheses related to differences between "resident" and "tourist" users of the recreation areas.

Research design

Data were collected using qualitative and quantitative methods. The Michigan State University Committee on Research Involving Human Subjects (UCRIHS) approved all methodology (Appendix A).

Agency input

During the initial year of this research, several workshops were held with MDNR staff members to obtain a practical set of ecosystem management objectives in the study area that could be incorporated into attitude measures on a mail questionnaire. These meetings included both on-site tours of each of the four public land areas with agency field biologists and facilitated planning meetings at MSU with field biologists and mid-level managers within the MDNR. During the latter meetings, a nominal group technique (Delbecq et al. 1975) was used to try to generate hypothetical ecosystem management opportunities (e.g., objectives) in the study area. Results of this process are summarized

¹⁰

A visual inspection of hunter addresses from 1996 daily hunting permits at Shiawassee River State Game Area confirmed a general pattern that a higher proportion of waterfowl hunters lived outside the 3 three counties than did deer hunters.

in Appendix B. Ultimately, the agency personnel had difficulty in articulating many concrete ecosystem management products or goals that could guide this research. In the absence of clear agency goals, the author developed some ecosystem management "trade-off" questions by adapting some of the ideas generated during these discussions that had a basis of support in the ecosystem management literature.

Pre-survey focus groups

Focus groups were also utilized to guide the development of the survey instrument. Focus groups provide a useful tool for obtaining qualitative data about the perceptions of a given population on some subject or topic of interest (Minnis et al. 1997). Focus groups are structured, facilitated group discussions that allow researchers to gain insights into the ways in which individuals relate to and think about concepts (Krueger 1994). We conducted focus groups with five different stakeholders: deer hunters, waterfowl hunters, bird watchers, environmentalists, and landowners adjacent to the study area SGAs.

Specifically, focus groups were conducted to achieve the following objectives:

- 1) Determine stakeholder perceptions about current environmental conditions and management practices on public and private lands within the study area.
- 2) Identify key criteria or variables that guide decisions for stakeholders in value trade-offs.
- 3) Evaluate stakeholder understanding of key terms (e.g., biodiversity) that may be used on the questionnaire.
- 4) Explore the use of hypothetical management scenarios as a vehicle for developing questionnaire items.

- 5) Identify stakeholder attitudes about ecosystem management when applied to their region.
- 6) Determine how stakeholders perceive their own degree of stewardship or obligation to support ecosystem management objectives.

Each group discussion was conducted by following a scripted set of questions (see Appendix C). Following the advice of Morgan (1996), ordering of questions varied among groups to take advantage of: 1) group differences in wildlife participation (e.g., bird watchers were not asked why they like hunting); 2) spontaneous development of issues or topics that were unique to a particular group; and 3) revised attempts to present participants with clear and meaningful definitions/goals of ecosystem management concept. Prior to discussion of ecosystem management with each group, a short explanation of biodiversity and ecosystem management was provided. For example, participants were told that biodiversity meant "the full variety of species in all the types and age classes of plant communities in which they occur". A simple handout was provided to emphasize that biodiversity exists at several levels including genetic, population, and community levels.

Meanwhile, ecosystem management was presented as a holistic management strategy that attempts to produce optimal levels of the following categories of benefits:

- biodiversity
- restoration
- self-sustaining, functioning systems
- reduced habitat fragmentation
- diverse human uses including recreational opportunities

Ecosystem management was contrasted with traditional management or single species

production, whereby managers attempt to produce or attract some maximum number of some species (e.g., game or endangered species). Ecosystem management applications that were tested in the focus groups were formulated from a synthesis of the current literature and through facilitated group discussions with Michigan DNR Wildlife Division Staff about possible approaches to future management. Focus group respondents were asked to react to trade-off scenarios where management decisions would favor one set of values over another. Participants were told that all questions were hypothetical and did not reflect actual management proposals for the state of Michigan or the pilot study area.

The analysis of focus group results guided the development of several hypotheses for this research and the selection of several variables for model testing. Most notably, initial plans to develop alternative, paired paragraphs that varied multiple attributes to present trade-offs were abandoned based on their poor performance during focus groups (Minnis et al. 1997). Instead trade-offs were simplified into discrete items that pitted two values against one another.

Pilot survey

A pilot survey (Appendix D) was mailed to a random sample of 200 people selected from the Lansing area phone book. The sample was drawn solely for convenience to allow for assessment of instrument reliability and validity, and not to infer any substantive meaning about public opinions. The results from the pilot survey were assessed for construct validity and item reliabilities for the variables measured with the instrument (see below for procedural details). Following statistical analysis of the pilot survey data, several measurement items were added, deleted, and modified to develop the

final instrument (Appendix E).

Questionnaire design

Measurement of variables

Likert scales were used for all of the value and attitude items on the questionnaire. Likert scales offer the primary advantage of being user friendly for survey respondents (Suskie 1992). There is some disagreement in psychometric theory about whether Likert scales produce ordinal or interval level data (Eagly and Chaiken 1993). This study assumes that data gathered is interval and that statistics used in the study are sufficiently robust to handle violations of this assumption (SPSS 1993).

Item ordering and scoring

The six ecosystem values were measured on a 5 point scale of importance using options of: "critically important" (4)¹¹, "very important" (3), "moderately important" (2), "slightly important" (1), and "unimportant" (0). An undecided option was also included to increase reliability (Converse and Presser 1986). Four of the ecosystem values were measured using four items each, existence value was measured using three items, and play space was measured with six items (Table 4).

Items for consumptive recreation, nature appreciation, existence, and economic extraction were intermixed to try to avoid "response sets" (Converse and Presser 1986).

These can occur when respondents fall into a pattern of answering based on the repetition of item ordering without fully considering each question.

¹¹

Numbers in the parenthesis following response options indicate the numerical value that the response was coded as in data entry and analysis.

Table 4. Standardized factor loadings and alpha reliabilities for ecosystem value scales.

Ecosystem Value Scale Items	Factor a loading	Cronbach's Alpha
Ecological dependence THAT ALL TYPES OF WILDLIFE & PLANTS BE RETAINED ON PUBLIC LANDS BECAUSE THEY MIGHT PLAY A ROLE IN MAINTAINING THE ENVIRONMENT THAT WE DEPEND ON IN SO. MICH?	0.87	0.93
That air & water quality in So. Mich. be improved to protect the health of the environment that you depend on $?$	0.83	
THAT PUBLIC LAND MANAGEMENT AVOID DISRUPTING ECOLOGICAL PROCESSES SUCH AS NUTRIENT CYCLING AND FOOD CHAINS IN CASE THEY ARE IMPORTANT FOR HUMAN SURVIVAL?	0.88	
THAT A DIVERSITY OF WILDLIFE AND ECOSYSTEMS BE MAINTAINED ON PUBLIC LANDS TO PROTECT THE HEALTH OF THE ENVIRONMENT IN SO. MICH ?	0.90	
Nature Appreciation That areas possessing natural and scenic beauty be maintained as places where people can go to relax and enjoy nature in So. Mich?	0.67	08.0
THAT PUBLIC LANDS IN SO. MICH. OFFER PLACES TO GO AND LEARN ABOUT NATURE?	0.77	
THAT THERE ARE OPPORTUNITIES TO WATCH & ENJOY WILDLIFE IN NATURAL SETTINGS ON PUBLIC LANDS IN SO. MICH., OTHER THAN DURING HUNTING?	0.77	
THAT HIKING TRAILS, VIEWING AREAS, OR SIMILAR ACCOMMODATIONS ARE PROVIDED TO ENHANCE OPPORTUNITIES TO SEE BIRDS, PLANTS , OR OTHER WILDLIFE IN SO. MICH. ?	0.64	
Extraction THAT PUBLIC LANDS ARE MANAGED TO PROMOTE GROWTH & ECONOMIC DEVELOPMENT OF SO. MICH. COMMUNITIES?	0.80	98.0
THAT MANAGEMENT OF OUR NATURAL RESOURCES ON PUBLIC LANDS IN SO. MICH. CREATES JOBS AND ECONOMIC OPPORTUNITIES ?	0.81	
THAT A MANAGEMENT PRIORITY OF OUR NATURAL RESOURCES ON PUBLIC LANDS IS TO ENHANCE THE ECONOMIC DEVELOPMENT OF LOCAL COMMUNITIES IN SO. MICH?	0.89	
THAT WE MAY UTILIZE ANY GAS AND MINERAL DEPOSITS FOUND ON PUBLIC LANDS FOR THEIR ECONOMIC POTENTIAL IN SO. MICHIGAN ?	0.61	

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Ecosystem Values Scale items	Factor Loading	Cronbach's Alpha
Consumptive Recreation THAT PUBLIC LANDS OFFER ACCESS TO RECREATIONAL HUNTING IN SO. MICH?	0.92	0.95
THAT THERE ARE OPPORTUNITIES TO HUNT A VARIETY OF WILDLIFE IN SO. MICH?	96.0	
THAT POPULATIONS OF GAME SPECIES (E.G., DEER AND WATERFOWL) BE MANAGED TO ENHANCE HUNTING OPPORTUNITIES ON PUBLIC LANDS IN SO. MICH. ?	0.91	
Existence Value TO KNOW THAT WILDLIFE AND PLANT COMMUNITIES THAT HAVE HISTORICALLY BEEN PART OF SO. MICH, 'S LANDSCAPE BE MAINTAINED OR RESTORED EVEN IF YOU NEVER VISIT THEM?	0.79	0.81
TO KNOW THAT WILDLIFE SPECIES ARE BEING MAINTAINED ON PUBLIC LANDS IN SO. MICH. WHETHER OR NOT YOU EVER USE OR SEE THEM?	0.79	
TO KNOW THAT THERE ARE PUBLIC LANDS IN SO. MICH. WHERE NATURE STILL FUNCTIONS "RELATIVELY FREE" OF HUMAN INFLUENCE WHETHER OR NOT YOU VISIT THEM?	0.79	
Play Space THAT PUBLIC LANDS IN SO MICH. PROVIDE OPPORTUNITIES OR ACCESS FOR <u>SNOWMOBILING</u> ?	98.0	0.85
THAT PUBLIC LANDS IN SO MICH. PROVIDE OPPORTUNITIES OR ACCESS FOR <u>RIDING ORV'S</u> ?	0.87	
THAT PUBLIC LANDS IN SO MICH. PROVIDE OPPORTUNITIES OR ACCESS FOR <u>RIDING JET SKIS</u> ?	08.0	
THAT PUBLIC LANDS IN SO MICH. PROVIDE OPPORTUNITIES OR ACCESS FOR <u>BOATING</u> ?	0.59	
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* Factor loadings are the standardized solution of maximum likelihood estimates in confirmatory factor analysis (LISREL 8).

The four items measuring ecological dependence had to be blocked because they were preceded by a belief question regarding ecological dependence that served as a filter question. I reasoned that valuing ecosystems for survival was dependent on holding the belief that human survival is in fact tied to a healthy environment. Therefore, respondents were asked to what extent they agree or disagree with the following statement: "Unless a sufficient level of environmental quality is maintained in Southern Michigan, our own existence as individuals and as a society will be jeopardized". Those respondents who disagreed with this item were directed to skip the four eco-dependence items and were assigned a score of zero for each of those items. The six items measuring play space were also blocked for purposes of saving space in layout and design.

The questionnaire also included items to measure other three other constructs which were believed to be important influences on one's acceptance of ecosystem management goals and strategies. *Ecosystem stewardship*, *DNR credibility*, and *perceived anti-hunting threat* were all measured on five point Likert scales with these response options: "strongly agree" (+2); "agree" (+1); "undecided" (0); "disagree" (-1); and "strongly disagree" (-2). Stewardship and credibility were measured with four items each, with one item negatively phrased and reverse coded. Perceived anti-hunting threat was measured with three items and only hunters were asked to respond to these items.

Attitude toward ecosystem management was measured through a series of nine questions relating to hypothetical management trade-offs on the public lands in the study area. A map was provided for the respondents who were asked to consider the questions in the context of the area depicted. These items were the only ones on the questionnaire

management questions utilized the same responses as described above. Agreement with the "ecosystem management option" presented in each trade-off was coded as a favorable (positive attitude) response. The underlined portion of the items in Table 5 indicates the preferred ecosystem management goal within each choice underlined. Four of these items (#42,43,45 & 48) were worded negatively and reverse coded.

Table 5. Questionnaire items (Appendix E) depicting ecosystem management value trade-offs.

Maintain biodiversity throughout the area, even if it means lowering the population sizes of some common species of wildlife living there.

<u>Set aside some forested areas for 100 years</u> even though opportunities for economic benefits from logging are passed up in the short term.

Always maintain game species at high population levels rather than allowing <u>populations</u> to go through <u>natural fluctuations</u>.

Manage ecosystems to meet specific public demands for wildlife recreation and scenic beauty even if it curtails ecosystem processes and functions.

<u>Sustain ecosystem processes</u> (e.g., nutrient cycling, soil conservation, and groundwater recharge), even if it means providing fewer opportunities for wildlife recreation.

Enhance existing ecosystems for wildlife rather than <u>restore ecosystem types that have been lost or degraded</u>.

Divert efforts from game species management to focus more on non-game species of wildlife.

Introduce plants from other countries that provide good food for wildlife species even if the introduced plants eliminate native plant types.

To assess an individual's overall ecosystem management attitude, a scale was created by collapsing the agree and strongly agree responses and assigning them a value of one (+1). The disagree and strongly disagree responses were collapsed and assigned a value of negative on (-1). Undecided were left at zero (0). Each person's ecosystem

management score became the sum of the collapsed responses to the nine items. The respondents were then sorted into three categories based on percentile scores of this distribution. The lowest 25 % of respondents were given a categorical value of one (1.0) indicating "low ecosystem management support". The middle 50 % of the responses were assigned a value of two (2.0)-- "medium ecosystem management support". Finally, the highest 25 % of the scores were assigned a value of three (3.0), indicating "high ecosystem management support".

Reliability and validity of values model.

Cronbach's alpha scores were used to assess the scale reliabilities for each of the six ecosystem values measured, and for "stewardship", "MDNR credibility", "perceived anti-hunting threat", and "attitude toward ecosystem management". By convention, Cronbach alpha's of 0.7 or greater were considered sufficiently reliable (Cortina 1993).

Confirmatory factor analysis (CFA) was performed using LISREL 8.0 ® to test measurement hypotheses related to validity of the measurement items for each of the variables in the hypothesized causal model and for each of the six hypothesized valued ecosystem benefits. Internal consistency and parallelism tests in CFA allow one to infer that variables of interest are unidimensional and sufficiently exclusive of one another. Both of these characteristics are evident that construct validity has been achieved (Boster, MSU, Dept. of Comm., pers comm.)

Scale scores were created for the latent variables described above. In the case of the six ecosystem values, scale scores represent the respondents's average score across all items in the scale. Averages were used rather than a summative score because the six

scales differed in the number of items used and several hypotheses required direct comparison of the relative importance of these values to each other. In contrast, scale scores for stewardship and the other attitude scales were developed by summing across item measures.

The questionnaire also posed a series of questions targeting attitudes about current levels of several ecosystem attributes in Southern Michigan. Attributes fell into three categories: ecosystem types, wildlife and recreational opportunities. Five point Likert scales offered the following response options: "far too many" (+2¹²); "slightly too many" (+1); "about the right amount" (0); "slightly too few" (-1); "far too few" (-2); and "no opinion" (treated as missing data). Variables involving participation in outdoor recreation, site visits, organization membership and demographic questions were posed as yes/no and check-off questions.

Total design method

Final surveys were administered using Dillman's (1978) total design method where the initial mailing is followed by a post card reminder and a second survey is mailed to nonrespondents. Surveys were mailed using first class postage and included a cover letter (Appendix F) and prepaid business return envelope. Nonrespondents were mailed an abridged 2 page questionnaire to assess non-response bias (Appendix G).

Sample selection

In the summer of 1997, surveys were mailed to four separate sample groups based

¹²

The direction of sign for the value of the response was assigned positive to indicate a surplus, and negative values to indicate a deficit.

on a priori interest in measuring the values and attitudes of certain stakeholders: deer hunters, waterfowl hunters, bird watchers, and members of environmental organizations. The same survey instrument was also mailed to a sample of the "general public" in the summer of 1998. Each of the five survey groups was generated from random samples from their respective sampling sources. Lists were pooled and sorted by last name to identify duplications and those were removed. The rationale and limitations of each of the five sample sources is discussed below.

Deer hunters

The names of 592 deer hunters were randomly selected from the MDNR database of 1996 resident hunters--both archery and gun--who completed hunter kill surveys and indicated that they hunted in Clinton, Gratiot, or Saginaw counties in 1996. Deer hunters were chosen from counties in the core study area to maximize the likelihood of capturing respondents who hunted on one or more of the state game areas. The sample was stratified 50/50 among archery and gun hunters to provide adequate sample sizes of archers.

Waterfowl hunters.

Name (n=605) were selected from records of the Michigan's point-of-sale license terminals of persons who purchased state waterfowl hunting stamps in 1996 and also resided in one of the 13 study counties. Names were drawn from the records in this

¹³

Though the term "general public" is used as a label of convenience, the author sides with the view of Witter (1990) that as a stakeholder group, the "general public" only becomes meaningful when it is segmented along some practical basis.

expanded area based on the observation by area managers that waterfowl hunters were more likely to travel farther to hunt in the state game areas than were deer hunters (Arnie Karr, Al Stewart, MDNR, pers. comm.).

Michigan Audubon Society members.

The names of 614 subjects were selected from Michigan Audubon Society members living within the 13 county area. Though all members of Audubon Society are not active bird watchers, it was assumed that sampling from this organization was the most efficient way to reach people with an interest in bird watching, short of doing field intercept interviews which were deemed to be cost and time prohibitive. The selection of organization members posed some potential limitations for this study in that these individuals may differ from non-member birdwatchers. An assessment of this limitation was made by comparing Audubon birdwatchers to nonmember birders who responded in the 1998 general public survey. These results are discussed subsequently.

Sierra Club members.

A random sample of 495 Sierra Club members living in the expanded 13 county area was selected from membership lists of the Michigan Chapter of the Sierra Club.

There were pragmatic reasons for selecting the Sierra Club for this study, though this organization can not be said to be representative of "all" environmentalists or environmental organizations. One practical reason for choosing the Sierra Club over other alternatives was that their centralized membership list represented the most complete and accessible database of all the potential environmental organizations queried for participation in this study. Another reason for their inclusion in this study is their

increasingly active role and interest in shaping forest and wildlife management policies in the state of Michigan (see Woiwode 1994, 1998).

General public

This sample was derived by randomly selecting 1,000 names that were purchased from the Michigan Department of Motor Vehicle's driver license database. The sample frame was drawn from drivers 18 or older living in Saginaw, Gratiot, or Clinton counties. The use of licensed drivers as a sampling source is an imperfect representation of all Southern Michigan citizens. However, the source was deemed more desirable than purchasing addresses from a commercial vendor ¹⁴ due to potential problems with gender bias and out of date addresses. Interest in sampling from the general public arose for three reasons. 1) It was hoped that an adequate response would yield a sizable group of "non-involved" stakeholders (e.g., nonmember, nonusers) for value and attitude comparisons.

2) Response from hunters and birders would allow for comparisons between sample frame and sampling tiers to increase confidence in measurement reliability. 3) If the percentage of respondents had been large enough, then attempts to identify cluster segments within the general population would have been pursued. The latter opportunity was abandoned due to a poor response from this sample survey.

Data analysis

Usable surveys were entered in a spreadsheet for analysis on SPSS 6.1 ® for

¹⁴

E.g., Survey Sampling, Inc. of Connecticut. Address lists available from commercial vendors are drawn from telephone directories which typically list males as head of household.

Windows. Every twentieth survey was rechecked for key-stroke errors and corrections were made when errors were discovered. The keystroke error rate of 0.04 % was calculated and determined to be sufficiently negligible on the outcome of data analysis.

Because many of the univariate histograms indicated that the data was not normally distributed, nonparametric statistics were employed to test a variety of hypotheses related to value and attitude profiles for discrete groups of interest. Alpha levels for significance testing were set at 0.05 for all statistical tests. Casewise deletion was used for missing data when performing univariate, descriptive statistics. Listwise deletion was used for missing data for model testing in LISREL 8.0 ®. Hypotheses regarding significant mean differences between key stakeholders utilized independent sample t-tests for comparing two groups and one way analysis of variance (ANOVA) for comparisons among two or more groups. In the latter instance, Sheffe's post-hoc comparison test was used to identify where the significant difference(s) had occurred.

All ANOVAs run to test for group differences included Levene's test to check for violations of the homogeneity of variance assumption--or that the variances of each groups were equal. In most cases this assumption was satisfied, but there were a few cases where violations occurred. These type of violations can be expected when dealing with non-normally distributed data as was the case for many of variables in this study (SPSS 1993).

Hypothesis testing involving bivariate relationships utilized cross tabulations and Pearson's Chi-square as the statistic to test for significance. Hypotheses testing of the effects of simple multi-variate models of influence utilized multiple regression and the

results include both significant model values (F-test) and significant single variable results (t-test).

Structural Equation Modeling (SEM)

Theoretical models examining the effects of selected ecosystem values and attitudes on the presence of ecosystem stewardship were tested using structural equation modeling (SEM) in LISREL 8.0 ®. Structural equation modeling, also referred to as covariance structure analysis, has emerged as a promising methodological advancement in the testing of hypotheses positing causal relationships among latent variables. Recent examples of the use of SEM in human dimensions research include Fulton et al. (1996), Bright and Manfredo (1996), and Minnis (1996).

SEM subsumes several statistical methods including multiple linear regression, path analysis, and factor analysis into one package (Fassinger 1987, Bollen 1989, Jöreskog and Sörbom 1996). In doing so, structural equation modeling allows a researcher to simultaneously test the fit of a linear model that posits a set of causal relationships among a set of unobserved (latent) variables and also the fit of a measurement model of indicator variables and the latent constructs they purport to measure (Fassinger 1987). This flexibility allows separate inspection of each component of a full SEM and enables the researcher to diagnose both measurement and theoretical shortcomings.

Full SEM's incorporate the error terms present in measured in assessing the fit of the global and measurement models. This feature presents an improvement over previous psychometric techniques such as multiple regression by testing the strength of theoretical relationships as if the variables of interest were measured perfectly (Bollen 1989).

How stakeholders are defined.

Wildlife-related, nonconsumptive recreations were defined to be birdwatching, nature study, wildlife feeding, and photography. These four activities loaded together in an exploratory factor analysis of the outdoor recreations included on the questionnaire (Table 6). The presence of two apparent play-space factors--machine based and fresh air-add additional support to the earlier decisions to drop cross country skiing and biking from the measurement model¹⁵.

Table 6. Exploratory factor analysis of recreation patterns.

		Na	me of rec	reational facto	or		
FRESH	AIR	TRADIT	IONAL	APPRECL	ATIVE	MACHI	NE
activity	factor loading	activity	factor loading	activity	factor loading	activity	factor loading
backpacking	.68	fishing	.53	birding	.78	ORV riding	.72
CC skiing	.57	hunting	.54	photography	.55	snowmobiling	.73
biking	.60	trapping	.60	nature study	.69	boating	.64
hiking .70 picking .52 feeding .71							
canoeing	.59						

¹⁵

The factor analysis of outdoor recreations is discussed only as a basis for establishing which recreations to classify as "nonconsumptive-wildlife-related". However, the emergence of two potential play space factors will be discussed in the final chapter.

Membership in stakeholder groups was determined by responses to questionnaires rather than by origin of sample frame. Depending on the research question and associated hypotheses, several stakeholder segmentations were used in data analysis. The simplest segmentation into hunters and non-hunters was done by splitting the pooled samples based on their response to item number #54 (Appendix E), "Are you a hunter?". All refinements of stakeholder segments retain this fundamental split.

The delineation of the five major, mutually exclusive stakeholder types are as presented in Figure 6, which will be repeated throughout the remainder of the dissertation for the readers' convenience. Those respondents who belonged to more than one category were eliminated from the all analysis related to attitude and value differences.

Figure 6. Definitions of major stakeholder segments used in the study. **pure hunters**: hunters who did not check any of the four nonconsumptive wildlife recreations¹⁶ as one their favorite types of outdoor recreation (1997 survey).

<u>dual use hunters</u>: hunters who checked one or more of the nonconsumptive wildlife recreations as a favorite (1997 survey)

<u>Audubon members</u>: non-hunters who belonged to Audubon Society, but not the Sierra Club (1997 survey)

<u>Sierra club members</u>: non-hunters who belonged to Sierra Club, but not the Audubon Society (1997 survey)

nonconsumptive wildlife users: includes all those who checked at least one type of nonconsumptive wildlife recreation as a favorite, are not hunters, and are not members of any environmental organization (1998 survey)

[,]

Nonconsumptive wildlife recreations were considered bird watching, wildlife feeding, photography and nature study. These were determined through results of exploratory factor analysis of 14 types of outdoor recreations.

Evaluation of construct validity and item reliability (Measurement hypotheses)

A confirmatory factor analysis was performed using LISREL to test a six factor model of orthogonal, latent constructs as a means to establish the construct validity of six ecosystem values hypothesized in the 3-D values framework. Maximum likelihood estimation procedures were employed to generate path coefficients between each observed indicator and the associated latent construct from a covariance matrix of the 25 indicators purported to measure the six latent ecosystem values. The overall fit of the model was assessed using a Chi-square test and several other indices provided in the LISREL output, including the Goodness of Fit Index (GFI), Normed Fit Index (NFI), and Root Mean square residuals (RMSR). GFI is the ratio of the sum of squares accounted for in the model over the total sum of squares of the estimated population matrix. Values range from 0 to 1; the closer this ratio is to one, the better the fit of the model to the data (Fassinger 1987). Generally values in the 0.8 or 0.9 range are deemed as an adequate fit of the model (Jörsekog and Sörbom 1996). The NFI measures how well the model fits the data compared to a baseline model with no common factors among the observed variables. Again, this value ranges from 0 to 1.0 and is interpreted similarly to the GFI (Fulton et al. 1996). The RMSR is a measure of the overall error variance in fitting each parameter to the model and should be close to zero (Fassinger 1987).

The initial confirmatory factor analysis model produced a solution after seven iterations. The solution yielded a Chi-square of 2,504.09 with 261 df, (p=0.00). Since SEM tests the null hypothesis that the model fits the observed data, a significant Chi square is not desirable. However, chi-square values are influenced by sample size such

that it is almost assured that a significant test result will occur when the sample size of a model exceeds 500 (Bollen 1989). Given that the n=1517 for the CFA of ecosystem values, Chi-square alone is insufficient as a test of model. For example, the model produced a GFI of 0.87, a NFI of 0.90, and a RMSR of .08-- all indicators that a moderate fit was achieved.

Revisions to measurement scales for ecosystem values

A second ecosystem values CFA model was tested after dropping three indicators from the original model based on modifications indices suggested by the LISREL output.

These items were:

How important is it to you...

- •... that game fish populations be managed to enhance the fishing opportunities on public lands in So. Mich. ? (Consumptive Recreation Scale)
- •... that public lands in Southern Michigan provide opportunities or access for biking? (Play Space Scale)
- •.... that public lands in Southern Michigan provide opportunities or access for cross country skiing? (Play Space Scale)

The exclusion of these items from the model makes sense on theoretical grounds.

The first item¹⁷-- dealing with fishing-- may have caused problems in the pooled sample that included both hunters and non-hunters. Nonhunting anglers' responses to this item were likely inconsistent with their responses to the three other scale items that dealt with

¹⁷ Although this item was dropped for purposes of model testing that involved the consumptive recreation latent value, it was included as one of four measures used to compute the consumptive recreation scale scores reported for stakeholder groups.

hunting benefits. This inconsistency would depress the inter-item correlations within the scale.

The exclusion of the two play space items suggest that there may actually be two separate play space factors-- one that is machine based and one that deals with the so-called "silent sports". Meanwhile, the value for biking and cross country skiing were not included in the computation of play space mean scores for stakeholder groups.

Based on these modifications to the six factor ecosystem values model (n=1512), the evaluation indices of the CFA were improved: chi-square=972.24, 194 df, (P=0.0); GFI=0.94; NFI=0.96; and RMSR=0.04. Standardized factor loadings and Cronbach's alphas for the latent constructs are reported in Table 4.

Strong reliability coefficients were achieved on each of the six value scales.

Cronbach alpha's ranged from 0.94 for the consumptive recreation value¹⁸ to 0.80 for the nature appreciation scale (Table 4). Based on the confirmatory factor analysis results and the strong reliabilities that were achieved scale scores were constructed for the six ecosystem values. In doing so, value scores that are reported throughout represent mean scores across the items within each ecosystem value. Based on these results, measurement hypotheses 1-8 are supported.

¹⁸ Incidently, the Cronbach alpha for the consumptive scale with the fishing item included was 0.92.

CHAPTER 4

RESULTS

Response rates

During the 1997 survey, a total of 1545 usable questionnaires were returned from the four stakeholder sample groups for an overall response rate of 68. 7 %. Response rates for sample groups ranged from 78.1 % for Sierra Club members to 65.3 % for Audubon members (Table 7). Response from Sierra Club members was deemed satisfactory and no nonresponse follow-up was conducted for this sample group. An abridged version of the questionnaire (Appendix G) was mailed to non-responding deer hunters, waterfowl hunters, and Audubon members along with a stamped return envelope in an attempt to cutdown on the number of hardcore nonrespondents. This mailing yielded an additional 205 responses (81 deer hunters, 68 Audubon members, and 56 waterfowl hunters) (Table 8). With the addition of this nonresponse mailing, the percentage of contacts rose to over 76% for all groups (Table 9).

The response to the 1998 survey of the general public was poor. Three hundred and ninety (390) usable surveys were returned. After adjusting for the 71 undeliverable surveys, the response rate was 42%. Eleven surveys were returned without a single question being answered.

Nonresponse bias

In the 1997 sample, statistical comparisons were made between those who answered the full questionnaire and those who sent in the abridged nonresponse survey.

Table 7. Overall survey response rates to 1997 summer survey.

Sample Group	Sent	Undeliverable *	Delivered	Returned	response rate %
Sierra Club members	495	10	485	379	78.1
Waterfowl hunters	605	15	590	398	67.4
Deer hunters	592	16	576	377	65.4
Audubon Society members	614	17	587	390	65.3
unidentified returns				1	
TOTAL	2306	58	2248	1545	68.7

^a Undeliverable surveys included those surveys returned by the Post Office marked "incorrect address", "forwarding order expired" and also persons who responded to indicate that the addressee was deceased. A total of 6 surveys were refused and returned and these were treated as nonrespondents.

Table 8. Response rates to nonresponse follow-up (abridged survey).

Sample group a	Sent	Returned	Response rate %
Deer hunters	216	81	37.5
Audubon members	225	68	30.2
Waterfowl hunters	210	56	26.6
TOTAL	651	205	31.5

A nonresponse follow-up was not conducted on the Sierra Club sample due to their high response rate.

Table 9. Combined response to both full questionnaire and nonresponse follow-up.

Sample	delivered surveys	total returns	response rate %
Deer hunters	576	458	79.5
Sierra Club members *	485	379	78.1
waterfowl hunters	590	454	76.9
Audubon members	597	458	76.7
TOTAL	2248	1750	77.8

^a Sierra club did not receive a nonresponse mailing.

Among Audubon Society members no differences were found between respondents and non-respondents on several key variables.

There were a couple of differences that emerged between hunter respondents and non-respondents. Nonrespondent hunters were less likely to be users (30 %) of the study public lands than were hunter respondents (48 %) (χ^2 =4.16, 1 df, p<.05). This suggests that 1997 hunter respondents may represent a higher percentage of public land users than would appear in a random sample of all Michigan hunters. There were no significant differences on items measuring ecosystem benefits. Therefore, nonresponse bias does not appear to be a substantial issue among either 1997 hunters or Audubon Society birders.

Among the 1998 survey group, too few nonresponse survey cards were returned to perform statistical comparison within stakeholder segments. Of those who did return the nonresponse post card (n=42), the most frequently cited reason (20) for not returning the long form questionnaire was "Not interested in the topic". Eighteen people checked "Survey was too long/complicated". Overall, those responding to the 1998 survey were primarily people with some recreational interest in wildlife. The survey failed to capture nontraditional wildlife stakeholders, especially minorities.

Stakeholder segments and definitions

For purposes of data analysis stakeholders were segmented into mutually exclusive groups. Results are reported for five stakeholder groups that were segmented based on responses to survey results rather than on sample origin. Results are intended to provide profiles of the stakeholder types, but are not meant to characterize the prevalence of the stakeholders within Southern Michigan. As a reminder, the delineation of the five major

stakeholder types are repeated in Figure 6. Some of the stakeholder terminology described in this chapter will utilize more or less specific labels. For example, the term "hunters", without

Figure 6. Definitions of major stakeholder segments used in the study.

pure hunters: hunters who did not check any of the four nonconsumptive wildlife recreations¹⁹ as one their favorite types outdoor recreation (1997 survey).

dual use hunters: hunters who checked one or more of the nonconsumptive wildlife recreations as a favorite (1997 survey)

<u>Audubon members</u>: non-hunters who belonged to Audubon Society, but not the Sierra Club (1997 survey)

<u>Sierra club members</u>: non-hunters who belonged to Sierra Club, but not the Audubon Society (1997 survey)

nonconsumptive nonmembers: includes all those who checked at least one type of nonconsumptive wildlife recreation as a favorite, are not hunters, and are not members of any environmental organization (1998 survey)

qualification, means ALL hunters. Any references to types of hunter (e.g., "waterfowl hunter") was defined by responses to the question "What is your favorite type of hunting?" even though the respondent may also have participated in other types of hunting. Furthermore, segmentation by hunter type does not adhere to the boundaries established for mutually exclusive stakeholders (i.e., small game hunters may or may not engage in nonconsumptive recreations). The term "environmental organization members" refers to both Audubon members and Sierra Club members collectively.

¹⁹

Nonconsumptive wildlife recreations were considered bird watching, wildlife feeding, photography and nature study. These were determined through results of exploratory factor analysis of 14 types of outdoor recreations.

Demographic descriptors

1997 Pure Hunters

Forty-three percent of all hunters in the sample were classified as pure hunters which means they did not check any of the four nonconsumptive wildlife recreations (bird watching, wildlife feeding, nature study, and photography) as one of their favorite types of outdoor recreation. The average age of pure hunters was 39.6 years old. As one would expect, most pure hunters were male (96.7 %) and Caucasian (88.7%). A plurality of pure hunters lived in rural areas (43.6%) (Table 10). Almost half (48.8) of the pure hunters lived within the core study area (Table 11). The median responses for education and household income were "some technical school" and \$50-75,000 dollars respectively. About half were members of some conservation organization--about one in five pure hunters was a member of Michigan United Conservation Clubs (22.5 %). Slightly over one quarter of pure hunters (27.2 %) belonged to the National Rifle Association.

On average, pure hunters participated in 3.5 types of hunting (out of 6 possible categories) annually. About 92 % of hunters reported gun-deer hunting and about 55% percent hunted for waterfowl (Table 12). When asked to select a favorite type of hunting among six options provided, archery deer hunting was the most frequently selected type (36.2%), followed by gun deer hunting (27.6%). About 21 % selected waterfowl hunting as their favorite type (Table 13). Besides hunting (98.1%), the most frequently reported

Table 10. A comparison of mutually exclusive stakeholder by demographic characteristics.

Demographic		Stakeho				
characteristic	pure hunters n=354	dual-use hunters n=395	Audubon members n=181	Sierra club members n=215	Test statistic	Sig.
≅ age	39.6	43.1	54.7	49.9	F=48.2	0.001
sex (% of males)	96.7	95.5	71.2	43.5	$\chi^2 = 531.5$	0.001
median household income	50-75K	50-75K	50-75K	50-75K	χ²=67.3	0.001
% with Bachelors degree or higher	21.8	20.2	52.7	73.6	χ²=331.4	0.001
% rural	43.6	45.3	19.9	9.0	$\chi^2=181.2$	0.001
% Caucasian	88.7	90.9	96.1	95.7	$\chi^2 = 70.7$	0.001

^a Of the non-white respondents to this surveys, most were Native Americans (e.g., 6.1 % of the hunters and 4.3% of the hunters/birders.) African, Asian, and Latino Americans were nearly absent from the respondents reflecting the low level of participation by those groups in both conservation and environmentalism.

Table 11. Distribution of the number of stakeholders residing in each study area tier.

Location of residence	pure hunters	dual use hunters	Audubon Members	Sierra Club members	$\chi^2 = 171.2$ 6 df
Tier 1 (study site counties)	176	178	24	15	Sig<.0001
Tier II (adjacent counties)	161	182	121	172	
Tier III (outlying counties)	27	40	40	29	

Table 12. A comparison of hunting participation levels and favorite types of hunting for

mutually exclusive hunter segments and all hunters in both survey years.

Outdoor recreation participation levels	Pure hunters	Dual use hunters	t-value	Sig
mean number of favorite recreations *	5.0	7.9	-15.11	0.000
mean number of hunting types/year ^b	3.5	3.8	-2.47	0.05
type of hunting		no participated in /pe each year	χ ²	Sig.
archery deer	47.6	52.4	0.002	0.99
gun deer	92.3	94.0	0.86	0.35
waterfowl	55.2	63.0	4.78	0.05
small game	85.4	83.8	0.41	0.51
upland birds	47.8	59.3	10.0	0.001
bear	6.0	9.0	2.37	0.12

 $^{^{8}}$ Respondents were asked to check outdoor recreations that represented "their favorite types" from a list of 14 options.

Table 13. Frequency of the favorite types of hunting by type of hunters in 1997 survey.

Type of hunter	% of hunting types selected by hunter as "their favorite".						
	Archery deer	Gun-deer	waterfowl	small game	upland birds	bear	$\chi^2=14.1$
pure hunters (n=364)	36.2	27.6	21.4	8.6	6.2	0.0	5 df Sig<.05
dual-use hunters (n=400)	37.4	27.4	25.5	3.0	6.9	1.0	

b Respondents were asked which of 6 different types of hunting they participated in during "a typical year".

favorite types of outdoor recreations ²⁰ for hunters were fishing (87.9%), camping (58.8%), and boating (53.3 %) (Table 14).

Approximately seven in ten of the pure hunters reported visiting at least one of the four public lands in the study area for outdoor recreation, and about 46% visited at least two of the areas. Over 40 % of pure hunters have used the Shiawassee River SGA (42.9%). Slightly fewer reported visiting the National Wildlife Refuge (36.5%), Maple River SGA (36.0%), and Gratiot-Saginaw SGA (33.8%), (Table 15). The most frequently reported use by the hunters visiting each property include: NWR, waterfowl hunting 51.1%; Shiawassee SGA, waterfowl hunting 63.5%; Gratiot-Saginaw SGA, deer hunting 69.9%; and Maple River SGA, deer hunting and waterfowl hunting were tied (51.9 %) (Tables 16, 17, 18 & 19).

Key Differences: Pure hunters versus dual-use hunters

About 57 % of hunters checked at least one nonconsumptive wildlife-related recreation as a favorite. Among these dual-use hunters, wildlife feeding was the most frequently reported favorite type of nonconsumptive recreation (39.8 %); twenty-nine percent of hunters reported birdwatching as a favorite outdoor recreation.

Several significant differences were observed between pure hunters and dual-use hunters on both demographic and recreational use variables. Dual use hunters were slightly older, were more likely to belong to an organization, and included a larger percentage of females than did pure hunters. In addition to the nonconsumptive wildlife

²⁰

Respondents were allowed to check more than one type of outdoor recreations as "a favorite type".

Table 14. Frequencies of favorite recreations for mutually exclusive stakeholder groups.

Outdoor				on as "one of their es except for hunt	
recreations	pure hunters n=363	dual-use hunters n=400	Audubon members n=184	Sierra Club members n=129	nonconsumptive users n=102
backpacking	7.4	12.8	20.1	39.4	12.1
cross country skiing	9.1	18.8	32.6	48.8	21.6
biking	23.4	34.3	39.7	47.4	39.7
hiking	16.2	32.5	52.2	68.1	44.0
canoeing	43.1	51.8	38.6	48.4	34.5
hunting	98.1	98.0			
trapping	11.3	19.8	0	0	0
fishing	87.9	93.3	40.8	18.8	47.4
berry & mushroom picking	30.8	49.0	31.0	16.0	31.0
birding		44.0	79.3	41.8	61.2
photography		35.5	52.2	42.3	45.7
nature study		26.8	65.2	46.5	30.2
wildlife feeding		71.5	60.3	22.5	46.6
ORV riding	25.0	29.5	3.3	1.0	6.9
boating	53.3	61.3	25.0	24.9	31.0
snowmobiling	32.4	29.5	3.8	0	12.9
camping	58.8	69.8	45.1	49.8	49.1
jogging	5.5	9.5	12.0	21.6	11.2

Table 15. Frequency of study area public land use for recreation by stakeholders.

	% of s	takeholde	rs who hav	e visited eac	h of the areas		
Public land area	pure hunters n=364	dual use hunters n=400	Audubon members n=185	Sierra Club members n=216	nonconsumptive users n=111	χ^2	Sig.
Maple River SGA	36.0	43.8	24.3	19.4	24.3	50.5	0.001
Gratiot- Saginaw SGA	33.8	44.5	11.4	12.0	29.7	106.6	0.001
Shiawassee River SGA	42.9	56.3	24.9	18.1	40.5	106.2	0.001
Shiawassee Federal Wildlife Refuge	36.5	48.8	28.1	22.2	39.6	50.5	0.001
No visit	28.6	16.8	50.8	59.3	29.7	144.5	0.001

Table 16. Frequencies of past participation in select outdoor recreations by stakeholder who reported visiting the Shiawassee Federal Wildlife Refuge.

		leral refug recreation		ho engaged i	n select	,	
Type of Recreation	pure hunters n=131	dual use hunters n=175	Audubon members n=45	Sierra Club members n=42	nonconsumptive users n=27	χ²	Sig.
deer hunting	38.3	31.3				1.75	0.18
waterfowl hunting	51.1	56.9				1.07	0.3
bird watching	13.5	31.3	80.8	50.0	65.9	96.2	0.001
hiking	20.3	34.4	63.5	66.7	50.0	52.3	0.001
others	15.8	16.9	13.5	25.0	18.2	2.79	0.59

Table 17. Frequencies of past participation in select outdoor recreations by stakeholder who reported visiting the Gratiot-Saginaw State Game Area.

	1	atiot-Sagir recreation		who engage	d in select		
Type of Recreation	pure hunters n=131	dual use hunters n=175	Audubon members n=45	Sierra Club members n=42	nonconsumptive users n=27	χ²	Sig.
deer hunting	69.9	62.9				1.58	0.20
waterfowl hunting	31.7	33.7				0.13	0.71
bird watching	4.9	18.5	71.4	46.2	36.4	67.9	0.001
hiking	16.3	28.1	61.9	57.7	54.4	40.1	0.001
others	22.8	25.3	9.5	26.9	24.2	2.79	0.59

Table 18. Frequencies of past participation in select outdoor recreations by stakeholder who reported visiting the Shiawassee River State Game Area.

	6	atiot-Sagir recreation		who engage	d in select	2	
Type of Recreation	pure hunters n=131	dual use hunters n=175	Audubon members n=45	Sierra Club members n=42	nonconsumptive users n=27	χ²	Sig.
deer hunting	42.3	47.8				1.58	0.20
waterfowl hunting	63.7	61.7				0.13	0.71
bird watching	4.7	21.0	51.4	37.5	31.6	44.2	0.001
hiking	12.6	19.1	55.9	49.3	54.4	36.7	0.001
others	11.6	17.3	9.5	20.1	19.6	2.79	0.59

Table 19. Frequencies of stakeholder recreation participation by visitors at the Maple River State Game Area.

Reason		aple River recreation		o engaged in	select		
for visiting	pure hunters n=131	dual use hunters n=175	Audubon members n=45	Sierra Club members n=42	nonconsumptive users n=27	χ²	Sig.
deer hunting	51.9	36.0				7.74	0.01
waterfowl hunting	42.7	46.3				0.37	0.53
bird watching	10.7	34.2	86.7	71.4	63.0	114.7	0.001
hiking	13.0	19.0	40.0	50.0	37.0	35.3	0.001
others	29.8	26.9	11.1	14.3	29.6	9.4	0.05

recreations, dual use hunters were significantly more likely than pure hunters to check all categories of outdoor recreations as their favorites (Table 14). Dual use hunters participated in more types of hunting than pure hunters and were more likely to have visited state game areas (Tables 12 & 15).

Audubon Society Members

Audubon Society Members tended to be older (\bar{x} =54.7 years old), to live in suburban or urban areas (58.5%), and included a higher percentage of females (71.2%))than did hunters. Almost all Audubon members were Caucasian (96.1%) (Table 10). Only 13% of Audubon Society members lived in the core study area, while most of them (65.4%) lived in an adjacent county. A majority (56.2%) had some sort of post-secondary education, and the median education level was a bachelor's degree. The median household income for birders was the same as it was for hunters and Sierra Club

members: \$50-75,000. Thirty-eight percent (38.4%) of Audubon members also are members of The Nature Conservancy.

Almost four out of five Audubon members reported bird watching as a favorite type of outdoor recreation. The next most frequently reported favorite recreations were nature study (65.2%), wildlife feeding (60.3%), and photography (52.2 %) (Table 14). Less than half (49.2%) have visited any of the four public lands (Table 15). The NWR had the highest percent visitation by Audubon members (28.1%) followed closely by the Shiawassee River State Game Area (24.9%), and the Maple River SGA (24.3%) (Table 15). For each of the public lands, birding was reported by more on-site Audubon participants than hiking or other activities.

Audubon birders were compared with Audubon non-birders for differences on demographic, recreational participation, and psychological variables. The only significant difference that emerged was that Audubon birders had visited a higher number of study site public lands (\bar{x} =0.97) than did non-birders (\bar{x} =0.53) (t=2.18, 148 df, p<.05). Therefore, these two groups were combined in the results that follow.

Nonhunting Sierra Club members (SC members) were predominately white (95.7%), well-educated and urban dwellers. Their median education level was a bachelor's degree and over one third held graduate or professional degrees. Sixty-six percent resided in urban areas with only 7 % living in one of the three core counties; 79.6% resided in adjacent counties. There was a fairly even split between men (43.5%)

and women (56.5%). The average age for SC members was 50 years. In addition to

Sierra Club members

belonging to Sierra Club, many also were members in the Nature Conservancy (39.4%) and Greenpeace (22.7%).

The most frequently reported "favorite outdoor recreation" of this stakeholder group was hiking (68.1%) (Table 14). About 60 % of Sierra Club Members have not visited any of the study site public lands. Of those people who did use the public lands, hiking was the most frequently reported activity (Table 16,17,18, and 19).

1998 Nonconsumptive users (nonmembers)

The average age for members in this segment was 52.7. Sixty percent of this segment were woman. Nine in ten were Caucasian and the median household income was between \$ 50-75K. Birding was the most frequently reported favorite recreation for nonconsumptive users (61.2%). Bird watching was the most popular activity for nonconsumptive nonmembers using Maple River (Table 19) and the federal refuge (Table 16); while hiking was the most highly reported activity for this group at the Gratiot-Saginaw and Shiawassee River SGA's.

Agency Credibility

Attitudes regarding DNR credibility were slightly positive for all five mutually exclusive groups. On a four item scale ranging from (+8) extremely positive to (-8) extremely negative, nonconsumptive nonmembers had a significantly higher mean score ($\bar{x}=1.85$) from either Audubon ($\bar{x}=1.00$) and Sierra Club members ($\bar{x}=0.92$) (F=5.72, 4 df, p<.0001). Pure hunters ($\bar{x}=1.36$) and dual-use hunters ($\bar{x}=1.55$) were not statistically different than any of the other groups on the DNR credibility index.

There were significant group differences in the responses to three of four credibility items that comprised the scale (Table 20). Nonconsumptive nonmembers had the largest frequency of positive responses on all three of the items where differences were found. Sierra Club members were least likely to endorse statements about agency credibility and also most likely to offer an undecided response. The one item for which no group differences were found was: "I do not trust the DNR to fairly consider my own interests when managing our public lands." Though no group had a majority of respondent's agree to that item, the results indicate a fairly high level of distrust of the agency across groups (Table 20). This finding suggests that while stakeholders can positively view the agency's scientific competence and ability to maintain a healthy, sustainable environment, this does not necessarily translate into trust that the agency will consider them in the process.

Perception of Anti-Hunting Threat

The timing of this survey was six months following a major ballot initiative in Michigan that challenged the right of bear hunters to use bait or dogs as legal methods. Though the effort was defeated at the polls, the issue clearly dominated the thoughts of hunters. Both pure hunters and dual-use hunters shared strong attitudes about the "antihunting threat" in Michigan. In fact, three questions targeting hunter perceptions about the extent to which anti-hunting posed a threat produced little variance as hunters offered nearly universal agreement. For instance, 93 % of hunters agreed with the statement that: "those in society who oppose recreational hunting pose a serious threat to future hunting opportunities". About 60 % of hunters agreed that "any resource management action

Table 20. Frequency of stakeholder responses to items on DNR credibility.

		% of stakeho	older group	response to	o agency cre	% of stakeholder group response to agency credibility items.	χ^2	Sig.
Items in the DNR credibility scale	Response Categories	pure hunters	dual use hunters	Audubon members	Sierra Club members	nonconsump. nonmembers		
I trust the DNR to manage our	Agree	57.6	1.72	0.44	41.3	62.3	30.3	0.001
public lands to ensure a healthy & sustainable environment for	Undecided	21.6	161	1.62	30.5	22.8		
Michigan citizens.	Disagree	20.8	23.2	56.9	28.2	14.9		
The DNR is professionally	Agree	53.4	58.3	49.7	44.8	6.09	44.2	0.001
competent when it comes to managing wildlife on our public	Undecided	23.2	24.0	32.3	42.9	30.4		
lands.	Disagree	23.5	17.7	18.0	12.4	8.7		
I do not trust the DNR to fairly	Agree	44.2	43.9	40.0	39.4	48.7	8.21	0.413
consider my own interests when managing our public lands.	Undecided	30.0	26.6	32.2	34.7	30.4		
	Disagree	25.8	29.9	27.8	25.8	20.9		
Overall, the DNR is doing a	Agree	56.5	59.5	50.3	44.3	61.7	43.4	0.001
professional & satisfactory job managing our natural resources	Undecided	20.3	22.0	35.0	39.2	27.8		
on public lands in Michigan.	Disagree	23.1	18.5	14.8	16.5	10.4		

that reduces hunting opportunities is the result of the growing anti-hunting movement in this country". Non-hunters were not asked to respond to the anti-hunting threat items.

Belief about our dependence on ecosystems

A one-item filter question²¹ was used to determine respondent beliefs about (human) dependence on healthy ecosystems in Southern Michigan for maintaining a high quality of human life. A majority of all stakeholders agreed with the following statement: "Unless a sufficient level of environmental quality is maintained in Southern Michigan, our own existence as individuals and as a society will be jeopardized". There were significant differences in the strength of agreement among groups--namely, environmental organizations members were more likely than hunters to strongly agree to that item (Table 21).

Respondents who disagreed with the ecological dependence belief question were assigned a score of zero for each of the four ecological dependence value items.

Table 21. Frequency of stakeholder responses to belief about ecological dependence.

χ ² =128.4 df=8 p<0.0001	To what extent do following statemen environmental qua Michigan our own society will be jeoj	nt: Unless a suffic ulity is maintained existence as indi	ient level of I in Southern
Stakeholders	% Strongly agree	% Agree	% Undecided or disagree
pure hunters (n=358)	28.8	50.6	20.7
dual-use hunters (n=392)	44.4	41.8	13.8
Audubon members (n=183)	57.4	38.8	3.8
SC members (n=213)	70.9	26.8	2.3
nonconsumptive (n=116) nonmembers	41.4	49.1	9.5

Stakeholder value profiles

<u>Hypothesis</u>, 9: Consumptive recreation will be the highest rated ecosystem benefit for pure hunters.

Of the six categories of ecosystem benefits, hunters placed the most importance on consumptive recreation based on mean scores (x=3.34) of ratings scales (on a scale of zero to four) (Table 22, see Figure 7). Pure hunters also placed very high importance on a second tier of benefits that included existence, nature appreciation, and ecological dependence. Exploitive and play space benefits were given much lower importance ratings. Hypothesis 9 was supported.

<u>Hypothesis 10</u>: Nature appreciation will be the highest rated ecosystem benefit for Audubon members.

<u>Hypothesis 11</u>: Ecological dependence will be the highest rated ecosystem benefit for SC members.

Table 22. One-way ANOVA tests for mean ecosystem values differences of 1997 mutually exclusive stakeholders.

1				~ 1	Mutually exclusive stakeholder type	exclusiv	e stakeh	older typ	ΟI					
Ecosystem values	nd	pure hunters	હ	dua	dual use hunters	ters	Andr	Audubon members	nbers	S 1	Sierra Club members	ے م	F Ratio	F Prob.
	u	- IX	SD	E	ıx	SD	E	ΙX	SD	u	ı×	SD		
ecological dependence	333	2.56ª	1.10	368	2.89 ^b	0.99	170	3.29°	0.71	961	3.34	0.77	37.3	0.001
consumptive recreation	358	3.34	99.0	268	3.31ª	69.0	165	1.35 ^b	1.09	061	0.95°	76.0	605.1	0.001
nature appreciation	352	2.76	0.73	390	3.03 ^b	99.0	181	3.29°	0.51	215	3.29°	0.56	41.8	0.001
extractive	310	1.79	1.04	345	1.67ª	1.09	156	1.59ª	1.02	188	1.17	96.0	14.8	0.001
existence	359	2.86	0.80	393	3.11 ^b	0.72	182	3.29€	99.0	213	3.33°	09.0	24.8	0.001
play space	342	1.73	1.09	384	1.61	0.99	9/1	0.88 ^b	0.74	206	0.77 ^b	89.0	69.5	0.001

¹Scale ranged from 4 = "critically important"; 3 = "very important"; 2 = "moderately important"; 1 = "slightly important"; 0 = "not at all important".

abe Different letters indicate significant differences in the mean scores across the rows (Sheffe's post hoc <.05).

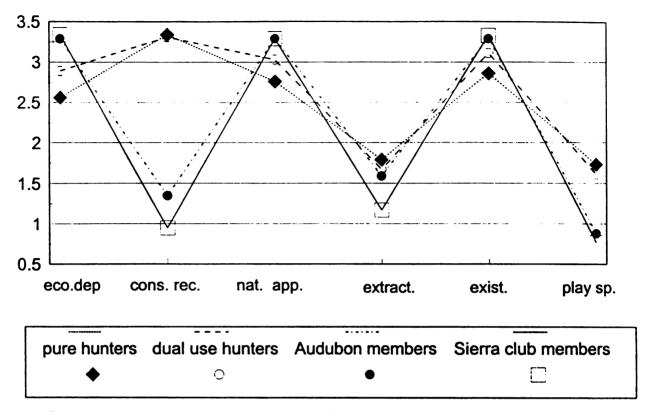


Figure 7. Ecosystem value profiles of 1997 mutually exclusive stakeholder groups.

Value profiles for Audubon members and SC members revealed a triple peak pattern where three ecosystem benefits were given nearly equal and very important ratings--ecological dependence, nature appreciation, and existence values (Figure 7). In fact, mean scores for Audubon members on these three values were identical (\bar{x} = 3.29). Though little practical difference occurs in the mean ratings scores of each of these values for SC members, they placed the most importance on ecological dependence (\bar{x} =3.34) (Table 22). Hypothesis 11 was supported. Hypothesis 10 was partially supported.

Dual use hunters exhibit a triple peak of value priorities as well with high importance placed on consumptive recreation (\bar{x} =3.31), existence values (\bar{x} =3.11), and nature appreciation (\bar{x} =3.03). Among dual use hunters, those who reported birdwatching as a favorite activity had a significantly lower consumptive recreation value (\bar{x} =3.16) than did dual use hunters who did not birdwatch (\bar{x} =3.42), (t= 3.87, 395 df, p<.001).

Stakeholder value comparisons

One way analysis of variance (ANOVA) for mean value differences among four stakeholder segments produced significant results on all ecosystem values (Table 22). In general, Audubon members were very similar to SC members in their relative values

suggesting that membership in either organization reflects a certain shared perspective.

The only statistically significant difference between Audubon members and SC members was on their value for consumptive recreation. On that scale, scores for Audubon members were slightly higher than those of SC members. However, neither group placed much importance on consumptive benefits (even with the inclusion of the fishing item).

Dual use hunters were unique in their values when compared with pure hunters.

Dual users differed from hunters in all value domains except consumptive recreation and play ground space (Table 22). Dual use hunters showed a pattern of values that appeared to place them midway between scores for pure hunters and Audubon members on five of the six scales (Figure 7).

<u>Hypothesis 12</u>: Pure hunters will place less importance on ecological dependence benefits than bird watchers and SC members.

Pure hunters' scores on eco-dependence were significantly lower than Audubon members, SC members, and dual use hunters (F=37.3, p<.000). However, pure hunters still rated this value as nearly very important. This hypothesis was supported.

<u>Hypothesis 13</u>: Hunters will place more importance on the consumptive recreation and extractive benefits than either birders or SC members.

Both pure hunter and dual use hunters scored significantly higher on the consumptive recreation than did the other two groups (F= 605.1, p<.000). On the extractive scale, hunters were significantly higher than SC members (F=14.8, p.<000), but not significantly different than Audubon members. This hypothesis was partially supported.

<u>Hypothesis 14</u>: SC members will have the highest mean scores for ecological dependence benefits of all stakeholder groups.

SC member's eco-dependence score was significantly higher than both hunters and dual use hunters, but showed no difference with Audubon members on this scale. This hypothesis was partially supported.

Stewardship

<u>Hypothesis 15</u>: SC members will score higher on the stewardship value than other stakeholder group.

Mean scores for all groups indicated positive support for stewardship (scale scores ranged from -8.0 to +8.0) (Figure 8). On the item "Our generation has a major responsibility to incur whatever costs and sacrifices are necessary to sustain wildlife and ecosystem into the future", agreement ranged from 70.9 % for pure hunters to 91.7% for Sierra Club members. Item # 25--the most concrete of the stewardship items-- measured intention to donate money to environmental or conservation organizations. Here, 57.3 % of pure hunters agreed that they would be willing to donate money and 21.1% were undecided. Meanwhile over 90 % of Sierra Club members expressed a willingness to donate money. Pure hunters and dual use hunters were both significantly lower on stewardship overall than either the Audubon members or SC members (F=11.7, p<.000). Post hoc comparisons revealed no differences between Audubon and SC members, nor between pure hunters and dual use hunters. Hypothesis 15 is not supported.

Key differences: 1997 and 1998 hunters

Hunters from the 1998 survey were found to significantly differ from 1997 hunters on several demographic and psychological bases. These results can be attributed to the

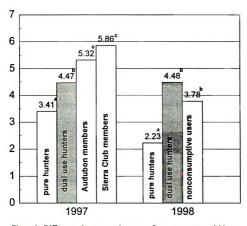


Figure 8. Differences in mean scale scores of ecosystem stewardship for mutually exclusive stakeholder groups in both years of the survey. abe Different letters across groups indicate significant differences at p<.05 (Sheffe's post hoc comparison).

different sampling methods utilized in each year of data collection. Hunters drawn from the drivers license sample tended to have slightly higher average extractive values (t= -4.04, p<.001, df=923) and slightly lower average consumptive values (t=3.46, p<.001, df=1044) than hunters drawn from the hunting license sample frame. The slightly lower consumptive value for 1998 hunters seems to be driven by an approximately 10 percent decrease in the number of respondents who thought it was "critically important" to have a variety of wildlife to hunt on public lands and also that game species be managed to enhance hunting (Table 23).

Several clues suggest that hunters from the 1998 data set were slightly less committed as a group than those hunters who responded in 1997. These differences likely reflect biases in the different sampling methods. For example, 1998 hunters reported participating in fewer types of hunting (\bar{x} =2.68) than 1997 hunters (\bar{x} =3.50) (Table 24), had lower participation in waterfowl and archery deer hunting (Table 25), and included a cadre of hunters (16 %) who participated but did not indicate that it was one of their favorite recreations (Table 26). These differences may partially account for the lower consumptive recreation value. Additionally, a higher proportion of 1998 hunters reported "gun deer hunting" as their favorite (50%) than was the case for the 1997 hunters (29%).²² Those hunters who identified gun-deer hunting as a favorite type of hunting tended to have slightly weaker consumptive value than hunters who said archery or waterfowl

²²

The deer hunter sample in 1997 was created in equal proportions from hunters who had responded to archery kill and antlerless tag (gun) survey from the MDNR. This 50-50 split created an artificial population of "deer hunters" that does not likely reflect the percentage of all Michigan hunters.

Table 23. A comparison of 1997 and 1998 hunters' importance ratings of consumptive recreation benefits.

Consumptive recreation items	1997	hunters	1998	hunters		
How important is it to you	Critically or very important	moderately or somewhat important	Critically or very important	moderately or somewhat important	χ^2 (2 df)	Prob.
that public lands offer access to recreational hunting.	84.1%	0.143	78.0%	20.8%	4.24	0.11
that game fish populations be managed to enhance fishing opportunities.	85.0%	13.1%	81.0%	17.6%	1.63	0.44
that opportunities exist to hunt a variety of wildlife on public lands.	79.6%	18.7%	68.0%	28.7%	9.02	0.01
that populations of game species be managed to enhance hunting opportunities.	84.0%	14.2%	73.4%	0.2	10.9	0.01

Table 24. A comparison of hunting participation levels between 1997 and 1998 hunters.

Outdoor recreation participation levels	1997 hunters n=910	1998 hunters n=158	t-value	Sig
mean number of favorite recreations*	7.6	6.0	7.48	0.001
mean number of hunting types/year b	3.5	2.7	3.00	0.01
type of hunting		o participated in pe each year	χ²	Sig.
archery deer	66.4	49.7	16.6	0.001
gun deer	90.9	87.3	2.15	0.141
waterfowl	54.2	18.5	70.8	0.001
small game	80.7	73.9	3.92	0.05
upland birds	52.4	33.1	19.9	0.001
bear	6.7	6.4	0.02	0.87

^a Respondents were asked to check outdoor recreations that represented "their favorite types" from a list of 14 options.

Table 25. Frequency of the favorite types of hunting for hunters in 1997 and 1998.

	% of hun	ting types sel	ected by hunte	er as "their	favorite".	
Year of survey	Archery deer	Gun-deer	waterfowl	small game	upland birds	
1997 hunters (n=910)	33.7	29.0	21.7	7.2	8.4	4 df Sig<.0001
1998 hunters (n=158)	25.0	44.4	4.9	18.1	7.6	

b Respondents were asked which of 6 different types of hunting they participated in during "a typical year".

Table 26. A comparison of the frequencies of favorite recreations for 1997 and 1998 hunters.

Outdoor recreations	% of stakeholders who favorites".	checked outdoor recreat	tion as "one of	their
	1997 hunters	1998 hunters	γ ²	Sig.
backpacking	12.8	14.0	0.18	0.66
cross country skiing	18.0	13.4	2.03	0.15
biking	30.7	31.2	0.01	0.86
hiking	29.2	28.0	0.08	0.77
canoeing	49.0	38.2	6.19	0.05
hunting	96.0	84.7	32.3	0.001
trapping	14.2	6.8	7.22	0.01
fishing	89.5	84.7	3.16	0.07
berry & mushroom picking	41.1	33.1	3.59	0.06
birding	30.1	20.1	5.43	0.05
photography	23.1	22.3	0.05	0.82
nature study	20.0	17.2	0.67	0.41
wildlife feeding	40.7	31.8	4.39	0.05
ORV riding	24.5	20.4	1.27	0.26
boating	56.1	49.7	2.23	0.13
snowmobiling	27.6	25.5	0.30	0.57
camping	64.1	61.8	0.32	0.57
jogging	8.8	12.7	2.44	0.12

was their favorite type of hunting (Table 25). Thus, the higher proportion of gun hunters in the 1998 sample may be partially responsible for depressing the consumptive value.

Recreational use and values

<u>Hypothesis 16</u>: The greater the number of nonconsumptive wildlife recreations that hunters participate in, the higher the value they will place on existence, ecological dependence, and nature appreciation benefits.

Simple correlations were performed on the 1997 survey respondents after splitting the sample into hunters and non-hunters. Similar results were obtained for each group as nonconsumptive recreation was positively associated with values for nature appreciation, ecological dependence and existence values (Table 27). Results indicate that "dual use" hunters placed greater importance on existence, ecological dependence and nature appreciation values than did pure hunters. These findings were significant across all three values (Table 27). This hypothesis was supported.

<u>Hypothesis 17</u>: Consumptive recreation value of hunters will increase based on the number of types of hunting one participates in.

There was a positive association found among the number of traditional (consumptive) recreations one participates in and the strength of an individual's consumptive value (r=0.23). A linear regression performed using number of traditional recreations as the independent variable explained only 6% of the variance (r=.06, F=55.7, P<.001) in a person's consumptive recreation value. This suggests that other important factors are related to a hunter's consumptive recreation value. Hypothesis 17 is partially supported.

Table 27. Association of nonconsumptive recreation participation and mean scores of select ecosystem values of hunters and environmental organization members (1997)

Categories of		of value scores a ive wildlife recr		
Valued benefits	hur	nters	environn	nentalists
	r	p	r	p
existence	0.20	0.001	0.12	0.004
ecological dependence	0.17	0.001	0.12	0.002
nature appreciation	0.20	0.001	0.13	0.002

<u>Hypothesis 18</u>: Waterfowl hunters (as defined by favorite type of hunting) will have higher ecological dependence and nature appreciation values than will gun-deer hunters.

Focus group findings in preliminary phases of this study suggested that waterfowl hunters may place greater value on nonconsumptive benefits of ecosystems than deer hunters. Results from the survey data do not support this relationship. One-way analysis of variance tested value differences among 5 categories of hunters based on their favorite type of hunting 23 . There was no difference in mean value ratings between waterfowl and archery-deer hunters on ecological dependence, nature appreciation, or existence values (Table 28, Figure 9). However, waterfowl hunters ($\bar{x} = 3.35$) tended to place slightly more value on consumptive recreation benefits than did gun-deer hunters ($\bar{x} = 3.16$). Waterfowl and archery deer were similar in their consumptive, ecological dependence, nature appreciation and existence values. Archery-deer hunters tended to be more like

²³

The number of respondents who selected (n=8) bear hunting as a favorite type of hunting was too small for statistical analysis.

Table 28. One-way AVOVA test of ecosystem value differences of hunter seements defined by their favorite type of hunting

ing.		F Prob.		66.0	0.00	0.15	0.00	0.05
e or nun		F Ratio		90.0	19.9	1.68	16.7	2.41
ite typ		ird	SD	1.14	86.0	0.87	0.92	0.92
riavor		upland bird	ı×	77 2.86	2.69¢	2.82	1.05€	80 2.86
thei		in	z	11		77 2.82	7.1	08
ned by		9	SD	0.77	0.88	0.73	1.07	0.83
ents deri		small game	ıx	2.87	2.91™ 0.88 81	2.83	1.59** 1.07 71 1.05°	2.92
segme		sm	z	81	98	87	62	87
I nunte	hunting	7	SD	1.00	0.64	69.0	1.03	0.78
ences o	Favorite type of hunting	waterfowl	IX	2.89	3.35ab 0.64	3.01	1.46™	3.06
differ	vorite		A	z	181	188	185	167
n value	Fa	L	SD	96.0	0.70	69.0	1.05	0.70
osyster		Gun deer	ıx	2.86	304 3.16 ^b 0.70	2.97	2.05₺	3.04
st or ec		0	z	288	304	303	271	304
VA IC		ser	SD	1.03	0.61	0.70	1.08	0.70
IY A V		Archery deer	IX	2.84	3.35* 0.61	311 2.97	1.71* 1.08	3.11
Jue-wa		Arc	z	284	315	311	772	317
Table 28. One-way AVOVA test of ecosystem value differences of numer segments defined by their favorite type of numbing.			Values	ecological dependence	consumptive 315 recreation	nature appreciation	extractive	existence

! Scale ranged from 4 = "critically important"; 3 = "very important"; 2 = "moderately important"; 1 = "slightly important"; 0 = "not at all important".

ab Different letters indicate significant differences in the mean scores across the rows (Sheffe's post hoc <.05).

142

0.00

0.82 6.69

1.52*b 0.86

0.94 286 1.80* 0.93 178 1.58* 0.85 81

309 1.83*

play space

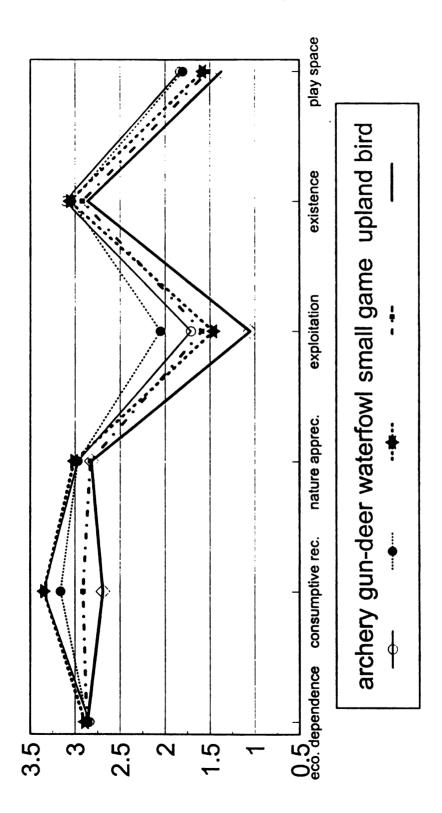


Figure 9. Ecosystem value profiles by type of hunter.

gun-deer hunters on the extractive scale, while waterfowl hunters place lower importance on exploitation than either gun-deer or archery deer hunters.

Furthermore, those hunters who reported small game or upland bird hunting as their "favorite type of hunting" also exhibited significant value differences from gun-deer, archery deer, and waterfowl hunters (Table 28). Mean scores for small game hunters show that this group placed roughly equal importance on existence value ($\bar{x}=2.92$), consumptive recreation ($\bar{x}=2.91$), ecological dependence ($\bar{x}=2.98$) and nature appreciation ($\bar{x}=2.83$). For upland bird hunters, however, the mean score for consumptive recreation was only the fourth highest among those values ($\bar{x}=2.69$).

Both small game and upland bird hunters placed less importance on consumptive benefits than did other types of hunters; they also placed less value on play space than gun-deer and archery hunters. Upland bird hunters had the lowest extractive value of any hunter group. Favorite type of hunting did not differentiate mean scores for the ecological dependence value among hunters. Hypothesis 18 was not supported.

<u>Hypothesis 19</u>: Participation in nature study as a favorite activity will be positively related to both nature appreciation and ecological dependence for both hunters and non-hunters.

Bi-variate correlations using Spearman's coefficients indicated a small, but significant linear association between participation in nature study and one's value for ecological dependence and nature appreciation among both hunters and non-hunters. As Tables 29 and 30 indicate, a higher percentage of those who participated in nature study rated ecological dependence and nature appreciation as "critically important" than did

Table 29. Row percentages of ecological dependence importance ratings of all respondents who participated in nature study as a favorite recreation.

Checked	Average value	response cate	egory for eco	ogical depe	ndence	
nature study as favorite recreation	Not at all important	slightly important	moderately important	very important	critically important	χ ² =154.25 p<.001
yes (n=351)	1.3%	0.6%	12.1%	33.8%	60.1%	100%
no (n= 896)	4.8%	2.7%	14.3%	47.9%	30.3%	100%

Table 30. Row percentages of nature appreciation importance ratings of all respondents who participated in nature study as a favorite recreation.

Checked	Average re	esponse cate	gory for natu	re appreciat	ion value	
nature study as favorite recreation	Not at all important	slightly important	moderately important	very important	critically important	χ ² =110.57 p<.001
yes (n=331)	0.4%	2.0 %	16.4%	52.9%	28.3%	100%
no (n=833)		0.5%	4.8%	44.0%	50.7%	100%

those who did not check nature study as a favorite activity. Whether or not engaging in nature study causes one to have a stronger value on these domains is unknown. However, nature study appears to be a strong predictor of the presence of extreme scores on these two values. Hypothesis 19 is supported.

<u>Hypothesis 20</u>: The ecological dependence and existence values will be higher for environmental organization members than for nonconsumptive nonmembers.

The mean values of nonconsumptive nonmembers differed from environmental organization members on all six categories of ecosystem benefits (Table 31).

Environmentalists were more likely to say ecological dependence benefits were critically

Table 31. A comparison of the mean ecosystem value ratings of nonconsumptive environmentalists and nonmembers

		Nonconsur	mptive us	ers			
Ecosystem values	Orga	onmental nization mbers	nonr	nembers	t-value	df	2-tailed Sig.
	n	₹ (SD)	n	₹ (SD)			
ecological dependence	516	3.39 (0.71)	217	2.94 (0.81)	-7.37	731	0.001
consumptive recreation	500	1.07 (1.03)	230	1.51 (1.14)	5.13	728	0.001
nature appreciation	554	3.29 (0.58)	241	2.91 (0.74)	-7.80	793	0.001
extraction	482	1.28 (1.00)	217	1.99 (1.06)	8.56	697	0.001
existence	553	3.36 (0.64)	241	2.82 (0.85)	-9.92	792	0.001
play space	535	0.77 (0.70)	229	1.19 (0.93)	6.87	762	0.001
stewardship a	552	5.83 (2.29)	243	3.35 (2.91)	-12.90	793	0.001

^a Scale scores for the stewardship scale ranged from -8.0 to +8.0, whereas mean scores for the other six values ranged from 0.0 to 4.0.

important than were nonconsumptive nonmembers. However, in an absolute sense, nonconsumptive nonmembers did place very high importance on ecological dependence. Environmentalists also assigned extremely high importance to existence values, while nonmembers rated existence as moderate to very important. Hypothesis 20 was supported.

<u>Hypothesis 21</u>: Birders who belong to environmental organization will have higher ecological dependence, nature appreciation, and existence values than will non-organization birders.

The mean values of environmental birders differed significantly from nonmember birders on all six categories of ecosystem benefits (Table 32). Environmental birders had significantly higher value scores on all categories of benefits in the hypothesis.

Environmental birders placed less importance than did nonmember birders on consumptive recreation, exploitation, and play space benefits of Southern Michigan public lands.

Hypothesis 21 is supported.

<u>Hypothesis 22</u>: There will be no differences in the priorities placed on the valued ecosystem benefits by study site users and nonusers among both hunters or non-hunters.

There were several significant, albeit slight, differences in the mean value scores of users and nonusers of the four public land areas among both hunters and non hunters [Tables in Appendix H]. These differences were revealed by splitting the 1997 pooled data set by hunters and non-hunters (Audubon and Sierra members). Independent sample t-tests were run using value scale scores as the dependent variable and the reported visitation of each public property as the independent variable. Value differences between public land users and nonusers were more frequent for hunters than for environmentalists. Public land hunters had higher mean scores for consumptive recreation and lower exploitation and play space scores than hunters who did not visit the public lands. With a couple of exceptions this was true regardless of which property was examined. This suggests that differences may be attributed to the types of hunters that are attracted to

Table 32. A comparison of the mean ecosystem value ratings of environmental

organization member-birders and nonmember-birders.

		Nonconsu	mptive us	ers	The second		
Ecosystem values	Orga	onmental nization er-birders	nonmen	ber-birders	t-value	df	2-tailed Sig.
varues	n	₹ (SD)	n	⊼ (SD)			
ecological dependence	333	3.44 (0.71)	92	3.14 (0.83)	-3.51	423	0.001
consumptive recreation	318	1.01 (1.04)	95	1.57 (1.16)	3.78	411	0.001
nature appreciation	351	3.31 (0.60)	101	3.09 (0.71)	-3.13	450	0.002
extraction	303	1.24 (1.04)	86	1.90 (1.17)	5.01	387	0.001
existence	351	3.42 (0.63)	103	2.99 (0.77)	-5.68	452	0.001
play space	339	0.73 (0.69)	94	1.09 (0.87)	4.29	431	0.001
stewardship a	348	6.07 (2.24)	102	4.16 (2.63)	-7.27	448	0.001

^a Scale scores for the stewardship scale ranged from -8.0 to +8.0, whereas mean scores for the other six values ranged from 0.0 to 4.0.

public lands in general rather than unique differences among hunters utilizing specific game areas.

There were fewer differences among environmentalists who did and did not visit public lands. No differences were found among environmentalists based on use of the Gratiot-Saginaw or Shiawassee River State Game Areas. Environmentalists who visited Maple River or the Federal Refuge had significantly lower extractive values than those

who did not visit either of those areas. In addition, Maple River users also had lower play space values than non users. Both hunters and environmentalists who visited that federal refuge had higher ecological dependence values than their counterparts who did not (Appendix H). Hypothesis 22 is not supported.

Current perceptions

<u>Hypothesis H_a 23</u>: Hunters will perceive fewer deer, waterfowl, and places to go hunting than will non-hunters.

<u>Hypothesis H_a 24</u>: Audubon and SC members will perceive less than adequate levels (i.e., "too few exist") of songbirds, frogs and amphibians and wildlife diversity than hunters and non-member, non-hunters.

Respondents were asked to rate the current level of 13 different ecosystem attributes in Southern Michigan in order to determine their opinions about existing conditions. These attributes included 4 major vegetation types (ecosystems), 5 wildlife attributes, and 4 types of recreational opportunities. Response options on a 5 point Likert scale included: "far too few/little" (-2), "too few/little" (-1); "about the right amount" (0); "too many/much" (+1); and "far too many/much" (+2). One way analysis of variance was performed to check for group differences on mean scores for each of these 13 attributes. In addition, χ^2 tests were performed on cross tabulations of stakeholders by their frequency responses across categories. Results indicate significant differences in stakeholder attitudes on all 13 attributes (Tables 33,34,35).

In all but one instance, stakeholders agreed on abundance of the elements (i.e., whether something was lacking or over abundant), but often differed in magnitude of their evaluations. In general, all five groups felt there were too many deer and too few or too

Table 33. Frequency of stakeholder opinions regarding current abundance levels of 4

ecosystems in Southern Michigan.

	cate your opinion al ibute in Southern M			% resp	onse of ab	undance	levels
ecosystem attribute	stakeholder	n	⊼ ¹ (SD)	Too few	About the right amount	Too many	No opinion
	pure hunters	311	-0.49 (0.86)	36.5	42.8	5.2	14.0
pine	dual use hunters	359	-0.63 (0.90)	43.5	42.0	4.3	10.3
$(\chi^2 = 46.3$ p<.001)	nonconsumptive users	136	-0.58 (0.85)	35.3	43.1	3.4	18.1
:	SC members	169	-1.02 (0.86)	55.1	21.3	1.9	21.8
	Audubon members	159	-0.81 (0.81)	48.1	37.8	0	14.1
	pure hunters	326	-0.86 (0.83)	52.7	34.1	1.1	11.1
	dual use hunters	372	-0.99 (0.82)	63.0	29.3	0.8	7.0
hardwoods $(\chi^2 = 28.4 \text{ p<.001})$ wetlands $(\chi^2 = 53.2 \text{ p<.001})$	nonconsumptive users	91	-0.85 (0.81)	50.9	26.7	0.9	21.6
	SC members	178	-1.24 (0.73)	67.6	14.8	0	17.6
	Audubon members	158	-1.05 (0.96)	60.0	25.4	0	14.6
	pure hunters	410	-0.50 (1.02)	41.4	38.5	10.3	9.6
	dual use hunters	452	-0.70 (0.84)	53.3	34.3	6.5	5.9
	nonconsumptive users	138	-0.59 (0.87)	39.4	34.7	5.6	20.2
	SC members	178	-1.08 (0.94)	59.1	18.8	3.7	18.4
	Audubon members	168	-0.98 (0.96)	61.5	23.0	5.4	10.1
	pure hunters	389	-0.52 (0.84)	35.5	46.3	4.0	14.3
	dual use hunters	430	-0.70 (0.83)	47.9	38.3	3.3	10.4
grasslands $(\chi^2=43.7 p<.001)$	nonconsumptive users	134	-0.63 (0.81)	39.4	34.7	3.4	22.5
	SC members	163	-0.96 (0.83)	50.4	22.9	1.4	25.3
	Audubon members	157	-0.86 (0.79)	53.5	29.4	1.1	16.0

Scale ranged from -2= "far too few"; -1= "too few"; 0 = "about the right amount"; 1= "too many"; 2="far too many".

Table 34. Frequency of stakeholder opinion regarding current abundance levels of 5 wildlife attributes in Southern Michigan.

Please indicat	e your opinion about the outhern Michigan.			% respor	nse of abunda	ance levels	
wildlife attribute	stakeholder	n	≅¹ (SD)	Too few	About the right amount	Too many	No opinion
	pure hunters	389	-0.51 (0.84)	27.1	46.3	4.0	14.3
songbirds	dual use hunters	423	-0.65 (0.83)	43.1	42.9	2.1	11.9
$(\chi^2 = 159.7$ p<.001)	nonconsumptive users	152	-0.88 (0.81)	57.2	28.9	1.7	12.2
	SC members	171	-1.15 (0.73)	62.4	16.1	0	21.5
	Audubon members	175	-1.26 (0.77)	76.0	17.1	0.5	6.4
	pure hunters	442	0.29 (1.01)	17.6	41.2	38.6	2.6
	dual use hunters	471	0.26 (1.02)	16.9	44.6	36.7	2.9
deer $(\chi^2 = 115.5$ p<.001)	nonconsumptive users	153	0.69 (0.87)	5.2	31.2	52.0	11.5
	SC members	187	0.88 (0.90)	3.6	23.9	58.2	14.3
	Audubon members	173	0.94 (0.94)	3.7	24.6	64.2	7.5
	pure hunters	340	-0.43 (0.84)	26.9	43.6	4.5	25.1
frogs &	dual use hunters	393	-0.58 (0.85)	35.5	42.7	3.7	18.1
amphibians $(\chi^2=70.6 p<.001)$	nonconsumptive users	134	-0.63 (0.86)	35.9	38.2	3.5	22.5
	SC members	151	-1.01 (0.87)	45.0	23.4	0.9	30.8
	Audubon members	161	-1.12 (0.95)	59.3	24.1	2.6	13.9
	pure hunters	404	-0.45 (0.89)	39.7	40.7	8.8	10.8
	dual use hunters	450	-0.62 (0.95)	48.8	36.9	8.2	6.2
ducks (χ ² =40.0 p<.001)	nonconsumptive users	141	-0.28 (0.72)	24.3	50.3	6.9	18.5
	SC members	147	-0.29 (0.82)	21.5	38.5	7.3	32.5
	Audubon members	169	-0.33 (0.71)	32.6	39.6	12.8	15.0

Table 34. (Cont.)

	te your opinion about thouthern Michigan.	e currer	nt level of each	% respo	nse of abund	ance level	s
wildlife attribute	stakeholder	n	≅ (SD)	Too little	About the right amount	Too much	No opinion
	pure hunters	404	-0.37 (0.64)	27.3	60.6	1.1	11.1
wildlife	dual use hunters	429	-0.49 (0.69)	38.3	49.8	1.2	10.6
diversity $(\chi^2 = 75.6 \text{ p} < .001)$	nonconsumptive users	144	-0.54 (0.73)	36.4	45.1	1.7	16.7
p,	SC members	168	-0.97 (0.80)	51.4	25.7	0	22.9
	Audubon members	169	-0.79 (0.83)	50.2	39.0	1.1	9.6

Scale ranged from -2= "far too few"; -1= "too few"; 0 = "about the right amount"; 1= "too many"; 2="far too many".

Table 35. Frequency of stakeholder opinions regarding current abundance levels of 4

recreational opportunities in Southern Michigan.

	e your opinion about the outhern Michigan.	e current	t level of each	% respor	se of abunda	ance levels	3
recreational opportunities	stakeholder	n	▼ ¹ (SD)	Too few	About the right amount	Too many	No opinion
	pure hunters	372	-0.50 (0.75)	35.5	44.1	2.4	18.1
places to	dual use hunters	445	-0.68 (0.72)	50.6	41.5	0.6	7.3
observe & study nature	nonconsumptive users	153	-0.74 (0.77)	55.5	31.2	1.8	11.5
$(\chi^2 = 75.5 p < .001)$	SC members	192	-0.96 (0.72)	63.3	24.7	0	12.0
	Audubon members	175	-0.95 (0.74)	68.5	39.0	1.1	9.6
	pure hunters	441	-1.08 (0.81)	70.5	26.0	0.6	2.6
places to go hunting $(\chi^2 = 546.7 \text{ p<.001})$ access to hiking trails $(\chi^2 = 58.3 \text{ p<.001})$	dual use hunters	469	-1.05 (0.87)	70.4	25.4	1.8	2.3
	nonconsump. users	119	0.35 (1.03)	9.8	36.4	22.6	31.3
	SC members	130	0.64 (0.98)	5.0	25.2	29.4	40.3
	Audubon members	120	0.30 (0.93)	8.1	38.5	17.7	35.9
	pure hunters	347	-0.39 (0.73)	27.6	45.8	3.1	23.6
	dual use hunters	394	-0.50 (0.77)	33.8	46.3	2.0	17.9
	nonconsumptive users	145	-0.58 (0.81)	42.2	38.7	2.9	16.2
	SC members	191	-0.84 (0.81)	55.5	31.2	0.9	12.4
	Audubon members	159	-0.72 (0.68)	51.3	33.2	0.5	14.9
**************************************	pure hunters	436	-0.64 (0.89)	40.5	53.3	2.2	3.9
	dual use hunters	466	-0.55 (0.78)	40.4	55.2	1.4	2.9
places to go fishing (χ²=55.9	nonconsumptive users	139	-0.84 (0.81)	19.1	56.6	4.6	19.7
p<.001)	SC members	152	-0.22 (0.70)	15.6	51.8	2.3	30.2
	Audubon members	153	-0.20 (0.74)	18.1	58.8	4.8	18.2

Scale ranged from -2= "far too few"; -1= "too few"; 0 = "about the right amount"; 1= "too many"; 2="far too many".

little of everything else. The only directional disagreement existed over the item "access to hunting opportunities" where both pure hunters (\bar{x} = -1.14) and dual user hunters (\bar{x} =-1.12) thought that too few opportunities existed while nonhunting stakeholders thought there were too many (Table 35).

Sheffe's post hoc comparisons indicated that there were no differences between SC members and Audubon members in mean ratings on any of the 13 categories. Though mean scores did not differ between SC members and Audubon members, SC members were unique among all stakeholder types in that a sizeable portion checked "no opinion" to many of the attribute items (Tables 33,34,35). This included a sizable portion (>30 %) who checked "no opinion" on current levels of frogs & amphibians, waterfowl, places to hunt, and places to fish. Between one-fifth and one-third checked no opinion on many of the other items (Tables 33,34,35). This may reflect an unwillingness by some SC members to offer an opinion not based on direct experience as this group was characterized by lower participation in wildlife related recreation and lower visitation rates to study area public lands than any of the other groups (Table 15).

Pure hunters differed significantly from SC members and Audubon members on all attributes except for "number of ducks" (Table 34). Overall, hunters rated shortages of most attributes as being less severe than did non-hunters. Dual use hunters acted very much like hybrids in their evaluation of abundance ratings, differing from hunters on 5 of 13 and from Audubon members on 8 of 13.

Judging by mean scores and percent responses in each category, pure hunters appear generally more satisfied with current conditions in Southern Michigan. While pure

hunters are more likely to respond that there are "too few" of a given attribute than "too many" (with deer being the exception), a plurality feel there is "about the right amount" of grasslands (47.3%), pine forests (42.8%), songbirds (45.6%), frogs and amphibians (44.2%) and ducks (41.2 %).

Two attributes that pure hunters were most concerned with are the amount of hardwood forests and lack of hunting opportunities. A majority of both pure hunters and dual hunters rated these attributes as lacking (Table 33). Of the five wildlife characteristics, the number of ducks received the highest percentage of "too few" responses among both pure hunters (40.7 %) and dual use hunters (52.8%).

Concern for the amount of all four ecosystem types was higher among environmental organization members when compared to both hunters and nonconsumptive nonmembers. In all but one instance, a <u>majority</u> of Audubon and Sierra Club members thought there were too few pine, hardwoods, wetlands, and grasslands (only 48.1 % of Audubon members thought there were too few pine) (Table 33). Among the nonhunting stakeholders, the abundance of hardwoods, wetlands, songbirds, and frogs & amphibians appear to be the most serious concerns (Table 33 and Table 34).

Though a majority of each stakeholder group felt there were too many deer in Southern Michigan, fewer hunters thought deer were overabundant than did their nonhunting counterparts. A clear majority of both Audubon members (63.8%) and SC members (58.3%) thought there were too many deer, compared to only 37.1% of the pure hunters and 35.5% of dual-use hunters.

There were no differences between pure hunters and nonhunting groups regarding number of waterfowl (Table 34). Curiously, dual use hunters rated waterfowl shortages as significantly greater than the other four stakeholders, perhaps indicating an additive effect of both consumptive and nonconsumptive values for that attribute. Hunters and non-hunters rated places to go hunting as significantly fewer than either nonhunting stakeholder group.

Finally, in most cases, Audubon and SC members were more extreme than either types of hunters in their attitudes about shortages in the attribute types. These differences were significant for the number of songbirds, frogs and amphibians, and level of wildlife diversity (Table 34). For example, a clear majority of both Audubon birders (76.8%) and SC members (62.0%) thought there were too few songbirds compared to only a quarter (25.8%) of the pure hunters. Dual use hunters were more likely than pure hunters to think there were too few songbirds in Southern Michigan (Table 34). Hypothesis 23 and 24 were supported.

<u>Hypothesis 25</u>: Waterfowl hunters will perceive fewer ducks than will deer hunters; and deer hunters will perceive fewer deer than will waterfowl hunters.

There were also significant differences in attitudes toward ecosystem attributes among different types of hunters (Table 36). A couple of general patterns were apparent. Those hunters who said "gun-deer hunting" was their favorite tended to be most satisfied when it came to rating the 5 wildlife attributes. That is to say, gun-deer hunters rated shortages as less severe than did other types of hunters. Significantly fewer gun-deer hunters thought there were "too few" songbirds in Southern Michigan than every other

Table 36 ANOVA of differ

Table 30. ANOVA OF UNITEDITIES IN BELIEFS ABOUT AUTHORITIES ALL DELEGISTRE AUTHORITIES IN SOUTHERN MICHIGANING OF TYPES OF HUNITED STATES.	200	or arrive	CICILOCS	OCI I	icis anni	II abuill	alle	or ccosys	ובווו מו	non	cs III so	milein	IVIICI	iigaii Uy	types	or munic	6
			2	fean sc	ores and	(standa	rrd dev	Mean scores and (standard deviations) by favorite type of hunting	by fav	orite	type of h	unting					
Ecosystem	arc	archery deer	ser		gun deer	L	2	waterfowl	_	S	small game	ne	'n	upland birds	rds	Ц	Ĺ
attrioure	п	- IX	SD	п	ıx	SD	п	ıx	SD	п	ıx	SD	г	ix	SD	Ratio	Prob.
pine forests	259	-0.50	98.0	214	-0.54	0.87	157	69:0-	0.92	54	-0.68	1.00	55	-0.51	86.0	1.44	0.21
Hardwoods	267	-0.97	0.81	219	-0.97	08.0	165	-0.93	0.83	99	-1.10	0.84	29	-1.04	98.0	0.55	69.0
wetlands	273	-0.62	96.0	223	-0.55	1.02	177	-1.29 ^b	0.84	99	-0.62∞	1.18	29	-1:04k	66.0	18.8	0.001
grasslands	262	-0.59	0.88	211	-0.56ª	0.82	163	-0.79*b	0.87	55	-0.91ab	0.86	99	-1.01b	0.88	5.9	0.001
# of songbirds	232	-0.43	0.85	216	-0.72 ^b	0.83	151	-0.52ab	0.83	47	-0.95 ^b	0.90	09	-0.85h	0.85	7.0	0.001
# of deer	278	0.12	86.0	241	0.39b	1.01	180	0.45b	66.0	59	0.68 ^b	1.07	71	0.54 ^b	0.85	6.5	0.001
# of frogs	227	-0.45	0.84	188	-0.63ab	0.92	148	-0.73ab	06:0	49	-0.89b	0.94	61	-0.83ab	0.89	4.7	0.001
# of ducks	259	-0.49	0.89	222	-0.43*	0.91	181	-1.00 ^b	0.83	99	-0.53*	1.02	89	0.77ab	0.87	12.5	0.001
wildlife diversity	265	-0.41*	69.0	211	-0.45ab	99.0	168	-0.51ªb	89.0	54	-0.70ab	0.74	29	-0.74b	0.75	4.7	0.001

Table 36 (cont.)

Ĺ.	Prob.		0.15	0.05	0.46	0.44
	atio		1.17	2.72 0	06.0	0.92 0
Ĺ.	_ ~			1 2		
	oirds	SD	0.7	1.01	0.68	0.7
	upland birds	ıx	-0.57	0.85	-0.57	-0.51 0.70
20	'n	Ľ	89	70	99	89
nunting	me	SD	0.89	0.71	0.81	0.79
ype of l	small game	ıx	-0.71	-1.06	-0.53	65.0-
rite t	S	ב	48	59	49	57
y favo	-	SD	0.82	0.81	0.75	0.76
ations) t	waterfowl	ıx	-0.65	-1.17	-0.43	-0.47
rd devi		u	161	178	141	178
(standaı	L	SD	0.74	0.86	0.70	0.81
Mean scores and (standard deviations) by favorite type of hunting	gun deer	ıx	-0.75	-0.97	-0.52	-0.61
ean sc		Ľ	216	239	161	235
M	er	SD	0.71	0.84	0.75	0.79
	archery deer	ıx	-0.57	-1.13	-0.43	-0.53
	arc	u	257	279	231	279
	Ecosystem		Places to observe & study nature	Places to go hunting	Access to hiking trails	Places to go fishing

Scale ranged from -2 ="far too few"; -1 = "too few"; 0= "about the right amount"; 1= "too many"; 2 = "far too many".

^{abc} Different letters indicate significant differences in the mean scores across the rows (Sheffe's post hoc <.05).

type of hunter except waterfowlers. Additionally, gun-deer hunters differed from all four other types of hunters in their attitudes toward the deer herd in Southern Michigan. The mean score for gun deer hunters (\bar{x} = -0.12) was the lowest of any group suggesting that most of this group did not perceive an overabundance of deer.

Waterfowl hunters rated the number of wetlands and ducks as "too few" on average. They differed from all groups except upland bird hunters in their mean score for current amounts of ducks (Table 36). Similarly, waterfowl and upland bird hunters were also similar in their differences with the other three types of hunters in their attitudes toward wetlands. Both of these groups differed significantly from deer and small game hunters in their mean ratings for the amount of wetlands in Southern Michigan.

Hypothesis 25 was supported.

<u>Hypothesis 26</u>: Public land hunters will perceive fewer places to hunt, fewer deer and fewer ducks than will non-public land hunters.

<u>Hypothesis 27</u>: There will be no differences in perceived abundance levels of all wildlife attributes between non-hunters who visit public lands and those who do not.

Mean scores of site-users versus non-site users were compared for both hunters and non-hunters on each of the four public lands using independent sample t-tests. In general there few significant or meaningful differences that emerged based on site-use among hunters or non-hunters. The only exception was for mean scores of on-site hunters at each of the four properties which indicated more severe shortages of "places to go hunting" than the ratings of hunters who did not use a given public land. This finding

suggests that the attitude measures are reflecting preferences to some extent rather than objective evaluations of amounts of various attributes. Hypotheses 26 and 27 were partially supported.

Attitudes toward ecosystem management

Assessing stakeholder attitudes toward ecosystem management proved to be the most challenging aspect of this research due to the difficulty in explicating and measuring the ecosystem management attitude as a uni-dimensional construct. An exploratory factor analysis performed on the nine ecosystem management trade-off questions yielded a two factor solution that did not achieve face validity upon examination of their factor loading. In other words, there was no justifiable, theoretical reason to accept the factors as selected by the SPSS analysis. Similarly, attempts to achieve acceptable alpha reliabilities using the exploratory factors failed. This likely reflects the complexity of ecosystem management as a multi-dimensional concept for which individuals may have as many attitudes as there are dimensions.

<u>Hypothesis 27</u>: Hunters will be less supportive of ecosystem management options in the tradeoffs than non-hunters.

<u>Hypothesis 28</u>: SC members will be more supportive of ecosystem management options than either of the other exclusive stakeholder groups.

We will consider results for overall responses to nine trade-offs collectively and to each question individually. To assess an individual's overall ecosystem management attitude, a scale was created by collapsing the agree and strongly agree responses and assigning them a value of one (+1). The disagree and strongly disagree responses were collapsed and assigned a value of negative on (-1). Undecided were left at zero (0). Each

person's ecosystem management score became the sum of the responses to the nine items. The respondents were then sorted into three categories based on percentile scores of this distribution. The lowest 25 % of respondents was given a categorical value of one indicating "low ecosystem management support". The middle 50 % of the responses were assigned a value of 2-- "medium ecosystem management support". Finally, the highest 25% of the scores were assigned a value of 3, indicating "high ecosystem management support".

Overall, ecosystem management attitudes across all groups might be described as slightly positive, but there were a substantial number of undecided responses on many of the trade-off questions. Few significant group differences emerged either on individual items on the ecosystem management index score (Tables 37 and 38). Sierra Club members were more likely to be among the highest supporters of ecosystem management than were other stakeholders, including hunters (χ^2 =50.0, 8 df, p<.0.001). About 44 % of SC members wound up in the highest category of support for ecosystem management compared to about one-third of the hunters. Meanwhile, a solid majority (69 %) of the nonconsumptive non member wildlife users were in the medium support category.

All hunters who participated in waterfowl hunting (not just those who indicated it was their "favorite") tended to score slightly lower on the ecosystem management index than non waterfowl hunters (Table 39). Of particular interest is that the only statistically significant differences among state game area hunters was among Shiawassee River waterfowl hunters who tended to score slightly lower than other hunters on the ecosystem

0.01

3.47

-0.14≈

0.18^b (0.97)

0.16 (0.98)

-0.04≈ (1.01)

0.02*

on public lands to develop corridors that connect public, private, and Q46. ... divert DNR staff time and resources from managing wildlife

commercial lands.

(0.96)

ecosystem types that have been lost or degraded.

(0.87)

0.18 0.00 Prob. 0.29 0.60 0.1 0.57 щ Ratio 32.6 1.56 0.72 1.86 1.23 99.0 nonmember Table 37. Analysis of variance of the stakeholder mean scores on the ecosystem management trade-off questions -0.11b Noncon. n=114 0.42 (0.90) 0.66 (0.79) (0.90)(0.91)1.09 -0.1 0.48 Mean scores 1 and (standard deviations) among members 0.38 (0.95) 0.61 (0.92) -0.10 (0.96) 1.20 0.65 0.62 (0.98) n=212 SCstakeholders members Audubon n=1821.15 (0.97) 0.42 -0.01 0.35 (0.95) 0.41 (1.03) 0.51 (1.03)dual use hunters n=3940.37 1.27 (0.90) 0.52 (1.02) 0.61 0.55 -0.01 (0.96) hunters n=359 (0.91)0.28 (1.02) (1.04)0.50 (1.02) 0.52 1.29 0.45 0.01 On public lands pictured on the study area map, resource conservation, and groundwater recharge) even if it means providing Q45. ... enhance existing ecosystems for wildlife rather than restore lowering the populations sizes of some common species of wildlife Q40. ... maintain biodiversity throughout the area, even if it means rather than allowing populations to go through natural fluctuations. opportunities for economic benefits from logging are passed up in wildlife recreation and scenic beauty even if it curtails ecosystem Q41. ... set aside some forested areas for 100 years even though Q42. ... always maintain game species at high population levels Q43 ... manage ecosystems to meet specific public demands for Q44. ... sustain ecosystem processes (e.g. nutrient cycling, soil fewer opportunities for wildlife recreation processes & functions managers should.. the short term.

On public lands pictured on the study area map, resource	Mean	scores ¹ an	d (standard d stakeholders	Mean scores 1 and (standard deviations) among stakeholders	among	ŗ	ţ
managers should	pure hunters n=359	dual use hunters n=394	Audubon SC members mer n=182 n=2	SC members n=212	Noncon. nonmember n=114	Ratio	Frob.
Q 47 divert efforts from game species management to focus more on non-game species of wildlife.	-0.18* (1.14)	-0.16* (1.10)	-0.09* (1.07)	0.21 ^b (1.10)	0.31 ^b (0.90)	8.37	0.001
Q48 introduce plants from other countries that provide good food for wildlife species even if the introduced plants eliminate native plant types.	1.05 (0.98)	1.07 (0.89)	0.99	1.04	0.99	0.30 0.87	0.87

¹Mean scores reflect recoded values which gave positive scores for "pro-ecosystem management" responses. These ranged from +2 for a strong positive response to -2 for a strong negative response.

^{ab} Different letters across rows indicate significant mean differences (Sheffe's post hoc comparison, p<.05)

Table 38. Frequencies of stakeholder support on the ecosystem management attitude index.

Mutually exclusive stakeholder groups	n	•	system management χ^2 =50.0, 8 df, p<.00	* *
		% Low (1)	% Medium (2)	% High (3)
pure hunters	353	23.8	40.8	35.4
dual use hunters	387	33.1	40.3	36.2
Audubon members	176	23.9	46.0	30.1
Sierra Club members	206	18.9	36.9	44.2
Nonconsumptive nonmembers	111	17.1	68.5	14.4

Categories were created from the distribution of ecosystem management attitude index scores. "Low support" represents the lowest 25 % of the distribution of index scores. "Medium support" represents the middle 50 % and "high support" is the upper 25 % of the distribution.

Table 39. Frequency of categorical ecosystem management support comparing waterfowl hunters with (non-waterfowl) hunters.

Stakeholder type	1	orical ¹ support management ar s		n	χ²	Sig.
	Low	Medium	High			
waterfowl hunters	29.7	41.5	28.9	515	10.8	0.01
all other hunters	21.2	43.5	35.3	518		

¹ Ecosystem management support categories were created from the frequency distribution of the combined scale score of responses to all nine ecosystem management trade-off questions. Low support respondents were those in the lowest 25 % of the distribution. Medium support was assigned to those from the 26-74% and high support was assigned to the highest 25 % of the scale scores.

management index. No significant differences on ecosystem management scores were observed among any other type of hunter for any of the game areas.

Among the individual trade-off items, significant stakeholder group differences emerged on three of the nine questions (Table 37). On item # 43, nonconsumptive nonmembers were more likely to agree "that ecosystems should be managed to meet specific demands for wildlife recreation and scenic beauty, even if it curtails ecosystem processes and functions" than were any other stakeholder group (F=13.8, p<.01). In fact, almost forty percent of nonconsumptive users agreed with the statement--almost twice as many as any of the other groups: pure hunters (19.6%); dual-use hunters (21.3%); SC members (12.3 %), and Audubon members (17.1%). There were also significant group differences on the question of whether managers should "divert efforts from game management to focus more on non-game species of wildlife". On this matter, both nonconsumptive nonmember wildlife users and SC members were more likely to endorse this statement than pure hunters, dual user hunters and Audubon Society members $(\chi^2=56.9, 4 \text{ df}, p<0.001)$ (Table 40). Mean scores for groups on this item indicate that nonconsumptive users (\bar{x} =0.16) and SC members (\bar{x} =0.21) slightly favored placing more emphasis on nongame species, while the other three stakeholder groups were slightly opposed to the idea on average (Table 40).

Table 40. Frequency responses of stakeholders to ecosystem management trade-off

dealing with efforts to increase nongame management.

$\chi^2 = 56.9$ 8 df p<.001	On the public land areas pictured in the study area, resource managers should divert efforts from game species management to focus more on nongame species					
	n	% Agree	% Undecided	% DISAGREE		
pure hunters	359	30.1	28.4	41.5		
dual use hunters	396	29.0	27.3	43.7		
Audubon members	183	33.3	26.2	40.4		
SC members	213	46.9	24.9	28.2		
nonconsumptive wildlife users	113	44.2	37.2	18.6		

Two of the nine ecosystem management trade-offs produced a clear consensus among all stakeholders. When confronted with a choice between establishing areas of mature (old growth) forests and generating economic benefits through logging, 84.5 % of all respondents opted for the forested areas (Table 41). Only 7 % thought logging should take precedence. A similar mandate emerged in response to the trade-offs of native plants versus exotic plants. Even when told that the exotics provided good food for wildlife, 77% of respondents--including hunters-- agreed that managers should favor native species (Table 41).

At the other end of the spectrum were two ecosystem management questions that were "toss-ups" for the survey respondents. Items # 45 and 46 addressed the issues of ecosystem restoration and development of corridors between private and public lands respectively. Over one third of the respondents were undecided and the remainder were

Table 41. Frequency responses of pooled stakeholders to ecosystem management trade-offs in which no significant differences were observed between groups.

	STRONGLY	AGREE	UNDECIDED	DISAGREE	STRONGLY	0	SD
On these areas, resource managers should	AGREE				DISAGREE	Κ	
Q40 maintain biodiversity throughout the area, even if it means lowering the populations sizes of some common species of wildlife there.	%0'6	39.9%	31.5%	16.5%	3.2%	0.35	0.97
Q41 set aside some forested areas for 100 years even though opportunities for economic benefits from logging are passed up in the short term.	47.8%	36.7%	8.4%	8:5%	1.7%	1.23	0.97
Q42always maintain game species at high levels rather than allowing populations to go through natural fluctuations.	4.4 %	13.8%	18.9 %	% 6:15	11.0%	0.51	1.01
Q44 sustain ecosystem processes (e.g. nutrient cycling, soil conservation, and groundwater recharge) even if it means providing fewer opportunities for wildlife recreation.	15.2%	42.2%	25.4%	14.5%	2.7%	0.53	1.00
Q45 enhance existing ecosystems for wildlife rather than restore ecosystem types that have been lost or degraded.	3.8%	27.6%	35.3%	28.2%	5.2%	-0.03	96.0
Q48 introduce plants from other countries that provide good food for wildlife species even if the introduced plants eliminate native plant types.	1.7%	6.2%	14.9%	40.6%	36.7%	1.04	96.0

 Mean scores reflect recoded values which gave positive scores for "pro-ecosystem management" responses. These ranged from +2 for a strong positive response to -2 for a strong negative response.

evenly split in each case. Among the other ecosystem management items, there was no clear direction of opinion (Table 41). These responses indicate that wildlife stakeholders are hesitant to give up the benefits provided by existing management in order to obtain the restoration of a degraded ecosystem or the development of wildlife corridors

Overall, the evidence for hypotheses 27 and 28 is inconclusive. With the exception of the question of promoting nongame management, the other trade-offs do not produce clear patterns of differences among stakeholders. But when summed as an index, the slight differences on individual items do suggest Sierra Club members are more supportive than are the other groups.

<u>Hypothesis 29</u>: Hunters who use the study site public lands will be less supportive of ecosystem management than other hunters.

Independent samples t-test comparisons of on-site versus off-site hunters on mean scores on all nine ecosystem management items showed no significant differences.

Hypothesis 29 was not supported.

<u>Hypothesis 30</u>: Most of the nonhunting, non-organization member respondents will be undecided about (most) ecosystem management trade-off options.

Nonhunting, non-organization members (n=190) were selected from the 1998 survey respondents. A larger percentage of this group was undecided on all nine questions than were the 1997 stakeholders. Undecided was the most frequent response for this group on three of the nine trade-off questions. These three items addressed the issues of ecosystem restoration, corridors, and nongame management. Respondents leaned slightly toward disagreeing that restoration should be given priority over management of existing ecosystems and toward diverting DNR staff time to developing

public-private corridors. They also tended to slightly oppose wildlife corridors. Overall, nonhunting, nonmember wildlife enthusiasts did seem to have opinions about ecosystem management applications on state lands. Hypothesis 24 was not supported.

<u>Hypothesis 31</u>: Support for ecosystem management trade-offs will be higher among urban residents, females, and college educated individuals for both hunters and non-hunters.

The demographic variables were treated as categorical, independent variables and the responses to the trade-offs were treated as interval, dependent measures. Again, the sample was split and analysis was repeated for both hunters and non hunters. Demographic variables of gender, level of education, and size of residence, were not significant predictors of the ecosystem management index scores for hunters. Level of education was the only demographic variable to produce significant differences among non-hunters (χ^2 =20.0, 6 df, p<.01). In general, as level of education increased so did the percent of non-hunters who were among the medium and highest category of positive ecosystem management attitudes (Table 42).

There were a few relationships of note that emerged among non-hunters. Level of education appeared to have a positive effect on ecosystem management attitude for managing old growth forest, naturally fluctuating wildlife populations, and ecosystem processes. Two significant relationships were observed based on the gender of non-hunters. Females were more likely to be undecided about whether ecosystem processes should be maintained if scenic beauty and wildlife recreation were diminished. Male non-hunters were more likely to support restoration while female non-hunters were undecided.

Table 42. Frequency of categorical ecosystem management support based on levels of education

ducution						
Level of education	% of categorical ¹ support for ecosystem management among stakeholders			n	χ²	Sig.
	Low	Medium	High		5.52	
high school diploma or less	28.1	41.5	30.4	427	19.9	.01
associate degree or technical school	22.7	49.0	28.3	674		
bachelor's degree	23.7	40.1	36.3	342		
advanced degree	19.3	43.9	36.9	358		

Ecosystem management support categories were created from the frequency distribution of the combined scale score of responses to all nine ecosystem management trade-off questions. Low support respondents were those in the lowest 25 % of the distribution. Medium support was assigned to those from the 26-74% and high support was assigned to the highest 25 % of the scale scores.

Both of these cases provide counter evidence to the idea that women have more positive ecosystem management attitudes than do men. Additionally, the other seven trade-offs revealed no differences between men and woman. Despite the few significant results observed, the data do not provide a strong case in support of hypothesis 31.

Demographics do not appear to be strong predictors of attitudes toward ecosystem management in Southern Michigan.

Model Testing

Separate path models of stewardship were tested for hunters and non-hunters. In each case, both components of the full SEM--the measurement model and the path model of latent variables -- were tested simultaneously. Maximum likelihood estimation

procedures were used in all cases. In addition to testing separate theoretical models of stewardship for hunters and nonhunters, different testing methods were employed to demonstrate (test-drive if you will) the features of the LISREL program. For hunters, the same linear model was tested using a large sample and a small sample of hunter respondents to compare the effects of sample size on parameter estimates and fit statistics. For nonhunters, the respondents were split into two halves and different models were tested on each half. The first half was used to test the hypothesized stewardship model, while the second half of the sample was used to test a revised model using LISREL modification indices. Results for the hunter model (Figure 10) will be discussed first.

Goodness of fit statistics for the hunter model of stewardship suggest a reasonable fit to the data. The global test of the model produced a significant χ^2 =258.27 (86 df, p=.000) with a sample size= 801. A significant (and large) Chi-square indicates that the data do not fit the proposed model. However, other fit statistics produced more encouraging results. Both the Goodness of Fit Index (0.96) and the Normed Fit Index (0.96) are acceptably high, and the Root Mean Square Residual (0.048) is very low (Table 43). GFI is the ratio of the sum of squares accounted for in the model over the total sum of squares of the estimated population matrix. Generally values in the 0.8 or 0.9 range are deemed as an adequate fit of the model (Jörsekog and Sörbom 1996). The NFI measures how well the model fits the data compared to a baseline model with no common factors among the observed variables. Again, this value ranges from 0 to 1.0 and is interpreted similarly to the GFI (Fulton et al. 1996).

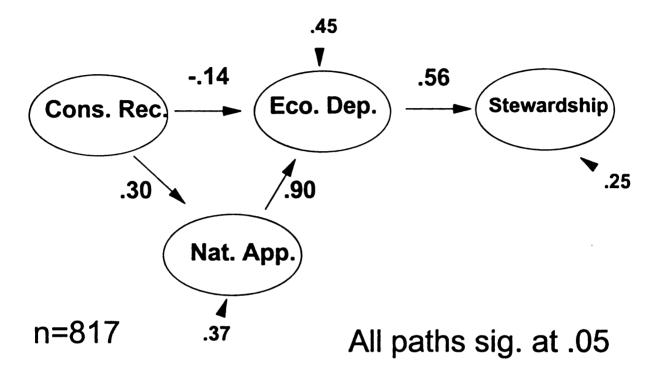


Figure 10. Estimated path coefficients and structural error terms from the ecosystem stewardship model for Hunters (full sample) on LISREL 8.0

Large sample size was likely a major influence on the large χ^2 value. Marsh and Hocevar (1985) proposed one modification of the χ^2 test which they suggest is a more suitable assessment of models with large sample sizes. Their modification looks at the ratio of the χ^2 to the degrees of freedom. According to Marsh and Hocevar, a χ^2 /df ratio ranging from 2:1 ro 5:1 is acceptable. Fulton et. al (1996) used this modification ratio as an important criterion in accepting the fit of hypothesized structural equation models to predict the intention to engage in wildlife recreation in Colorado.

Table 43. LISREL output fit statistics for causal stewardship models.

	Hunt	Hunters Non-hunters		unters
Select Fit Statistics	Full sample n=801	Subsample n=125	Original model n=300	Model based on modifications n=300
χ²	258.27 p=.000	103.0 p=.063	225.91 p=.000	175.63 p=.000
χ^2 for independence model	6145.8	1242.2	2177.4	2177.4
Root mean square residual	0.048	0.058	0.006	0.044
Goodness of Fit index	0.96	0.90	0.89	0.91
Normed Fit Index	0.96	0.92	0.90	0.92
Parsimony Normed Fit Index	0.78	0.71	0.73	0.74
Comparative fit index	0.97	0.98	0.93	0.96
Relative fit index	0.97	0.98	0.87	0.90
Critical N	370.9	137.6	126.3	160.5

The current model yields an adjustment ratio of 3.01 which suggests an acceptable model fit. A word of caution is necessary. As with all the fit indices in structural equation

modeling, decisions about acceptability of model fit must be made tentatively because conventional standards for value cut-offs such as Cronbach's alpha (e.g., >.7) have not been established. Furthermore, the Marsh and Hocevar Chi-square adjustment may be arbitrary because the ratio seems to correct for number of variables in the model (i.e., degrees of freedom) rather than sample size (A. Mertig, MSU, pers. com).

In order to assess the influence of the large sample size on the evaluation of model fit, the hypothesized stewardship model for hunters was re-tested using a sub-sample of the larger data pool. A second covariance matrix of the same variables was created in SPSS by taking a random sample of 15 % of hunter cases from those in the first sample population in order to obtain a smaller size (n=125).

An identical linear model was then re-run in LISREL to assess the effects of sample size on fit statistics. The smaller sample model yielded a significant, but substantially smaller χ^2 value of 106.94 (86 df, p=.006), providing additional support that the proposed global model of hunter stewardship fit the data adequately. However, an examination of the estimates of individual path co-efficient shows that improvements could be made. Results indicated that three of the four hypothesized links in the model were significant predictors within the model. Consumptive recreation value was a significant predictor of nature appreciation (γ =0.44, t=4.06, p<.01). The paths from nature appreciation to ecological dependence (β =0.73, t=5.61, p<.01) and from ecological dependence to stewardship (β =0.74, t=6.91, p<.01) were also significant) (Figure 11). The path from consumptive recreation to ecological dependence was not significant. It is interesting to note that a reduced sample size not only effected the size of the Chi-square

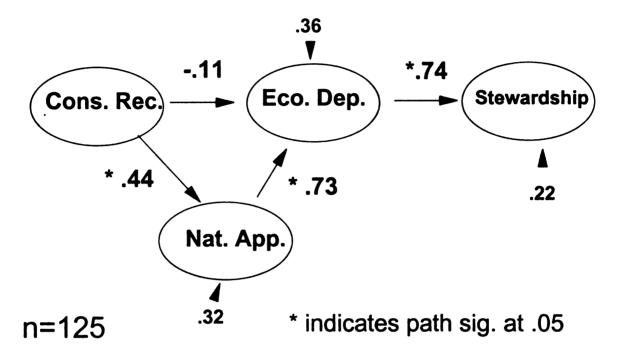


Figure 11. Estimated path coefficients and structural error terms from the ecosystem stewardship model for Hunters (small sample) on LISREL 8.0

value for the model, but it also reduced the statistical power of path parameter estimates. The path from ecological dependence to stewardship (γ =-0.14) was significant in the larger sample size test, but not significant in the small sample test. These findings suggest that hunter's value for ecological dependence does not result directly from their consumptive recreation values (and may in fact be negatively associated), but indirectly through nature appreciation. The hypothesized model was partially supported.

In order to take advantage of modification specifications provided with each LISREL data output, a split sample approach was taken to test the non-hunter model of stewardship. Since the appropriateness of retesting models on the same sample is generally frowned upon, treating the sample as two separate populations allows the researcher to investigate post-hoc improvements to model assessment (Bollen 1989). Fifty percent of the non-hunter cases were randomly selected in an SPSS spread sheet and the other cases were saved as a separate file. Separate covariance matrices were constructed for each half. The covariance matrix for the first half of the non-hunter sample was used to test the hypothesized model. Both the measurement and structural path model were tested simultaneously.

The initial test of the hypothesized non-hunter model of stewardship yielded a significant χ^2 of 225.9, 86 df, p=.000. Though several of the other goodness of fit measures suggested a moderate fit (Table 43), the path between ecological dependence and stewardship was not significant (t=-0.33) (Figure 12). Therefore, a second non-hunter model was tested using the path modifications suggested by LISREL (Figure 13).

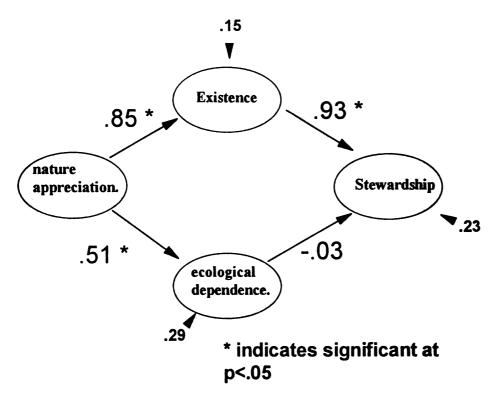


Figure 12. Estimated path coefficients and structural error terms from the ecosystem stewardship model for nonhunters on LISREL 8.0

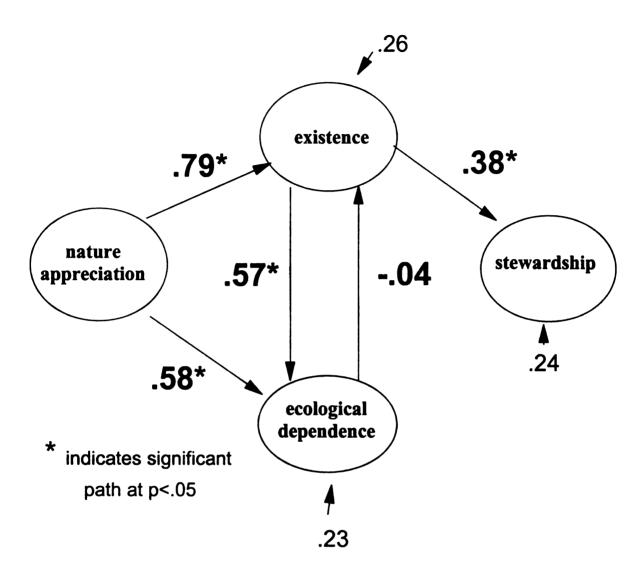


Figure 13. Structural equation model results of non-hunter stewardship based on revised LISREL model.

The revised model yielded a non-significant Chi-square = 175.6, 85 df, p=. 000). In addition, the goodness of fit scores for the revised model represented improvements over the original model (Table 43). All but one of the paths were significant predictors in the revised model (Fig.12). Nature appreciation value predicted both stewardship (γ =.58, t=5.57, p<.01) and existence value (γ =.79, t= 7.72, p<.01). Existence value was also a significant predictor of stewardship (β =.38, t= 3.89, p< .01), though the magnitude of its effects on stewardship were greatly reduced compared to the initial model.

The revised model suggests that existence value may contribute to one's sense of ecological dependence (β=.57, t=6.22, p<.01), but that the relationship is non recursive. Contrary to the path modification that ecological dependence and existence value reinforce each other, the path from former to the latter was not significant (t=-0.33) once the effects of other variables were controlled. This leaves in doubt the role of ecological dependence in the development of stewardship. Like the hunter model, it appears a more direct and parsimonious model would eliminate the ecological dependence value as a significant predictor of ecosystem stewardship. This has important implications for education and persuasive attempts to increase support for ecosystem management goals centered around maintaining ecosystem functions and services. These will be discussed in the following chapter.

Chapter 5

DISCUSSION

Overview

This study sought to improve our understanding of stakeholder attitudes and values for the management of ecosystems in Southern Michigan and to examine the potential influence of these values on an individual's commitment to ecosystem stewardship. These objectives were achieved and the results offer both meaningful theoretical contributions and pragmatic management implications for resource managers seeking to implement ecosystem management principles.

The key findings and their theoretical and/or management significance are organized in the following manner. The utility of the ecosystem values cube will be briefly discussed. Next, the major findings related to stakeholder ecosystem values, attitudes regarding current ecosystem conditions and attitudes toward ecosystem management principles are considered individually. There are some "nuts and bolts" implications of these findings for agency communication and public involvement efforts that are included within each of these sections. This is followed by a section which pulls together the "big picture" messages and implications that can be gleaned from the overall results of this study. Lastly, results from the models of ecosystem stewardship are discussed along with their theoretical significance. This chapter begins with a look at the limitations of this study.

Limitations

This research sought to develop profiles of the attitudes and values of key

stakeholder groups that were identified prior to data collection. The rationale of focusing on key recreation users of the state lands, as well as two prominent environmental organizations--The Sierra Club and the Audubon Society-- has already been described in the methodology. However, all decisions come with trade-offs and there are many other important stakeholders that were not surveyed that do warrant attention if the DNR wants to build public support for ecosystem management. Two in particular come to mind. Although "recreational play space" was not found to be a high priority benefit among the users described in this study, national recreational trend surveys suggest that there will be growing demands placed on public lands for activities like mountain biking, riding ORV's, and other activities that have strong potential to impact wildlife, habitat, and wildlife stakeholders--both consumptive and nonconsumptive. Therefore, the low importance that this study's stakeholders placed on play space opportunities should not be taken as a way to dismiss those interests.

Another extremely important stakeholder group not included in this study is adjacent landowners of the public land areas. The significance of this group in the success of ecosystem management almost goes without saying. Landowners have the potential to contribute to or impede the achievement of both ecological and sociological objectives. Landowner support or opposition to public land management is one important consideration. But another important consideration is the contributions that private land management can play in the achievement of both ecological and sociological goals. By coordinating ecosystem management objectives with cooperating landowners, wildlife managers have more flexibility with regard to providing adequate ecological

representation of vegetative cover types and successional stages (Haufler et al. 1996) than if they are forced to utilize public lands exclusively. Additionally, fostering more opportunities for hunter access onto private lands could help offset declines in public land hunting opportunities if increased emphasis on ecological objectives should result in less emphasis placed on game species management.

Another limitation of this study was created through the sampling design. The results of this study provide profiles of the attitudes and values of certain types of stakeholders, but they do not speak to the relative proportion of those views in the Southern Michigan population. There are two dimensions of this limitation. One is that these results are not applicable to the general public at large. The inadequate response rate derived from the 1998 mail survey of driver license holders prevented the exploration of the frequency of stakeholder types within the general public. Two, the over sampling of waterfowl and archery deer hunters during the 1997 survey limits the generalizability of the attitudes and values results to all hunters. Although there was utility in segmenting hunters into "pure hunter" and "dual-use hunter" categories, the reader needs to keep in mind that both of these segments contain a higher percentage of archery and waterfowl hunters than would be found in a random sample of southern Michigan hunters. Therefore, the results reflect differences in proportion of hunter types and the extent to which value or attitude differences do occur among types of hunters. While these differences are not substantively dramatic, caution must be exercised when generalizing the results even within hunter segments. Any attempts to talk generically about the

attitudes of all hunters in Southern Michigan is problematic because the differences resulting from type of hunting preference are magnified in this sample.

The values "cube" revisited

A major portion of this study was guided through the operationalization of a three dimensional ecosystem values model (Figure 1). Before discussing the results of data and the implications for management, I thought it appropriate to discuss the utility of the model in helping achieve the goals of this study. The conceptual values model provides on good organizational framework for bringing together the multi-dimensionality of values that are found in the literature. As the model depicts, values can exist within societies and cultures and with present and future implications. However, values measured in this study were limited to individual's preferences for various ecosystem benefits.

The benefit categories served the purpose of this project well. The development of valid and reliable measurements for these six benefit constructs was successful. The results which will be discussed momentarily give guidance to managers in terms of describing the broad and diverse values shared across groups. Though the value results do not provide "a cookbook" for management goals, they do provide a starting point in establishing goals based on multiple values as called for in the ecosystem management literature.

Future attempts to utilize these benefit categories should adjust experiment with adjusting measurement items to attempt to capture more variance within samples without losing the unidimensionality of constructs.

The results of the exploratory factor analysis of outdoor recreations revealed the

potential existence of two categories of play space-- "fresh air" activities (e.g., cross country skiing) and "machine-based" sports (e.g., riding jet skis). This split makes intuitive sense, but needs further investigation to verify empirically. Certainly, demands for each type of play space would pose different challenges for the MDNR.

Ecosystem values

The results demonstrate that all stakeholders in this study place strong value on several categories of ecosystem benefits. In an absolute sense, all groups thought that nature appreciation, ecological dependence and existence benefits were important. In addition, hunters placed high importance on consumptive recreation benefits. All groups also placed low importance on play space and extractive benefits of public land management in Southern Michigan. The low priority assigned to play space may to some degree reflect stakeholder acceptance of current laws that forbid the use of motorized recreation on state lands in Southern Michigan. If that is the case, these scores may be under representing the potential demand for such activity if it were legalized. Similarly, the low priority of extractive benefits may also reflect the Southern Michigan application of the questions and could yield very different results if another geographic area was specified.

Both consumptive and nonconsumptive groups appear to have expectations that wildlife managers should be maintaining biodiversity and natural communities on public lands. The value for maintaining native plant and wildlife species extends beyond their contribution to recreation enjoyment. All groups placed high importance on existence and ecological dependence benefits as well as nature appreciation benefits of maintaining

wildlife and ecosystem diversity. The implication of these findings is that the public expects that the agency has responsibility for managing public lands to maintain a healthy environment as well as providing places to go and to interact with nature.

Though significant group differences were found across all six categories of ecosystem benefits, in most cases these differences were not substantially large. The two most substantial group differences were in the consumptive recreation and the ecological dependence domains. It is not surprising that nonhunting stakeholders would not assign very high importance to management that enhances consumptive recreation, but the fact that they place very little value on this category does verify the challenge of maintaining hunting and fishing as management tools in the future.

The low importance placed on the management of consumptive benefits on public lands by all three nonconsumptive groups suggests that these users do not recognize the indirect benefits they receive from the management of state lands for hunting. While it seems unlikely that nonconsumptive users will ever place high importance on consumptive benefits themselves, there is potential to develop and maintain support for consumptive management among these groups. The agency needs to direct some effort into communicating how things like game species management enhance viewing opportunities and provide habitat for a variety of species.

One of the keys to gaining public acceptance for ecosystem management may be to narrow this wide gap between hunters and non-hunters in terms of the importance placed on consumptive recreation management. In the wake of the 1996 anti-bear hunting ballot initiative in Michigan, hunters are concerned about the threat posed by anti-hunters to

their hunting heritage as evidenced by their extremely high scores on the anti-hunting perception scale. If the agency hopes to foster consensus among stakeholders in the development of ecosystem management, it will be necessary to create trust between groups. Hunters may react negatively to nonconsumptive groups whom they perceive are not supportive of hunting opportunities on public lands and may view ecosystem management as a codeword for the anti-hunting movement.

The second substantial value difference found was between hunters--especially "pure hunters"-- and environmental organization members on the importance of ecological dependence. This difference can be put into perspective by ranking the mean rating scores of the stakeholders. Among Audubon members and Sierra Club members, ecological dependence benefits were as important as their other top priorities. But among pure hunters, ecological dependence was their fourth highest priority (among 6 categories) and not nearly as important as consumptive recreation benefits. This relative priority rank ordering may to some extent reflect hunter perceptions about current opportunities and threats to opportunities, as well as their true preferences for maintaining healthy ecosystems. In other words, pure hunters may have placed so much importance on consumptive benefits in order to defend those values against potential threats (i.e., management that may emphasize other types of benefits). But if the correct interpretation is that hunters truly do value recreational benefits more than ecosystem components and functions on state game areas, then there is reason for ecosystem managers to be concerned.

The results provide some evidence that hunters' lower ecological dependence value is related to differences in their beliefs about ecological dependence. Hunters are less likely to believe that humans' quality of life is directly tied to "maintaining some minimum level of environmental health in Southern Michigan" than are environmentalists who almost universally accept this assumption. This difference in belief about ecological dependence appears to be influencing the relatively lower values which pure hunters assigned to ecological dependence. The relationship between valuing the attributes that make up ecological dependence and recreational participation values are discussed further in the modeling section.

Based on these findings that reveal substantive value differences between hunters and non-hunters regarding consumptive recreation and ecological dependence benefits, one would expect that hunters may be resistant to any management that shifts its emphasis from the production of game species to the maintenance or restoration of ecological values. Therefore, on-going communication efforts with pure hunters may need to raise the salience of human connections to functioning ecosystems if support for ecological objectives of ecosystem management are to be fostered. Since dual-use hunters place a higher importance on eco-dependence benefits than do pure hunters, they may make effective and credible sources for these messages (Mackie et al. 1990). The agency might consider enlisting the support of dual use hunters as messengers to communicate about the need to maintain ecosystem function and productivity. The message itself should target the relationship between maintaining quality hunting opportunities and maintaining the

hunters than appeals to conserve biodiversity for its functional importance because the impacts are likely to be seen as more immediate than are less tangible connections between ecosystem health and human's quality of life.

There were value differences that emerged within stakeholder groups that also have implications for ecosystem management. Among hunters, those who reported waterfowl hunting or archery deer hunting as their favorite were particularly extreme in placing a high value on managing for consumptive benefits. Other types of hunters--those who said small game or upland bird hunting was their favorite-- were more likely to place moderate importance on consumptive benefits. This difference may be explained by the more specialized nature of waterfowl and archery hunting--both of which can require more substantial investments of time and money compared to other types of hunting.

The results also suggest that small game and upland bird hunters valued extractive benefits even less than did deer and waterfowl hunters. Based on these value differences, wildlife managers need to understand that not all hunters value all benefits equally. In particular, waterfowl and archery deer hunters are likely to offer the most resistance to any changes that they perceive as threats to management for game species. The agency may consider targeting specific messages about ecosystem management through information provided during the sale of different license types (e.g., waterfowl stamps).

The measurement of hunter type needs to be clarified. Hunter types were defined by their response to their "favorite type of hunting", but most of these hunters participated in multiple types of hunting. Therefore, the segments used in this research may not discriminate value differences as much as a measure of specialized participation (e.g.,

individuals who only waterfowl hunt) would have. This is an important distinction to make and it also may explain why the hypotheses about waterfowl hunters formulated from focus groups were not supported. Waterfowl hunters in the focus group were almost exclusively "activity specialists"--that is, they only did waterfowl hunting. Almost all of the hunters in the survey who indicated waterfowl hunting was their favorite type also did other types of hunting. Future research should consider capturing more of the activity specialists to further explore the impact of hunting type on values and attitudes and to establish the proportion of these segments with the overall hunting population.

Finally, few substantive value differences were found between users and nonusers of study site public lands among either hunters or non-hunters. However, hunters who used public lands did exhibit slightly higher values for consumptive recreation. This is not surprising, given that the value items all addressed public land management specifically. Those who use the benefits (e.g., public land recreation) value them more. Again, a qualification regarding this finding is necessary. The instrument only asked about recreational use of the study site SGAs as opposed to any SGAs or public lands in general. Therefore, some of the nonusers of the study site SGAs may be using other public land areas. If that is the case and public land users do in fact have value differences compared to nonusers, these results might not reflect the magnitude of those differences.

Still, it is safe to conclude based on the data that value differences that do exist among public land users are not unique to any of the four properties in the study. As one example, Maple River hunters are not significantly different from Shiawassee River hunters in the importance they assign to all categories of ecosystem benefits. They may

differ somewhat in their attitudes toward specific management practices or issues, but at a generic level users of both areas seek similar ecosystem benefits. The same can be said regarding the non-hunting users of these areas.

Ecosystem/wildlife attitudes

In all but one instance, stakeholders agreed in their opinions about the relative abundance of the elements (i.e., whether something was lacking or over abundant), but often significantly differed in magnitude of their evaluations. In general, all five groups felt there were "too many" deer and "too few or too little" of everything else. The only directional disagreement existed over the item "access to hunting opportunities" where both pure hunters and dual use hunters thought that "too few" opportunities existed while non-hunting stakeholders thought there were "too many".

Responses to current abundance levels of ecosystems, wildlife attributes, and recreational opportunities likely reflect an individual's preference as much as a reflection of subjective evaluation of current conditions. For example, bird watchers rated songbird shortages as more severe than other stakeholders did. Similarly, waterfowl hunters thought there were fewer ducks than other types of hunters did. Indeed stakeholder attitudes about the current ecological conditions in Southern Michigan are likely comprised of their beliefs about what's out there as well as their preferences for what they would like to see (Peyton 1984).

Overall, most groups wanted more of everything. But stakeholders differed dramatically in their opinions about the degree to which a given attribute (e.g., the number of songbirds) was lacking. I am tempted to say pure hunters were "more

satisfied" with current levels of ecosystem types and wildlife attributes than were other groups, but it is neither entirely appropriate to infer satisfaction from mean abundance ratings, nor were their absolute attitudes indicative of a group that has everything they want. Even hunters were more likely to answer "too few" than "too many" for all attributes except for deer.

Yet in relative terms, a higher percentage of pure hunters answered "about the right amount" to three out of four ecosystem types and three out of five wildlife attributes -- more than any other group. Only on the number of hardwoods in Southern Michigan did a majority of hunters think there were "too few".

By contrast, a majority of environmentalists said there were "too few" hardwoods, wetlands, grasslands, pine forests, songbirds and wildlife diversity. Meanwhile, dual-use hunters tended to look more like hunters in their ratings of wildlife abundance levels, but more like environmentalists in their ratings of ecosystem abundance. One exception already noted in the results is that more dual-use hunters said there were "too few" ducks than any other group.

Though mean scores did not differ between SC members and Audubon members, SC members were unique among all stakeholder types in that a sizeable portion checked "no opinion" to many of the attribute items. This included over one-third who checked "no opinion" on current levels of frogs and amphibians, waterfowl, places to hunt, and places to fish. Between one-fifth and one-third checked no opinion on many of the other items. This may reflect an unwillingness by some SC members to offer an opinion not based on direct experience. This group was characterized by lower participation in

wildlife related recreation and lower visitation rates to study area public lands than any of the other groups.

The difference in perception between non-hunters and hunters about current conditions reflects value differences to some extent. The fact that stakeholders shared many of the same ecosystem values suggest other factors are creating those perception differences. This finding raises questions about the base(s) or sources of evaluation used by hunting and non-hunting stakeholders in forming their attitudes. Non-hunters are more critical of existing conditions than are hunters across most categories, yet they are also less likely to use the state game areas than are hunters. Does this mean hunter attitudes are based more on direct experience while environmentalists are relying more on indirect experiences (e.g., organization magazines) to assess current conditions? Unfortunately, the survey instrument only asked about recreational use of study site public lands rather public lands in general. Therefore, it is not possible to assign the importance of direct experience. Investigating the bases of perceptual differences between hunters and nonhunters is an important area for future research. A content analysis of interest group publications might be instructive to investigate differences in ecological information that may be contributing to perceptual differences.

These findings illustrate that although stakeholders value ecosystem benefits similarly, they have substantially different attitudes about the current state of the ecosystems in Southern Michigan. It is likely the attitudes reported by stakeholders are influenced by their preferences for what they'd like to see as well their subjective beliefs about what's out there--which may be based in their own experiences, media messages, or

other sources. It is also likely that differences exist among stakeholders in the weights given to these different sources that form their attitudes about abundance levels. Focus group discussions suggested that hunters are more likely to form their attitudes based on their own experience, while environmental organization members are more influenced by external communication than on experience. This may be especially true when evaluating conditions on state game areas where hunters are far more likely to visit for recreation than non-hunters.

Regardless of how stakeholder attitudes are formed it is clear that important differences do exist regarding their perceptions about the current abundance levels of most ecosystem attributes in Southern Michigan. Hunters seem generally more satisfied than do non-hunters with regard to the current levels of nongame species. Though all stakeholders would like to have more of almost everything, non-hunters tend to rate current conditions as more severely deficient than do hunters. If the MDNR hopes to engender support for specific ecosystem management approaches, it will be important to facilitate a public involvement process whereby stakeholders and wildlife biologists have an opportunity to share information about their perceptions/concerns over what species, ecosystems, or recreational opportunities are lacking and the bases for their perceptions. It is important that all players come to a common understanding of each other's perceptions in an attempt to reach a shared understanding over what the real priorities of ecosystem management ought to be and how the objectives will be met. Such an exchange may help stakeholders and agency representatives to learn from each other and develop a more objective view of ecosystem conditions and priorities or concerns.

For example, Audubon members expressed an overwhelming attitude that song birds are lacking in Southern Michigan. It would be important to know whether this is based on actual observations or what they have read in Audubon publications.

Understanding the source of their perceptions will determine implications for how the agency might respond. The importance of developing a shared understanding of beliefs will be elaborated on in the next section.

The significantly different attitudes among stakeholders regarding current conditions must be considered in the context of the actual status of ecosystems and wildlife in southern Michigan. In addition to developing a shared vision among stakeholders about which species and ecosystems need more attention, the agency may also be called upon to clarify for stakeholders the "true" status of nature in southern Michigan. In other words, at the very least stakeholders will expect the agency to be able to address the current status of game and nongame populations in Southern Michigan to provide a scientific basis for ecosystem management. This suggests the need for the Division to enhance it's inventory and monitoring of biodiversity on state lands in order to be able to assuage concerns—especially of groups like the Sierra Club—that adequate measures are being taken to maintain all species. Equally important, it would also convince the hunters of the need for improving ecosystem attributes that hunters perceive to be adequate.

Ecosystem management attitudes

In this section, overall ecosystem management index scores will be discussed first, followed by a consideration of the individual trade-off items. When responses to trade-

offs were calculated as a summative index, all stakeholders were slightly positive about ecosystem management principles on state public lands to the extent they understood the trade-offs involved. None of the nine ecosystem management options were viewed negatively by a majority of respondents and two options were strongly endorsed by all groups. But most of the questions yielded weak support with a substantial number of undecided responses.

The reader is advised to keep the magnitude of the group differences described below in perspective. First, significant differences between groups on the ecosystem management index were substantively small--they represent slight tendencies rather than profound differences. Second, even those individuals in the highest category of support for ecosystem management rejected some of options they confronted.

Few significant group differences emerged either on individual items or the ecosystem management index score. Hunters were less likely to be among the highest supporters of ecosystem management (all items indexed) than were non-hunters (χ^2 =6.1, 2 df, p<0.05). About three in ten hunters wound up in the highest category of support for ecosystem management compared to four out of ten non-hunters who did. Those hunters who participated in waterfowl hunting tended to score slightly lower on the ecosystem management index than those hunters who did not participate in waterfowl hunting. This would not have been predicted from the focus group with waterfowl hunting specialists. Of particular interest is that the only statistically significant differences among state game area hunters was that Shiawassee River waterfowl hunters tended to score slightly lower than other hunters on the ecosystem management index. No significant differences on

ecosystem management scores were observed among any other type of hunter for any of the game areas.

Among the five stakeholder groups, SC members were more likely to score higher on the ecosystem management index than were members of any other stakeholder group (F=3.66, 4 df, p<.01). On average, SC members scored 3.6 out of a possible nine on the ecosystem management index. This score reflects the net difference between those items that were supported minus those items that were opposed. This finding illustrates the tentative nature of the ecosystem management support--even the respondents that were most favorable to ecosystem management did not endorse a majority of the nine trade-offs.

The group differences on the ecosystem management index score make intuitive sense. Of all the recreational user groups in the study area, Shiawassee waterfowl hunters would have the most to lose if changes were made to current management. Thus they are likely to be most wary about discussions of ecosystem management. The findings reflect a wariness to change. Similarly, it also makes sense that SC members would be most receptive to considering trade-offs where ecological benefits were given greater emphasis. This is especially true given that SC members are less likely to be directly impacted by changes since their recreation participation rates on state lands were lower than any other group.

Among the individual trade-off items, significant stakeholder group differences emerged on three of the nine questions. On item # 43, nonconsumptive non-organization members were more likely to agree "that ecosystems should be managed to meet specific

demands for wildlife recreation and scenic beauty, even if it curtails ecosystem processes and functions" than were any other stakeholder group (F=13.8, p<.01). In fact, almost 40% of nonconsumptive users agreed with the statement-- almost twice as many as any of the other groups: pure hunters (19.6%); dual-use hunters (21.3%); SC members (12.3 %), and Audubon members (17.1%). If this is a valid result (see upcoming discussion), it suggests that nonconsumptive nonmembers may not understand or appreciate the ecological services that public lands provide.

There were significant group differences on the question of shifting emphasis to non-game species management. This was perhaps was one of most concrete of the trade-offs presented, yet the differences were not substantially huge. Hunters and Audubon members disagreed slightly on average while SC members and nonconsumptive nonmembers agreed slightly on average. Again, focus group results help to elaborate these findings. Some hunters may find the question somewhat moot because of their beliefs that is what's good for game species is good for all species. SC members on the other hand may be conflicted by the choice and reluctant to choose one over the other. I point this item out in particular to illustrate that though differences appear small, they do not necessarily reflect uncertainty or ambivalence on the part of stakeholders.

Two of the nine ecosystem management trade-offs produced a clear consensus among stakeholders. When confronted with a choice between establishing areas of mature (old growth) forests and generating economic benefits through logging, over 80 % of all respondents opt for the forested areas. Only 8 % thought logging should take precedent.

A similar mandate emerged in response to the trade-offs of native plants versus exotic

plants. Even when told that the exotics provided good food for wildlife, three-quarters of respondents--including hunters-- agreed that managers should favor native species.

Strong attitudes expressed on these two questions likely reflect the fact that they were two of the easier trade-offs these particular stakeholders were asked to make. Since all stakeholders placed low importance on extractive values of public lands management, it was probably relatively easy to forsake logging opportunities in favor of mature forests and the many associated benefits (e.g., existence). The endorsement of native plant species over exotics is more difficult to explain, but likely reflects a growing public awareness of detrimental effects for which other state exotics have received substantial negative publicity (e.g., purple loosestrife, zebra mussels). In light of this finding, the agency may find it necessary to develop and communicate a clear policy on the use of exotics in their management practices. Otherwise, agency credibility may be diminished on this issue if stakeholders perceive contradictory messages regarding the role of exotics in ecology and management of ecosystems.

While all stakeholders express support for things like maintaining biodiversity in an abstract sense, that support quickly erodes when confronted with trade-offs that make the costs of such a strategy more concrete. For example, although 48 % of hunters agree that biodiversity should be maintained "even if it means lowering the population of some common species living there", only 29 % of hunters overall agreed that more emphasis should be placed on nongame species management. Furthermore, almost half of the hunters (48.8%) who did express support for biodiversity disagreed that management should be diverted from game species management to focus more on non-game species of

wildlife. These contradictory opinions parallel other environmental opinion surveys that have found that the public often pays lip service to abstract environmental principles, but back away from these principles when confronted with the trade-offs of their choice (e.g., Times-Mirror 1994,1995). It reveals an inclination to value these attributes but also a wariness of the costs to other values.

While it is possible that hunters may only be paying lip service to supporting biodiversity, there is an alternative explanation for their seemingly contradictory attitudes in this case. It is feasible that hunters may not believe it is necessary to choose between game species management and nongame management because they think they are already getting both. Our focus groups with hunters in the preliminary phase of this research revealed that this is a common belief. The perception among many hunters is that what's good for deer (e.g., edge, early successional forests) is good for all species.

Another aspect of hunter perception about current levels of diversity and nongame species may result from hunters using the more developed areas in Southern Michigan as their baseline for assessing attributes present on state game areas. Simply put, for many hunters the state game areas are already natural, wild, diverse, and self sustaining ecosystems when compared to more developed areas of Southern Michigan. In contrast, environmental organization members with less experience on public lands may be basing their evaluations against a more pristine, ideal view of nature. There needs to be an ongoing effort to educate hunters and non-hunters about the ecological nuances of habitat, niche specialization, disturbances, etc. that is placed in context of what are realistic expectations for Southern Michigan ecosystems.

The survey responses to attitude items dealing with the current level of ecosystem attributes in Southern Michigan also lend support to the notion that hunters are more satisfied with the current levels of biodiversity and nongame species present than are non-hunters. For example, a majority of pure hunters (60.1%) and dual use hunters (50.0%) think we have "about the right amount" of wildlife diversity in Southern Michigan. By contrast, a majority of non-hunters thought that there was "too little" wildlife diversity.

Non-hunters also exhibit inconsistencies in their responses to ecosystem management trade-off items. For example, 38 % of nonconsumptive nonmembers seem to flip flop when asked about protecting critical ecosystem services versus managing to provide wildlife recreation. A plurality of "nonconsumptive nonmembers" (40.0%) agreed with item #43 that managers should "manage ecosystems to meet specific public demands for wildlife recreation and scenic functions even if it curtails ecosystem processes and functions". Yet in the following item which makes the trade-off more explicit, 57.4% agreed that managers should "sustain ecosystem processes (e.g., nutrient cycling, soil conservation, and groundwater recharge) even if it means providing fewer opportunities for wildlife recreation." It appears the inclusion of concrete examples of ecosystem processes in the second item clarified the trade-off for "nonconsumptive nonmembers"-- a majority of whom then supported the ecosystem management objective.

The fact that only nonconsumptive nonmembers exhibit this inconsistency in their attitudes regarding maintenance of ecosystem processes versus recreational benefits raises some question about the validity of these items. It could be that nonconsumptive nonmembers are less involved and less informed than hunters and environmental groups

and therefore simply did not understand the abstract trade-off posed by item # 43.

However, this explanation raises some doubt about the validity of these two questions and illustrates the difficulty of predicting context specific choices from the use of generic measures of environmental values (Satterfield and Gregory 1998).

In addition to the apparently inconsistent attitudes described above, there is also a substantially high percentage of "undecideds" on many of the items. The frequency of undecideds ranged from 25-35 % on six of the nine trade-offs indicating that many respondents had difficulty evaluating the consequences of choosing between ecosystem management and traditional management alternatives.

The big picture

In summary, all stakeholders expressed some value for ecosystem management benefits when these were posed to them in a generic sense in the absence of any costs. However, the lack of clear opinions on many trade-offs, the lack of group differences on those trade-offs, and the high percentage of "undecided" responses indicate that all stakeholders will need opportunities to more fully consider the consequences to valued benefits posed by ecosystem management approaches. As with any decision making that utilizes complex, scientific information, wildlife managers will need to actively facilitate a process to assist stakeholders in understanding and evaluating potential consequences to valued benefits posed by specific management strategies (Hadden 1981).

These findings are encouraging in that the ecosystem benefits are valued and stakeholders are not strongly polarized. Yet, area managers cannot interpret the results as a mandate to move forward with ecosystem management at the expense of traditional

management. Many factors could cause stakeholders to oppose ecosystem management in spite of these encouraging results. For example, because the full range of benefits were important to most stakeholders, any attempt to shift from the status quo could cause an immediate opposition from stakeholders compelled to protect existing benefits. This is an especially likely concern given that hunters and non-hunters have widely different perceptions about the extent to which ecological benefits are already being provided on state lands. The fact that hunter concern about the threat of anti-hunting is very high could also impact their willingness to consider shifts from traditional management. Another potential factor that could create problems for agency efforts to adapt current management is that there is some perception among all stakeholder groups that the agency does not adequately consider their interests. Finally, the lack of specificity between the hypothetical trade-offs used in this study and more concrete applications of ecosystem management that the agency may be considering makes predictions about stakeholder response risky (Ajzen and Fishbein 1980, Satterfield and Gregory 1998).

Based on the preceding interpretation, there are three major implications for the MDNR Wildlife Division in integrating public preferences into ecosystem management planning for southern Michigan. First, the agency desperately needs to articulate a clear and concrete vision for ecosystem management needs and opportunities prior to any efforts to involve the public in any meaningful way. Second, the need for and nature of ecosystem management will have to be communicated to the public (and to area managers as well) in a way that facilitates understanding of the potential benefits, as well as the risks and uncertainties involved. Three, the agency should look for opportunities to build

relationships with and among stakeholders that capitalize on shared values to avoid conflicts and to build support for ecosystem management. These implications are elaborated on below.

Need for clear, concrete policy vision

Since 1995, the Wildlife Division has initiated several ecosystem management planning efforts throughout Michigan in addition to this study, yet clear direction regarding goals is only slowly emerging. Most recently, the agency has launched its "Joint Ventures" project which establishes a series of broad goals for achieving "holistic", "ecosystem", and "adaptive" management (MDNR 1997). An eleven page internal document describing "Joint Ventures" offers no clear policy consideration for what land management objectives may result from the broad goal statements. A review of this document suggests that the agency has not progressed very far in identifying the needs or priorities for ecosystem management since attempts in 1995-96 for this study failed to do so.

In this study, ecosystem management was operationalized as management that prioritized the maintenance of ecological values where those values directly conflicted with recreational, economic, or utilitarian benefits of public lands. Obviously, human uses and values can be quite compatible with maintaining diverse and productive ecosystems. But how much emphasis should be placed on allocation of recreational opportunities versus other ecosystem benefits like biodiversity when the two objectives conflict? There is a need for the agency to identify such potential conflicts and provide a clear set of ecosystem priorities. Closely related to the need for clear policy priorities is the need for

the agency to evaluate its ability to provide "scientific management". The public will expect ecosystem management goals or priorities to be rooted in scientific data (i.e., species trends). The need to provide scientific information about ecological priorities will be especially crucial given the vastly different perceptions of stakeholders regarding current conditions in Southern Michigan.

Communication needs

As the agency defines options for ecosystem management in southern Michigan, a good deal of intervention in the form of communication and public involvement will be necessary to avoid conflict and gain acceptance of some of these management shifts.

Traditional attempts to "educate" user groups by providing more information can not succeed unless the agency has an adequate database that clearly demonstrates the need to pursue a given set of ecosystem management objectives. Nor can managers predict with any certainty the effects of adopting new management strategies (Hollings 1996).

Therefore, the best approach may be public involvement strategies that allow stakeholders to interact with managers to develop a shared vision for the ecosystem priorities of the area. This will be a challenging proposition and one that has many risks for the agency.

A recent example in Missouri is a case in point, where a well conceived communication effort not only failed to bring about public acceptance of the need for ecosystem management, but created a backlash directed toward the agency (Epperson 1997).

The literature emphasizes public involvement based on collaboration and shared decision making (and goal setting) in order to develop a mutual understanding of the need to do ecosystem management and to develop a buy-in from all groups (Cortner and

Shannon 1993, Sirmon et al. 1993). Yet effective models or empirically tested approaches for exactly how this can be achieved are severely lacking.

The agency has a suite of options for constructing deliberative, interactive public involvement processes to integrate stakeholder values into ecosystem management planning in Southern Michigan. These public involvement techniques range from facilitated workshops to citizen juries (Brown and Peterson 1994, Renn et al. 1994). The agency will need to confront the extent to which they wish to grant decision making authority to the public in setting ecosystem management priorities. Another challenge will be in designing public involvement programs that can achieve the desired reach among many, diverse groups without becoming so large that they result in policy gridlock (Yosie and Herbst 1998). Regardless of which approach(s) the agency uses, it should utilize sound principles of issue management. A few examples are warranted.

First, stakeholders will need opportunities and assistance to understand and evaluate potential consequences to values of ecosystem management options defined by the agency. Even though many of the ecosystem benefits were highly valued, they were not valued equally by individual stakeholders, nor among stakeholders. It will be difficult for an individual to choose between some of the tradeoffs resulting from shifts in management from game species to ecosystem goals. Managers will need to provide information on ecological needs, but also acknowledge the uncertainty and limits of science in order to maintain public trust and avoid creating unrealistic expectations for what ecosystem management can achieve.

Second, information must also be presented and packaged properly to avoid a perception of surprise and threat. Only then, can stakeholders be expected to openly consider change, rather than concocting conspiracy theories about the motives of wildlife managers and the agencies they work for (Holsi 1978).

Third, it will be important to limit the number of priorities that are established and to set measurable goals so that decision making is not overcome by the complexity of options (Weick 1984).

Building on common ground

Though the difficulty of the communication and public involvement challenges posed by ecosystem management can not be underestimated, results of this study provide some positive news with which to begin such efforts. The value findings in this study suggest that seemingly disparate stakeholder groups have more similar value profiles than might be expected. The shared values of stakeholders could provide a basis of common ground that the agency could draw upon to foster support for ecosystem management objectives. Two categories of benefits--existence and ecological dependence--that likely would receive greater emphasis under the ecosystem management paradigm are highly valued across groups. This is good news for wildlife managers seeking to develop ecosystem management goals and strategies in Southern Michigan. The shared values of the stakeholders means that information, education and public involvement efforts do not need to invest substantial effort convincing the groups studied of the *importance* of many ecosystem benefits. Hunters, nonconsumptive wildlife recreationists, and

environmentalists already recognize the importance of maintaining diversity and ecosystem integrity on public lands whether or not they use them directly.

As public involvement efforts are developed, the agency should take every effort to highlight the shared values among groups as a way to enhance cooperation among stakeholders, to build trust in the process, and to avoid the development of contentious issues. It will require a continued and on-going effort to nurture relationships among stakeholders and with the agency, but the current atmosphere appears more favorable than if the results had indicated that groups were radically different in the importance they placed on different ecosystem benefits. Instead, managers can now focus on gaining a mutual understanding of the nature of current benefits on state lands and the needs for the future. The ultimate approach will likely require a negotiated planning effort where managers can foster the shared importance placed on multiple wildlife values while building a basis of understanding for ecological stewardship.

The role of ecosystem values on stewardship

The hypothesized path models for value influences on ecosystem stewardship were partially supported for both hunters and non-hunters. Though separate models were tested for each group, the results indicate that a nature appreciation value has a strong influence on stewardship for both hunters and non-hunters. Among hunters, there appears to be a strong and positive link between nature appreciation and ecological dependence; and a strong link between ecological dependence and stewardship. The consumptive recreation value appears to have only an indirect effect on stewardship through its impact on one's nature appreciation value. In fact, the consumptive recreation is negatively

correlated with ecological dependence, though the magnitude of the relationship is fairly weak (γ =-0.14).

These empirical findings on the causal influences of hunter stewardship have significant theoretical implications. Past research has attempted to establish a link between recreation participation and environmental concern. The Dunlap-Heffernan (1975) thesis suggested that environmental concern was stronger among nonconsumptive users than it was for consumptive users. Theodori et al. (1998) clarified the recreation--stewardship relationship by testing paired combinations of recreations including participants who did both consumptive and nonconsumptive recreations. They found support for the Dunlap-Heffernan hypothesis when testing individuals who participated exclusively in consumptive or nonconsumptive recreations, but got very different results when looking at people who did both. Theodori et al. (1998) found the strongest correlation with environmental concern existed among people who hunted and bird watched. My findings corroborate these results to some extent and offer a mechanism for why the relationship exists.

I would argue that stewardship is not so much influenced by the recreational activity itself, but from the values one derives from their exposure to the outdoors through activities. For instance, Jackson and Norton's (1980) stages of hunter development suggests that one's early involvement is highly focused on activity specific attributes (e.g., the equipment, game bagged) but that these attributes become less important over time as other factors--including desire to participate in conservation-- take on greater importance over time. Ditton et al. (1992) analysis of recreational specialization also posits that concerns over resource protection grow as individuals' investments in an activity increase.

The SEM results of this study suggest that the mechanism for development of stewardship among hunters is complex and is likely to be stronger for those who are dual users of wildlife resources. The implication is that wildlife viewing and other nonconsumptive recreations need to be promoted and encouraged among young hunters to increase the likelihood that strong nature appreciative values will strengthen support for ecosystem stewardship.

The finding that is most difficult to explain based on SEM results of hunter model is the negative relationship that was revealed between consumptive recreation and ecological dependence. Proponents of hunting would argue that in today's highly mechanized and urban world hunting remains one of last direct and participatory links to the "natural" world (Peterson 1996). The results of model testing suggest hunters may tend to develop their value for ecological processes and functions only if they do both consumptive and nonconsumptive recreations.

The effects of ecological dependence value on the stewardship value of non-hunters was also different than predicted in the hypothesized model. Value for ecological dependence does not appear to have much direct influence on stewardship once the effects of existence and nature appreciation values are controlled. There was, however, a strong and positive effect of nature appreciation on existence value and of existence value on stewardship for non-hunters.

The findings suggest that although environmentalists strongly value ecological dependence, other values are more likely to influence their stewardship ethic. This finding has implications for creating communication efforts about ecosystem management. Much

of the rationale for preserving biodiversity lies in its role for maintaining sustainable, functioning ecosystems, yet this might not be the most effective message to garner support from environmental organization members. Instead SC members and Audubon Society members would appear to be more influenced by ethical appeals to maintaining species for their existence value.

Future research is needed to investigate the complex causal relationships between recreation participation, ecosystem values and ecosystem stewardship. The stewardship items measured attitudes and behavioral intentions motivated by the desire to help future others--as was operationalized in the conceptual values model. But the measures did not address the extent to which individuals: a) engage in specific stewardship behaviors; b) the consistency with which respondents act across behaviors; or c) the extent to which they have awareness of the impacts of their behaviors on others. To date, no current measurements of environmental concern or stewardship have addressed all of these measurement challenges. Future efforts need to fine tune these measures to target more specific stewardship behavior without losing the uni-dimensionality or inter-item consistency of the current measurement scale.

From a theoretical standpoint, models of ecosystem stewardship need to be tested that incorporate other variables for hunters and non-hunters. It may be instructive to develop a measure of perception about environmental health as important moderator of the value-stewardship relationship. Finally, there needs to be more work to establish an empirical link between participation in consumptive and appreciative wildlife reaction and the presence of stewardship. Specifically, we need to know under what conditions do

hunters, anglers, wildlife viewers and others develop a stewardship ethic so that educators and managers can intervene in this process to enhance public support for a holistic ecosystem management approach to wildlife conservation.

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APPENDIX A UCRIHS APPROVAL LETTER

MICHIGAN STATE

March 20, 1998

TO: R. B. Peyton

13 Natural Resources Bldg.

FR: David E. Wright, Ph.D.

Chair

The University Committee on Research
Involving Human Subjects (UCRIHS)

246 Administration Building

RE: IRB#: 97-307

TITLE: STAKEHOLDER ECOSYSTEM VALUES WITH

IMPLICATIONS FOR SUPPORT OF ECOSYSTEM

MANAGEMENT

CATEGORY: 1-C

APPROVAL DATE: 05/14/97



OFFICE OF RESEARCH AND GRADUATE STUDIES

University Committee on Research Involving Human Subjects (UCRIHS)

Michigan State University 246 Administration Building East Lansing, Michigan 48824-1046

> 517/355-2180 FAX: 517/432-1171

RENEWAL: Our records indicate that this project was approved on the date shown above. As you know, UCRIHS approval is valid for one calendar year. If you are planning to continue your study after May 14, 1998, you must complete and return to the UCRIHS office a green renewal application form by April 14, 1998. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time

CHANGES: As you are aware, UCRIHS must review and approve all revisions to human subjects activities, prior to initiation of the change. Therefore, if you have any future study revisions you wish UCRIHS to review and approve at this time, please answer question #7 on the renewal form "no" and follow

need to submit it again for complete review.

the instructions given there.

If you have decided to discontinue the research or if you have already submitted your application to renew this study, please disregard this reminder.

THE APPLICATION FOR RENEWED APPROVAL HAS BEEN SENT TO THE RESPONSIBLE PROJECT INVESTIGATOR (ADDRESSEE ABOVE).

The Michigan State University

DEA as Institutional Diversity

Total Control of Association

MSU is an affirmative action,

cc: Robert H. Holsman

APPENDIX B

SUMMARY OF ECOSYSTEM MANAGEMENT DISCUSSIONS WITH MDNR PERSONNEL IN 1996

February 6, 1996

A report of the discussion of ideas related to Ecosystem Management opportunities in the Maple River/Shiawassee study area.

Participants

This report is a compilation of results from two sessions held recently with wildlife professionals in Michigan DNR and U.S. Fish and Wildlife Service to discuss ecosystem management opportunities in a pilot study area of mid-Michigan. Two separate groups participated in similar nominal group activities designed to generate a list of concrete examples of what management activities might include under an ecosystem or landscape approach.

The first meeting on January 8th, 1996 included the following participants from the DNR Wildlife Division's Lansing staff. George Burgoyne, Dick Elden, Penney Melchoir, Bill Moritz, Dale Rabe, Ray Rustem, Pete Squibb, and Leni Wilsmann. Also present during this session were MSU research team members Rique Campa, Jack Liu, Bob Holsman, and Ben Peyton.

The second meeting on January 17th, 1996 included the following district and field level biologists whose management areas lie in or near the pilot study: Ed DeVries and Doug Spencer (Shiawassee National Wildlife Refuge); Dave Dominic and Al Stewart (Maple River and Gratiot-Saginaw State Game Areas); Doug Reeves, Arnie Karr, and Brian Vogl (Shiawassee State Game Area); Brian Mastenbrook (Saginaw Bay Restoration Project), and Mark Sargent (private lands). Also present were MSU research team members: Rique Campa, Jack Liu, Bob Holsman, Kiersten Kress, Ben Peyton and Scott Winterstein.

Task Ouestions

Each group was asked to respond to a series of different task questions (listed below) to guide discussion of ecosystem management approaches. During the Lansing staff meeting we sought to explore the range of possible ecological opportunities that could be considered at a range of spatial and temporal scales. Initially, we hoped that this exercise would provide a list of ecological conditions (stated both as management strategies and desired outcomes) that would characterize or define ecosystem management and enable us to assess the levels of support from various publics. What we got was a lot more. Responses provided by the Lansing staff included a broad range of categories that included not only ecological opportunities, but broad ecological goals, planning process needs, research needs, and unresolved policy questions. Therefore, task questions for the field staff participants were reorganized to address a broader range of ecosystem management issues: goals, ecological opportunities and constraints (needs).

Lansing Task questions

- What ecological opportunities are we using--or could we be using, or could we be creating--to implement ecosystem management at the state level over the next 5, 10, 50+years?
- What ecological opportunities are we using--or could we be using, or could we be creating--to implement ecosystem management on the management areas within the study area (e.g. Maple River, Shiawassee, private lands) over the next 5, 10, 50+ years?
- What ecological opportunities are we using—or could we be using, or could we be creating—to implement ecosystem management at the habitat level within the study area (e.g. Maple River, Shiawassee, private lands) over the next 5, 10, 50+ years?
- Are there some additional processes that need to be considered as priorities at the state level before ecosystem management can be implemented on the ground?

Field managers task questions

- What do you think should be the primary goals of establishing ecosystem management in the state of Michigan?
- What ecosystem management opportunities are we using, could be using, or could be creating to manage (across spatial boundaries) over the next 5, 10, and 50+ years?
- What are the constraints to implementing ecosystem management at the field level in Michigan?

As usual with nominal group sessions, responses to specific task questions often spilled over into other categories. In other words, ideas provided by participants often mixed goals and objectives; opportunities and constraints; and processes and products throughout the discussion. To simplify reporting these broad responses, I have regrouped them into subcategories that became apparent during synthesis of this information. I have also included the original order in which the ideas were listed from corresponding task questions as appendices to this summary. It is important to remember that all ideas brought forth during the nominal group activities and listed in this report are merely possible ideas. Inclusion of any ideas or order of presentation should not be interpreted as established priorities or consensus of opinion for the DNR Division of Wildlife staff or the staff of the Shiawassee National Wildlife Refuge. Also, editing performed to clarify

statements was kept to a minimum to avoid changing the respondents' meaning of intent. Therefore some of the listings highlight the need to further clarify goals and objectives through future discussions and planning. For example, a response to 'What should be the goal of ecosystem management?' was: *Sustainability*. It is not clear whether that by itself means sustainability of economic production, ecological production, waterfowl production, naturally sustaining systems, or some combination of the above.

Summary

One of the problems with the term *Ecosystem Management* is that it means different things to different people. Much of the debate is triggered by the word ecosystem which does not clearly specify spatial boundaries. If we are going to manage an ecosystem, where does it begin and where does it end? Even if we select ecoregions or regional climax community types as the scale, it is an artificial delineation that discounts species that utilize different ecosystems for different needs at different times (neotropical migrants), as well as ecological interchanges that occur across community types. This spatial problem was partially addressed during our two meetings through use of a multitier spatial model that allowed participants to describe ecosystem management opportunities at different spatial levels from a habitat stand level to statewide ecosystem level. Such a model does not completely remove arbitrary boundaries or account for all ecological needs, but it does point to a need to relate the management activities and objectives at small scales to the ecological goals of larger scales. It requires asking the question, "How does prescribing X strategy to this 50 acre field help to achieve regional ecological objectives A and B and/or state objectives C and D? Moreover, it requires that managers also ask. "Are there other objectives whose achievement could be fostered by prescribing strategy Y to this 50 acre field? How do management activities on tracts of public land provide ecological or social services not available on adjacent private lands? How do management activities at a local level contribute to or adversely affect the biotic health of the region or the state?

Another problematic aspect of the term Ecosystem Management is whether it is a product (a set of ecological goals and resulting conditions) or a process (the planning, interagency collaboration, and public involvement to coordinate and establish management goals). Responses from groups indicate Ecosystem Management is both. Throughout the early phase of this research, one question has been asked repeatedly in a variety of different ways: How will management activities under the banner 'Ecosystem Management' be any different from what we are currently doing? Underlying this question is the assumption that there exists some biological or sociological needs that are currently not being adequately addressed.

• The results of both meetings suggest that the Division has not yet had sufficient opportunity to identify what those needs might be, to set priorities among needs, or to link objectives for needs to regional and local management units.

- Based on the discussions during the second meeting, it is unclear to field managers what would be expected of them in implementing 'Ecosystem Management' or how their discrete areas fit into the larger picture.
- If there was a consensus among participants of both sessions, it centered on the need for the Division to undertake a strategic plan that would: 1) establish statewide goals for species and their habitats and 2) develop regional implementation guidelines that link local management objectives to statewide goals.

Several policy issue questions consistently emerged during the discussions that a strategic planning process on ecosystem management would also need to address:

- 1) What role does <u>restoration</u> play for native plant communities (e.g. pines, wet meadows, prairie) and/or ecological processes (e.g. "historic" hydrological conditions) in the implementation of ecosystem management?
- 2) If we are concerned about restoring some former ecological conditions, what "historic" time frame should serve as a baseline to guide management strategies.

Resolving the related issues of restoration and baseline conditions would be especially important for evaluating the "success" of ecosystem management programs. We won't ever get there if we don't know where we're going. Comments from Al Stewart during one of the discussions captured the uncertainty surrounding both of the previous questions:

"I think we should look at native plants or exotics in terms of their use and what it would take to get rid of them. Something like Reed canary grass, it's been established for a long time. We could spend a bunch of time and energy trying to get rid of it, but it will still be there. At what point is something native? 100 years? 200 years? 500 years? I'm just uncomfortable with starting points under ecosystem management. Is there some sacred time period we should be looking at?"

3) What emphasis or priority does <u>biodiversity preservation</u> receive in implementation of ecosystem management?

Biodiversity and ecosystem management as terms are often incorrectly assumed to be

inherently linked as the overriding goal and corresponding strategy of management. While several participants identified this misconception during discussions, yet many others identified goals or objectives based on preserving or enhancing biodiversity on genetic, population and process levels. Clearly defined goals and corresponding objectives need to be established to clarify the relative importance of biodiversity concerns under ecosystem management.

4) To what extent should <u>naturally sustaining</u> ecological processes replace the use of current intensive management practices?

Many sub-issues are related to this question including: the use of agriculture vs. moist soil management for waterfowl in wetland areas; setting back succession of some plant and forest areas through techniques like clear cutting vs. allowing the development of a variety of seral stages including climax communities; and breaking tile systems to allow a return to more "natural" drainage. Ed De Vries provided one example of where a shift to naturally sustaining ecological processes occurred quite naturally:

"In some cases, it would not take much to restore these areas. There are fields on the refuge that we quit farming on and they regenerated naturally to prairie-cord grass wetlands, which what the area was like historically. That habitat came back itself, it wasn't anything we had to plan for or manage for."

But the issue of naturally sustaining ecosystems also ties back into the need for establishing a historical <u>baseline</u> as pointed out in comments by Doug Reeves:

"If you look back in this state 100 years ago, things were radically different. There weren't any forests. We had pine communities and sharp tails and prairie chickens and a lot of fires after the logging. We let everything grow back, but maybe that fire\prairie chicken community was sustainable. Maybe we could have just kept cutting and burning and had sharp tails and prairie chickens but not much else. But somebody has got to make a call on a time frame."

Many of the above questions and issues that emerged during our meetings are also tied into societal values and the needs and desires of various publics. Several participants in our discussion expressed the need to systematically evaluate and prioritize social demands and integrate that information into establishing ecosystem management plans. The next phase of our research project will the range of public values held by various stakeholders toward some of the Ecosystem Management opportunities generated throughout our two meetings. Implementing Ecosystem Management in the study site or anywhere involve at some point will involve a negotiation of tradeoffs that are illustrated by many issues outlined above.

So what is Ecosystem Management? Is it a product or a process? Is it about managing ecologically or managing to meet public demand? Is it about the past or the

future? Is about 100 acres marshes or ecoregions? The answer to all four of those questions is YES, or as Brian Mastenbrook put it:

"This is not an either-or question about whether to have both farming and natural areas. We are addressing different social needs and right now there are needs for both corn fields and natural areas. This is about providing a mix of ecological and social objectives. We have already been doing this, now we just need to move it to the landscape level. That doesn't mean that we give everybody everything they want either. We need to look at what products society wants and then factor in what's possible ecologically."

Lansing staff responses related to ecosystem management.

I. Ecosystem Management Process

A) Planning needs

- •Establish landscape goals
- •Develop a uniform Strategic Plan
- •Build public land acquisition strategies for (natural areas) into strategic planning initiative based on ecosystem boundaries, not political boundaries.
- •Develop a system for recognizing the different human values of land uses and finding a means of weighting priorities/values involved in land use decisions.
- Need system for consensus building among stakeholders.
- •Review policy, guidelines, management activities to get feedback as a routine process.

B) Research/Information needs

- •Identify trends in land use activities (e.g. agriculture).
- •Review other states Ecosystem management plans/programs including their evaluation criteria.
- •Gain a better understanding of ecological processes--wildfire & natural water fluctuations.
- •Complete the statewide inventory of historical data and decide how to best apply it.
- •Improve capability of using landscape wide information (through GIS and other technological applications).
- •Complete inventory of refuges.
- Identify important habitat areas in relation to state significance (e.g. stopover for migratory songbirds, deer travel corridors).
- •Review laws that are constraints (e.g. drain code, pollution laws)-Assess barriers

that may have to be changed.

C) Communication needs

- •Educate/Communicate information within and with other agencies.
- •Coordinate management efforts with national/international efforts like 'Circle of Flight'.
- •Educational process to gain acceptance of tradeoffs
- •Provide feedback to staff/evaluate plans and guidelines for management units

D. Policy Issues:

- Weigh control of exotics vs. impact of their control on entire system.
- •Existing Act needs to be implemented--examine activities re biodiversity. Funding mechanisms.
- •Put use of Southern Michigan guidelines on hold until they have been revisited to reflect E.M. goals./ Initiate multi disciplinary group to revisit guidelines.
- •Recognize that altering management may affect funding sources.
- •Utilize easements as a tool to go along with acquisition.
- •Increase private lands opportunities for both ecological and recreational opportunities.

II. Broad Biological Goals of Ecosystem Management

- •Development of programs that would emphasize restoration and enhancement.
- •Develop statewide natural areas as a core element of Ecosystem Management.
- •Preservation of functioning natural systems.
- •Maximize use of natural processes in management.
- •Minimize use of non-renewable natural resources.
- •Maximize long term impacts of decision making.
- Maximize consideration of accumulating impacts.
- •Preservation of viable populations of state's 'wildlife'.

III. Sub goals/Strategies

- Preservation of threatened/rare species: Bald eagle, fox snake, wood turtle, orchid.
- Preservation of critical habitat needs: heavy migration area for spring warblers,

shorebirds; black tern nesting sites.

- •Restore aquatic flora and fauna systems (e.g. mollusks, insects)
- •Management of exotic species (e.g. purple loose strife)
- Preservation of threatened/rare community types: brackish areas/artesian wells.
- Provide for heterogeneity of habitats (at a variety of different spatial scales) based on native patterns and processes.
- Variety of successional stages, critical components.
- •Provide habitat critical habitat components of unique species in the area.
- •Enhance lowland hardwood management.
- •More natural riparian functions of hydrology.
- •Emulate natural disturbance factors for various habitats.

IV. Specific Management Strategies

- •Reduce pesticides
- •Eliminate farming
- •No till farming
- •Conservation tillage farming
- Organic farming
- Moist soil management
- •Elimination of roads, wide trails; take into account impact of utility right of ways.
- •Aggregate upland and lowland units to achieve restoration.
- Woody vegetation along ditches (drains)
- •Increase grasslands
- Increase corridors
- •Promote large hardwood blocks for interior species
- •Breaking artificial drainage systems to establish ponding

Field Managers' ideas related to ecosystem management.

I. ECOSYSTEM MANAGEMENT PROCESS

- •Better communications/sharing information.
- Projection & consideration of current and future trends.
- •Should solicit support from all administrative levels.
- •Involve more collaboration in planning between agencies and across levels.
- •Educate people to ecological impacts of management activities.
- •Provide training and funding to private landowners to accomplish management.
- Address land-use zoning to protect ecological attributes.
- Provide for land acquisition
- Focus ecosystem management on smaller regions consistent with funding sources and constraints.
- •Incorporate effective planning to compensate for limited human and monetary resources.
- •Develop guidelines to provide direction for implementation
- •Need to define goals for ecosystem management that describe the a set of conditions as end points.

II. Broad Biological Goals of Ecosystem Management

- •Sustainability.
- •Maintain productivity.
- •Maintenance of habitat types at different spatial scales to meet multiple -use objectives.
- •Conserve, enhance, and protect species at levels that protect gene pools-recognizing that some will vanish.
- •Conservation-oriented, as opposed to preservation.
- •Diversity of historic habitats.
- •Sustainability within natural selection.
- •Long term Sustainability of natural resource products.
- Preservation
- •Reduce herbicides.
- •Restore hydrology.
- •Maintain a variety of successional stages--clear-cut to old growth.

III. Attributes/Characteristics of Ecosystem Management

- •Should contain practical social aspects.
- •Eliminate political boundaries for management purposes.

- •Management time period should reflect in generational terms of species in question.
- •Should not be restricted to public lands.
- •Not focusing on single species.
- •Should provide human benefits compatible with the resource.
- •Sociologically acceptable and economically feasible.
- •Recognize benefits of some exotics as well as native plant species.
- •Consider effects of management on all resources (soil, air, water, wildlife) in ecosystem.
- Variable in size and scope depending on the resource.

IV. SUB-GOALS/STRATEGIES

- •Use new equipment and technology (e.g. no-till equipment, spot sprayers).
- •Eliminate purple loose strife, replace with buttonbush.
- •Re-establish conifer types.
- Promote better watershed stewardship on private lands.
- •Re-establish native wildlife population (e.g. wild turkey).
- •Create more habitat for upland habitat for species like cottontail.
- •Allow natural succession to proceed in some areas (e.g. willow growth for flycatchers, mallards).
- •Creating and managing wetlands.
- •Promote the Conservation Reserve Program (CRP).
- •Produce large, contiguous blocks of forest.
- Put more management emphasis on shorebirds and wading birds.
- •Limiting/minimizing hard-core farming practices on public and private lands.
- •Integrated pest management on public and private lands.
- •Promote minimum/ no till farming.
- •Provide diversity by various management disturbances.
- •Maintain smaller deer herd.
- •Encourage wildlife habitat on rural estates (i.e. growing trend of conversion of farm lands into smaller residential parcels).
- •Move to selective cutting; away from clear cutting.
- •Promote private land sustainable agriculture.
- •Use public lands' demonstration areas to model desirable land practices to private land owners.
- •Have areas where NO cutting is allowed. Allow for succession.
- •Use fire and mechanical means to control vegetation

V. Constraints to the Implementation of Ecosystem Management

- •Conflicting mission/goals between agencies and between agencies and the public.
- •Internal politics at various levels of bureaucracy.
- •Need more professional humility.
- •Establishing guidelines for ecosystem management.
- •The democratic process itself.
- •Lack of evaluation process/strategic plan.
- •Landowner goals conflict with manager's goals.
- •Lack of adequate staff.
- ·Lack of funding.
- •Politics (economics of public choice for allocation of land/ resources.)
- •Lack of priority on ecosystem management as a focus within the Division.
- •Previous education programs have created (negative) lasting impressions (e.g. Smokey the Bear-wildfires; M.S.U.E.-need for fall plowing.)
- •Lack of adequate ecological databases.
- Public health and safety considerations (e.g. flood control, fire protection).
- •Institutional inability to take risks.
- •Conflicting policies impede adaptability to address specific issues and problems.
- •Lack of time or dedication
- •Lack of consideration for future generations.
- •No 'Vision' for the future
- •Difficulty gaining public acceptance of any developed guidelines.
- •Lack of research to predict management outcomes.
- •Micro-management by top level administrators.
- Present budget sources restrict thinking.
- •Historically, researchers/managers have been reactive, not proactive.
- •New challenges different from past training.
- •Private property rights.
- •Previous farm policies that forced lack of stewardship (e.g. cornbase to qualify for farm subsidies.)
- •Inability to control factors beyond land boundaries.
- •Ignorance on the part of public and resource professionals.
- •Little opportunity for professional growth and training.
- •Lack of decision making.
- •Lack of any information and education bureau within DNR
- •Difficult to establish ecosystem boundary.
- •Lack of an agreed historic starting point or reference point.

ORIGINAL RESPONSES IN CHRONOLOGICAL ORDER WITH CORRESPONDING TASK QUESTION

What do you think should be the primary goals of establishing ecosystem management in the state of Michigan?

- Sustainability.
- •Maintain productivity.
- •Better communications/sharing information.
- •Maintenance of habitat types at different spatial scales to meet multiple -use objectives.
- •Establish ecosystem boundary.
- •Consider effects of management on all resources (soil, air, water, wildlife) in ecosystem.
- •Variable in size and scope depending on the resource.
- •Conserve, enhance, and protect species at levels that protect gene pools--recognizing that some will vanish.
- •Conservation-oriented, as opposed to preservation.
- •Should contain practical social aspects.
- •Have some historic starting point.
- •Should solicit support from all administrative levels.
- •More collaboration in planning between agencies and across levels.
- •Should not be restricted to public lands.
- •Not focusing on single species.
- •Diversity of historic habitats.
- •Sustainability within natural selection.
- •Long term sustainability of natural resource products.
- •Projection of future trends.
- •Compatible w/ the resource (human benefits).
- •Sociologically acceptable and economically feasible.
- Preservation
- •Provide direction.
- •Management time period should be determined in generational terms of species in question.

What ecosystem management opportunities are we using, could be using, or could be creating to manage (study area, unit level, habitat level) over the next 5, 10, and 50+ years?

- •Reduce herbicides; use fire and mechanical means to control vegetation.
- •Restore hydrology.
- •Use new equipment and technology (e.g. no-till equipment, spot sprayers).
- •Eliminate purple loose strife, replace with buttonbush.

- •Educate people to impacts of management activities.
- •Outreach.
- •Re-establish conifer types.
- •Promote better watershed stewardship on private lands.
- •Re-establish native wildlife population (e.g. wild turkey).
- Provide training and funding to private landowners to accomplish management.
- •Recognize benefits of some exotics as well as native plant species.
- •Create more habitat for upland habitat for species like cottontail.
- •Better planning needed with fewer people and fewer dollars.
- •Eliminate political boundaries for management purposes.
- •Allow natural succession to proceed in some areas (e.g. willow growth for flycatchers, mallards).
- •Creating and managing wetlands.
- •Promote the Conservation Reserve Program (CRP).
- •Develop land-use zoning to protect ecological attributes.
- •Large, contiguous blocks of forest.
- Put more management emphasis on shorebirds and wading birds.
- •Limiting/minimizing hard-core farming practices on public and private lands.
- •Maintain a variety of successional stages--clear-cut to old growth.
- •Integrated pest management on public and private lands.
- •Promote minimum/ no till farming.
- •Provide diversity by various management disturbances.
- •Land acquisition.
- •Maintain smaller deer herd.
- •Encourage wildlife habitat on rural estates.
- •Move to selective cutting; away from clear cutting.
- •Promote private land sustainable agriculture.
- •Use public lands' demonstration areas to model desirable land practices to private land owners.
- •Break large areas down into focus regions for funding.
- Have areas where NO cutting is allowed. Allow for succession.

What are the constraints to implementing ecosystem management at the field level in Michigan?

- •Conflicting mission/goals between agencies and between agencies and the public.
- •Levels of bureaucracy (internal politics).
- •Need more professional humility.
- •Establishing guidelines for ecosystem management.
- •The democratic process itself.
- •Lack of evaluation process/strategic plan.
- •Landowner goals conflict with manager's goals.
- •Lack of adequate staff.

APPENDIX C SAMPLE FOCUS GROUP SCRIPT

Focus group script #3: Audubon Members July 8, 1996 Quality INN, Saginaw, MI

I. INTRODUCTIONS

A. INTRODUCTION OF NONPARTICIPANTS

- Moderator
 - a. name
 - b. MSU F&W Dept.
 - c. role
- Recorder
 - a. name
 - b. Will not participate
 - c. Will record our thoughts in abbreviated form so that we have a group memory to refer to during our discussion. We may need to help her capture your ideas. Not concerned with spelling.

B. ORIENTATION

- 1. Thanks for coming to participate in this discussion group. This is one of several discussion groups we are holding with outdoor recreationists and concerned citizens in Mid-Michigan. The issues and ideas brought forth in this discussion will help us to formulate a questionnaire that will be sent to citizens across the region next year.
- 2. From both the postcard you received and follow-up telephone calls, you are aware that I am conducting this study for Michigan State University. The purpose of this discussion is to investigate the values that people place on wildlife and to gather opinions about various wildlife management options for public and private lands.

The results of this study will be shared with the Wildlife Division of the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service. Indeed both agencies are aware of this research project. But just so that it is clear, I work for MSU, not the DNR or the U.S. Fish and Wildlife Service. This is intended to provide direction to the DNR in its approach to management in So. Michigan. The agency is working to develop some policy guidelines, but there are no specific proposals being considered at this time. Public input is needed to help define what management options might be considered.

- 3. As you can see, the discussion is being taped so that I do not have to take notes, although I may occasionally jot some things down. Youridentities will be confidential. We will be using only first names in our discussion tonight, and your name will not be included in the report of this study. Let's all try to speak loud and clear so the microphone can pick up what we are saying.
- 4. To help us get the most out of our discussion in the short time we have together, there are a few simple ground rules for us to follow.
 - a. First and foremost, due to the small size of the group, it is

vital that each of you share what is on your mind regarding the topics we discuss. We want your individual perspective on everything. We do not want what others say here to influence you.

- b. I expect and hope that there will be differences of opinion in this group, and I am <u>not</u> looking for any particular responses to the questions I have for you tonight. Disagreeing or not having an opinion about something is okay. There are no right or wrong answers. So share your views and respect the views of others with whom you might disagree.
- c. Any time that a question is unclear, please just ask for clarification.
- d. As moderator, I may ask you to be brief and I may need to interrupt you or redirect the conversation. We have a lot of questions to discuss in two hours and we have to get to all of them. So please know up-front that I do not intend to be rude or discourteous when I have to move the conversation along.
- e. Again, please speak one at a time and loud enough so that all of your comments can be clearly understood when I go back over the tape.
- f. Does anyone have any questions about the ground rules?
- g. We will take a short break in an hour or so.
- h. Has everyone written down your social security number on this sheet? The accounting office at MSU will process your check and send it to you in the next week or so. Sometimes they can be a little slow, but it will get to you.
- i. I hope that you are all comfortable and relaxed. I think you ill enjoy our discussion tonight.

II. ENVIRONMENTAL BEHAVIORS

A. I would like to begin the discussion by going around the table and having each one of you share your first name, where you live, the type of outdoor recreation that you most enjoy doing.

Everyone here tonight was invited to our discussion because of their membership in an environmental organization like Audubon Society...

- B. I'd like for us to go around the table again and share what prompted you to join?
- C. How active would you describe your current involvement with regard to environmental or wildlife issues? How regularly do you participate in types of ACTIVISM such as voting for candidates, write letters, or attend meetings?

1. When it comes time to vote for candidates for public office, how much weight do you give environmental issues when deciding who vote for?

III. SHIAWASSEE BENEFITS

Now I'm going to show you a regional map with several large tracts of public land.

- A. I'd like to see a show of hands for how many of you have visited the following areas for any kind of outdoor activity...
 - 1. Shiawassee National Wildlife Refuge
 - a. What did you go there for?
 - b. What did you like about that area?
 - c. What did you dislike about that area?
 - 2. Shiawassee River State Game Area
 - a. What did you go there for?
 - b. What did you like about that area?
 - c. What did you dislike about that area?
 - 3. Gratiot-Saginaw State Game Area**
 - 4. Maple River State Game Area**
 - 5. Are there any particular reasons why you have NOT visited any of these public lands for recreation?

[** If there is a lot of usage of Gratiot-Saginaw and Maple River, I will repeat question series for these areas also, but I do not anticipate much usage from this group.]

For the next question, I'd like to focus our attention on the Shiawassee State Game Area. I'm going to give you a minute or two to think about your response. Feel free to write down your thoughts on the paper in front of you and then we'll go around the table and generate a list of people's ideas. The question is:

B. What benefits do the Shiawassee State Game Area provide for Michigan

Citizens?

- 1. List.
- 2. Clarify
- 3. Rank most important to them.

*** Now that we've built this list of benefits that the Shiawassee State Game Area provides, I'd like each of you to vote on what the most important benefit of the area is to <u>you</u>. Shannon is giving everyone three colored stickers to vote with. I'd like everyone to go up and place their stickers next to the benefit or benefits that are most important to them about the Shiawassee State Game Area. You can place all three stickers next to one item, to spread them out over three different items, or place two on one and one on another—however you want to spread your three votes. Does anyone ave any questions or need clarification?

**[Evaluate results and offer opportunity for comments or closure]

- C. Of the benefits we've listed, which items are given priority by the agency that manages the area?
 - Do you agree with current management priorities?
 Probe: Are there some other considerations or benefits that should be managed for?

IV. NOTIONS ON STEWARDSHIP & CONSERVATION

We are going to talk generally about conservation and stewardship of resources for a few minutes. We will return to talking specifically about Shiawassee and the surrounding area in a little while.

- A. What do you see as the major conservation and environmental issues facing us today?
 - 1. How about the next 10 years?
 - 2. How about the next 50 years?
 - a. Rank issues--most serious issues facing Southern Michigan.
- B. When you hear the term *stewardship* in connection with the environment, what does that suggest to you?
 - 1. What does it mean to be a good steward?
 - 2. Are there any types of people or organizations that are examples of good environmental stewards?
- C. Next, I'd like to hear your opinions about a few scenarios where management for ecological benefits may conflict with producing recreational benefits. In each situation, a hypothetical management option is included to address the dilemma. Listen carefully and assume all the facts in each case to be true. I'll read each situation twice and Shannon will post the description on the wall. Please write down your response to each situation and we will go around and discuss everyone's opinion.
 - 1. Example # 1: Suppose there is a 300 acre wetland in the Northern Lower Peninsula that is managed for waterfowl nesting through tight regulation of water levels through a system of dikes. It has been discovered that this intense water level control has lead to the reduction of wood turtles, a threatened species in Michigan. Managers are faced with a decision of retaining current water level management to benefit ducks or remove the dikes to restore flowing water needed for the wood turtle. Less water control will mean fewer ducks.
 - a. Which option do you recommend? Probe: Why or why not?
 - 2. Example #2: There are examples where wildlife managers may deem it necessary to close off nesting areas of certain bird species to human access where excessive activity of hikers, birdwatchers, and others may endanger nest sites. Examples include closing off roads and trails in Kirtland -Jackpine stands or closing stretches of beach to protect Piping Plovers.
 - a. Are such measures acceptable to you?
 Probe: Why or why not?
 [If NO: The DNR closes fishing season to protect spawning fish, should we not afford the same protection to breeding birds?]

V. DEFINITIONS OF SOME OPTIONAL MANAGEMENT GOALS

- A. Traditionally, management of wildlife has been based on <u>FEATURED</u>

 <u>SPECIES PRODUCTION</u> --where an area is managed to produce some optimal amount of species or closely related group of species. The featured species can be a game species or a nongame species (usually an endangered species). The featured species approach is usually sought through managing the habitat to produce desired conditions for that species and imposing regulations to control the harvest levels.
- B. An alternative approach is being used in some areas of the country. This new option is called ecosystem management. Let's see a show of hands for how many of you have heard of the concept ecosystem management.
 - 1. [For those raised your hands] describe what you think it is. Probe: Where did you hear about ecosystem management?
- C. I am going to run through a list of ecosystem management goals or outcomes and I'll ask for your response to each one. Keep in mind as I introduce these five outcomes, that they do not all necessarily receive equal consideration... but under ecosystem management, managers would strive to achieve some desirable mix of the following five products.
 - 1. **Biodiversity.**
 - Again, let's see a show hands. How many of you have heard of the term biodiversity or biological diversity?
 Probe: [For those raised your hands] describe what you think it is.

<u>Probe</u>: Where have you heard about biodiversity? [Give them a hand out that describes biodiversity at 3 levels.]

- i. Species--including threatened and endangered spp.
- ii. communities
- iii. genetic
 - (1) Is biodiversity something that is valuable to you?

 [If YES] What about biodiversity is valuable to you?

 What benefits do you see from Biodiversity?
 - (2) Should conserving biodiversity be an important management goal for the DNR?
 Probe: [If no]: Do we have any obligation to conserve biodiversity? If so, what is it?
 - (3) How important is it that <u>you live in</u> an area that has diverse plant and animal communities?

 <u>Probe:</u> Are you concerned about losing biodiversity in So. Michigan?

2. Self-sustaining qualities

- a. What do you think of when you think about a self-sustaining ecosystem?
- b. How important is it to you to recreate in an area that represents a

self sustaining ecosystem?

i. Areas CAN BE managed to produce artificially high numbers of species like waterfowl through the use of intensive agriculture. Would you favor such production if it increased your bird viewing

opportunities?

<u>Probe</u>: [If yes] Even if such production came at a cost of naturally sustaining functions of the system?

- ii. There are many instances where fish are stocked in lakes and stream where natural reproduction does not exist or is poor. These fish are stocked solely to meet recreational demand for angling opportunities. Some states have pheasant stocking programs where birds are released on public lands prior to hunting season. How would feel about the opportunity to watch stocked wildlife at Shiawassee that are released to increase biodiversity?
- Restoration--A third element of ecosystem management is restoration of
 native habitats and plant communities that have been lost or badly
 degraded in quality. Examples would be restoration of oak-savannahs,
 wet meadows, or prairie communities.
 - a. How important is restoration of plant communities?
 - b. IF restoration is important, what types of communities (i.e. prairie, wetlands, river bottom forests) would you like to see restored? What would you be willing to give up to return part of the ecosystem to its previous condition?
- 4. Reduce fragmentation. Managing whole ecosystems instead of managing a collection of individual habitats or forest stands also strives to reduce the amount of forest fragmentation that can occur when decisions are made at a small scale without looking at the big picture.
 a. Do you think forest fragmentation is a problem in So. Michigan?
- 5. Optimal human benefits. Ecosystem management also produces a broader mix of social outputs including diverse recreational opportunities and commodities like timber.
 - a. Should wildlife management agencies be concerned about providing outdoor recreation other and hunting and fishing?

 Probe: What about direct wildlife viewing opportunities such as trails and bird watching observation towers?
- D. To review: The five outputs of ecosystem management are biodiversity, naturally sustaining ecosystems, restoration of native habitats, reduced forest fragmentation, and diverse recreational opportunities.
 - 1. What kind of an affect do you think ecosystem management would have on your favorite types of outdoor recreation?
 - 2. What do you see as the benefits of ecosystem management in Southern Michigan?

- 3. What do you see as the costs of ecosystem management In Southern Michigan?
- E. As a final exercise tonight, I want you to take out a sheet of paper and write down the location of your favorite outdoor spot, but I'd like you to pick a place that is located on public land somewhere. It can be in an area we've already talked about or another location. After you picked a location, write a couple of words to describe why you chose that spot. I'll give a minute to think about it...
 - 1. Under ecosystem management, one might expect that current benefits that are provided may have to be redistributed across the landscape in order to achieve important ecological objectives. For example, areas actively managed to produce hunting opportunities may have to be converted to more diverse, self-sustaining communities types like prairie, while the hunting may have to be shifted somewhere else. Think about the place you wrote down on the piece of paper. Imagine that it gets plowed up and converted to agriculture food plots to attract game species for hunting in order to restore a diverse grassland community 10 miles away. Are you willing to make that sacrifice?
 - 2. On the other side of the coin, how much should hunters be expected to give up in order to achieve the goals of ecosystem management?
 - 3. Who should pay for ecosystem management?

APPENDIX D PILOT SURVEY AND COVER LETTER

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE 13 NATURAL RESOURCES BUILDING (517) 355-477 FAX (517) 432-1699 EAST LANSING + MICHIGAN + 48824-1222

May 14, 1997

Dear Michigan Citizen:

Your opinion counts! Enclosed is a survey being conducted by Michigan State University to determine your preferences and opinions for wildlife and public land management in Southern Michigan. You are among a small number of Michigan citizens who have been randomly selected to receive this important survey. The information collected will help guide the Michigan Department of Natural Resources and other resource management agencies in deciding the future direction of management of our state lands.

It takes an average of twenty minutes to complete this survey. Because we have contacted a relatively few number of people, your response is extremely important to the success of our study. You indicate your voluntary participation by returning the survey. Please be assured that your responses will remain confidential.

If you have any questions about this survey, please call our toll-free survey hot-line: 1-800-738-2168. Please return your completed survey in the postage paid envelope provided. Thank you for your valuable assistance.

Sincerely.

Bob Holsman, Research Assistant Dept. of Fisheries & Wildlife

Survey of opinions on managing public land and wildlife in Southern Michigan

Survey instructions:

- •Please mark all of your choices in ink.
- · "DNR" = Michigan Department of Natural Resources.
- •Southern Michigan = the area below the dark line on the

map to the right.

- •Public lands= all state and federally owned lands (e.g national forests, national refuges, state parks and state game areas)
- •"Ecosystem" a geographic landscape area and all the interactions between living and non-living things residing there.
- "Biodiversity" = the variety of all life forms; including plants, insects and wild animals capable of living in an area.



THANKS IN ADVANCE FOR YOUR HELP!

If you have any questions, please call toll-free at 1-800-738-2168.

Your preferences about the Southern Michigan Environment

DIRECTIONS: The following set of questions ONLY deal with public lands in Southern Michigan (So. Mich.). Please circle the response in the appropriate column to indicate the importance of the following items to you.

And the state of t

➤How important is it to you ...

1)TO KNOW THAT WILDLIFE SPECIES ARE BEING MAINTAINED ON PUBLIC LANDS WHETHER OR NOT YOU EVER USE OR SEE THEM?	5	4	3	2	1	U
2)THAT PUBLIC LANDS BE MANAGED TO PRODUCE RAW MATERIALS SUCH AS TIMBER, AGRICULTURAL PRODUCTS, AND MINERALS FOR SOCIETY?	5	4	3	2	1	U
3)THAT PLANT AND WILDLIFE DIVERSITY BE MAINTAINED ON PUBLIC LANDS ?	5	4	3	2	1	U
4)THAT PUBLIC LANDS OFFER ACCESS FOR RECREATIONAL HUNTING ?	5	4	3	2	1	U
5)THAT PUBLIC LANDS BE MANAGED TO PROMOTE GROWTH & ECONOMIC DEVELOPMENT OF LOCAL COMMUNITIES IN SO. MICHIGAN ?	5	4	3	2	1	U

These questions still apply ONLY to public lands in Southern Michigan.

CHART ROOF OF THE OWNER BOOK OF THE OWNER OF THE OWNER OWNER

➤How important is it to you ...

Tion important is it to you	•	•	6.	•	2	•
6)THAT LAKES AND STREAMS ON PUBLIC LANDS BE MANAGED FOR RECREATIONAL FISHING?	5	4	3	2	1	U
7)THAT WE UTILIZE ANY GAS AND MINERAL DEPOSITS FOUND ON PUBLIC LAND FOR THEIR ENERGY AND MATERIAL POTENTIAL?	5	4	3	2	1	U
8)THAT OPPORTUNITIES ARE PROVIDED TO HUNT A VARIETY OF WILDLIFE ON PUBLIC LANDS?	5	4	3	2	1	U
9)THAT MANAGEMENT OF THE NATURAL RESOURCES ON PUBLIC LANDS STRIVE TO CREATE JOBS AND ECONOMIC OPPORTUNITY?	5	4	3	2	1	U
10)THAT THERE ARE OPPORTUNITIES TO WATCH AND ENJOY WILDLIFE IN NATURAL SETTINGS ON PUBLIC LANDS ?	5	4	3	2	1	U
11)THAT A MANAGEMENT PRIORITY OF OUR NATURAL RESOURCES ON PUBLIC LANDS IS TO ENHANCE THE GROWTH AND ECONOMIC DEVELOPMENT OF COMMUNITIES?	5	4	3	2	1	U
12)THAT POPULATIONS OF GAME SPECIES (E.G. DEER & WATERFOWL) BE MANAGED TO ENHANCE HUNTING OPPORTUNITIES ON PUBLIC LANDS?	5	4	3	2	1	U
13)THAT WE MANAGE PUBLIC LANDS FOR PRODUCTION OF MATERIALS SUCH AS TIMBER OR AGRICULTURAL PRODUCTS?	5	4	3	2	1	U
14)THAT GAME FISH POPULATIONS BE MANAGED TO ENHANCE FISHING OPPORTUNITIES ON PUBLIC LANDS?	5	4	3	2	1	U
15)THAT LANDS ARE MANAGED TO PROVIDE A SUPPLY OF RAW MATERIALS FOR FOOD, HOUSING, AND OTHER MATERIAL NEEDS?	5	4	3	2	1	U
16)THAT MANY UNDISTURBED, NATURAL AREAS ARE PROVIDED ON PUBLIC LANDS TO APPRECIATE, STUDY, OR OTHERWISE ENJOY NATURE?	5	4	3	2	1	U

17) How important is it to you that <u>public lands in Southern Michigan</u> provide opportunities or access for any of the following types of recreation?

	CRITICALLY IMPORTANT	VERY IMPORTANT	MODERATELY IMPORTANT	SLIGHTLY IMPORTANT	UNIMPORTANT	UNDEC.
SNOWMOBILING	5	4	3	2	1	U
BIKING	5	4	3	2	1	U
RIDING ATV'S	5	4	3	2	1	υ
RIDING JET SKIS	5	4	3	2	1	U
BOATING	5	4	3	2	1	U
X-C SKIING	5	4	3	2	1	U
Exercise	5	4	3	2	l	U

The next 5 questions apply to ALL lands in Southern Michigan in general, including public lands.

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➤ How important is it to you...

18)THAT REMAINING UNDEVELOPED AREAS OF SO. MICHIGAN BE AVAILABLE FOR HOUSING AND BUSINESS DEVELOPMENT TO PROMOTE GROWTH AND ECONOMIC DEVELOPMENT?	5	4	3	2	1	U
19)THAT THE FURTHER EXTINCTION OF PLANT AND ANIMAL SPECIES IN SO. MICHIGAN BE PREVENTED?	5	4	3	2	1	υ
20)THAT WHAT IS LEFT OF OUR NATURAL (UNDEVELOPED) ENVIRONMENT IN SO. MICHIGAN IS MAINTAINED?	5	4	3	2	1	υ
21)THAT WILDLIFE AND PLANT COMMUNITIES THAT HAVE. HISTORICALLY BEEN PART OF SO. MICHIGAN'S LANDSCAPE BE MAINTAINED OR RESTORED?	5	4	3	2	1	U
22)THAT ECOLOGICAL PROCESSES SUCH AS FOREST SUCCESSION OR SPECIES INTERACTIONS (E.G. FOOD CHAINS) BE SUSTAINED IN SO. MICHIGAN?	5	4	3	2	1	U

Personal Choices

Circle one response to indicate the extent to which you agree or disagree with each statement.	STRONGLY AGREE	AGREE	UNDECIDED	DESAGREE	STRONGLY DISAGREE
23) I AM NOT WILLING TO PAY MORE IN TAXES TO INCREASE EFFORTS TO SUSTAIN A HEALTHY ENVIRONMENT FOR FUTURE GENERATIONS OF PEOPLE TO ENJOY.	1	2	3	4	5
24) I CURRENTLY DONATE MONEY EACH YEAR TO ORGANIZATIONS OR PROJECTS THAT WORK TO PROTECT THE ENVIRONMENT.	1	2	3	4	5
25) I Intend to look for or take opportunities to donate time or money to ensure that future generations have access to a healthy environment.	1	2	3	4	5
26) I FEEL NO OBLIGATION TO CONSERVE WILDLIFE POPULATIONS OR OTHER RESOURCES FOR FUTURE GENERATIONS OF HUMANS.	1	2	3	4	5
27) I THINK THAT EACH ONE OF US SHOULD STRIVE TO REDUCE OUR MATERIAL CONSUMPTION IN ORDER TO MINIMIZE NEGATIVE IMPACTS TO WILDLIFE AND THEIR HABITATS.	1	2	3	4	5

Opinions about challenges to hunting

Circle one response to indicate the extent to which you agree or disagree with each statement.	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
28) Those in society who oppose recreational hunting pose a serious threat to future hunting opportunities.	1	2	3	4	5
29) ATTEMPTS TO ABOLISH OR RESTRICT HUNTING IN MICHIGAN ARE LIKELY TO INCREASE IN THE FUTURE.	1	2	3	4	5
30) Any resource management action that reduces hunting opportunities is a result of the growing anti-hunting movement in this country.	1	2	3	4	5

Opinions about current levels of various environmental attributes in Southern Michigan

Please circle the number in the appropriate column to indicate your opinion about the current level of each attribute in So. Michigan.	FAR TOO MANY	SLIGHTLY TOO MANY	ABOUT THE RIGHT AMOUNT	SLIGHTLY TOO FEW	FAR TOO PEW	NO OPINION
31) PINE FORESTS	1	2	3	4	5	n
32) HARDWOOD FORESTS	1	2	3	4	5	n
33) WETLANDS	1	2	3	4	5	n
34) GRASSLANDS	1	2	3	4	5	n
35) NUMBER OF SONGBIRDS	1	2	3	4	5	n
36) NUMBER OF DEER	1	2	3	4	5	n
37) NUMBER OF FROGS AND AMPHIBIANS	1	2	3	4	5	n
38) NUMBER OF DUCKS	1	2	3	4	5	n
39) DIVERSITY OF WILDLIFE	1	2	3	4	5	n
40) PLACES TO OBSERVE & STUDY NATURE	1	2	3	4	5	n
41) PLACES TO GO HUNTING	1	2	3	4	5	n
42) ACCESS TO HIKING TRAILS	1	2	3	4	5	n

Opinions regarding the Michigan DNR

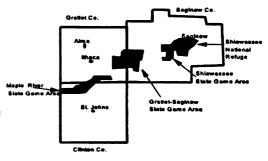
Circle one response to indicate the extent to which you agree or disagree with each statement.	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
43) I TRUST THE DNR TO MANAGE OUR PUBLIC LANDS TO ENSURE HEALTHY AND SUSTAINABLE ENVIRONMENT FOR MICHIGAN CITIZENS.	1	2	3	4	5
44) THE DNR IS PROFESSIONALLY COMPETENT WHEN IT COMES TO MANAGING WILDLIFE ON OUR PUBLIC LANDS.	1	2	3	4	5
45) I do not trust the DNR to Fairly consider my own interests when it manages public lands.	1	2	3	4	5
46) OVERALL, THE DNR IS DOING A PROFESSIONAL AND SATISFACTORY JOB MANAGING OUR NATURAL RESOURCES ON PUBLIC LANDS IN MICHIGAN.	1	2	3	4	5

Opportunities to manage Southern Michigan's ecosystems

Circle one response to indicate the extent to which you agree or disagree with each statement.	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
47) THE LANDSCAPE IN SO. MICHIGAN HAS ALREADY BEEN SO ALTERED BY HUMANS THAT EFFORTS TO PROTECT NATURALLY FUNCTIONING ECOSYSTEMS WOULD NOT BE WORTH THE COSTS AND CONTROVERSY.	1	2	3	4	5
48) I THINK THAT THERE ARE WORTHWHILE OPPORTUNITIES TO RESTORE UNIQUE OR NATURAL ECOSYSTEMS IN SO. MICHIGAN.	1	2	3	4	5
49) RESTORATION OF NATURAL COMMUNITIES, NATIVE SPECIES, OR ECOSYSTEMS IN A REGION AS DEGRADED AS SO. MICHIGAN WOULD STAND LITTLE CHANCE OF BEING SUCCESSFUL.	1	2	3	4	5
50) IT IS REALISTIC TO EXPECT THAT ALL TYPES OF OUR NATIVE PLANTS AND WILDLIFE CAN BE MAINTAINED IN SO. MICHIGAN.	1	2	3	4	5

Opinions of trade-offs in managing resources

Directions: The statements below involve a series of management tradeoffs typical of those wildlife managers of our public lands must confront. Assume the statements apply to the lands shaded on the map. Indicate the extent to which you agree or disagree with each statement.



(CIRCLE ONE RESPONSE FOR EACH STATEMENT)	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE			
IN THIS AREA, RESOURCE MANAGERS SHOULD								
51)MAINTAIN BIODIVERSITY THROUGHOUT THE AREA, EVEN IF MEANS LOWERING THE POPULATIONS OF SOME COMMON SPECIES OF WILDLIFE THERE.	5	4	3	2	1			
52) SET ASIDE SOME FORESTED AREAS FOR 100 OR SO YEARS EVEN THOUGH OPPORTUNITIES FOR ECONOMIC BENEFITS FROM LOGGING ARE PASSED UP IN THE SHORT TERM.	5	4	3	2	1			
53)ALWAYS MAINTAIN GAME SPECIES AT HIGH POPULATION LEVELS RATHER THAN ALLOWING POPULATIONS TO GO THROUGH NATURAL FLUCTUATIONS .	5	4	3	2	1			
54)MANAGE ECOSYSTEMS TO MEET SPECIFIC PUBLIC DEMANDS FOR WILDLIFE RECREATION AND SCENIC BEAUTY EVEN IF IT CURTAILS ECOSYSTEM PROCESSES & FUNCTIONS.	5	4	3	2	1			
55) SUSTAIN ECOSYSTEM SERVICES (E.G. NUTRIENT CYCLING, SOIL CONSERVATION, AND GROUNDWATER RECHARGE) EVEN IF IT MEANS PROVIDING FEWER OPPORTUNITIES FOR WILDLIFE RECREATION.	5	4	3	2	1			
56)ENHANCE EXISTING ECOSYSTEMS FOR WILDLIFE RATHER THAN RESTORE LOST OR DEGRADED ECOSYSTEM TYPES.	5	4	3	2	1			
57)DIVERT DNR STAFF TIME AND RESOURCES FROM MANAGING WILDLIFE ON PUBLIC LANDS TO DEVELOP WILDLIFE HABITAT THAT CONNECTS PRIVATE, PUBLIC, AND COMMERCIAL LANDS.	5	4	3	2	1			
58)DIVERT EFFORTS FROM GAME SPECIES MANAGEMENT TO FOCUS MORE ON NON-GAME SPECIES OF WILDLIFE.	5	4	3	2	1			
59)INTRODUCE PLANTS FROM OTHER COUNTRIES THAT PROVIDE GOOD FOOD FOR VALUED WILDLIFE SPECIES EVEN IF THE INTRODUCED PLANTS ELIMINATE NATIVE PLANT TYPES.	5	4	3	2	1			

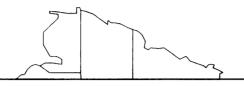
Background Information

	information will rem		nave sampled the Southern Michigan confidential. Your answers will not be
	5		
60. From the following list o your favorite types of outdoor			p to three (3) activities that represent
		iot have to the	ck direc.
O None of these are favorite			Clawaic
☐ BACKPACKING	☐ ITUNTING ☐ PHOTOGRAPHY		☐ BIKING ☐ JOGGING
☐ FISHING		•	_
☐ BIRD WATCHING	D BOATING		☐ HIKING
☐ CAMPING	☐ SNOWMOBILIN		DEING
ORV RIDING	O NATURE STUDY	☐ TRAPPING	G
CROSS COUNTRY SKIING	O WILDLIFE FEED	DING	☐ BERRY & MUSHROOM PICKING
61. Do you hunt?	ONO If 'No	', Skip to Ques	ition # 64.
62. In a typical year which of	f the following types of	of hunting do ye	ou participate in? (Check all that apply)
☐ ARCHERY DEER	O WATERFOWL	O UPLAND BIRDS	
GUN DEER	O SMALL GAME	☐ BEAR	
63. From the six choices liste	ed above, please indic	ate your single	favorite type of hunting (Choose only
one):		-	
64. Please list any environme	ental or conservation	organizations is	n which you are currently a member:
65. Within the past 5 years, I organization?	have you been an office Oyes Ono	cer in any Mich	nigan based environmental or conservation
66. In what county do you cu	rrently reside?		·

67. How would you d	escribe the area	in which you current	ly reside?					
☐ RURAL-FARM	O SMALL	SMALL TOWN (LESS THAN 25,000 PEOPLE)						
☐ RURAL-NON-FA	ARM 🗆 URBAN	☐ URBAN AREA (MORE THAN 25,000 PEOPLE)						
68. In what year were	you born? 19	·						
69. What is your sex	? OFEMAL	E OMALE						
70. What is your race	? DAFRIC	AN-AMERICAN	□ ASIAN					
	CAUC.	asian	O INTER-RACIAL					
	CLATIN	o	□ NATIVE AMERICAN					
	Оотнея	(PLEASE SPECIFY):	·					
71. What is the higher	est level of educ	ation you have comp	leted ?					
☐ NO SCHOOL COMPLETED	☐ HIGH SCHOOL D	OLPLOMA EQUIVALENT	☐ BACHELOR'S DEGREE					
C LESS THAN 9TH GRADE	☐ SOME COLLEGE	OR TECHNICAL SCHOOL	☐ MASTER'S DEGREE					
CISOME HIGH SCHOOL	☐ ASSOCIATE DEC	REE	☐ DOCTORATE					
			☐ PROFESSIONAL SCHOOL DEGREE					
72. What was your g	ross household	income in 1996?						
☐ Less than \$9,999	S15,000-\$24,99	99 🗆 🕻 35,000-\$49	,900 Greater than \$75,000					
\$10,000-\$14,999	\$25,000-\$34,9	99 🗆 \$ 50,000-\$74	,999					

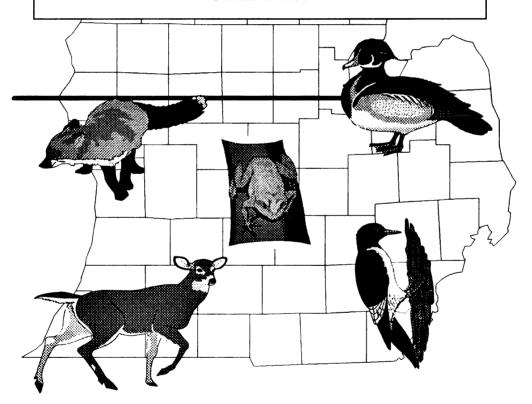
Thanks for completing the survey! Please return in the stamped envelope provided to:

Bob Holsman, Research Assistant 13 Natural Resources Building Department of Fisheries and Wildlife Michigan State University East Lansing, MI 48824



How should we manage our public lands and wildlife in Southern Michigan ?

An opinion survey conducted by Michigan State University Summer 1997



APPENDIX E FINAL SURVEY INSTRUMENT

SURVEY DEFINITIONS:

Note the following definitions of terms used in this survey...

- •"DNR" = Michigan Department of Natural Resources.
- •Southern Michigan = the area below the dark line on the map to the right. All of the survey questions apply only to <u>PUBLIC LANDS</u> in Southern Michigan (So. MICH.)
- •Public lands= all state and federally owned lands (e.g national forests, national refuges, state parks and state game areas). This does not include county lands.
- "Ecosystem" = some identifiable area of the environment (e.g. oak-hickory woodlot or cattail marsh) and all of the interactions between the living and non-living things residing there.
- •"Biodiversity" = the full variety of all life forms; including plants, insects and wild animals that live in an area.
- 1. From the following list of outdoor recreations, please check ALL of the activities that represent your favorite type(s) of outdoor recreation.

O NONE OF THESE ARE FAVORIT	E ACTIVITIES OF MINE.	
☐ BACKPACKING	☐ HUNTING	O BUKING
O FISHING	□ PHOTOGRAPHY	[] JOGGING
O BIRD WATCHING	☐ BOATING	☐ HIKING
CAMPING	☐ SNOWMOBILING	CANOEING
ORV RIDING	☐ NATURE STUDY	☐ TRAPPING
CROSS COUNTRY SKIING	☐ WILDLIFE FEEDING	☐ BERRY & MUSHROOM PICKING

2. To what extent do you agree or disagree with the following statement:

"Unless a sufficient level of environmental quality is maintained in Southern Michigan, our own existence as individuals and as a society will be jeopardized."

STRONGLY AGREE UNDECIDED AGREE

DISACREE

STRONGLY DISAGREE

ANote: If you answered DISAGREE or STRONGLY DISAGREE, please skip to Question # 7.₩

Your prefer	ences f	or l	and
and wildlife	manag	gem	ent

➤ How important is it to you...

	DON'S PL	leni .	important	ooreni ni	۸
critically in	Perl Proof	moderate	HINDOREN IN	DO. Junkrooteri	undecided

3) THAT ALL TYPES OF WILDLIFE & PLANTS BE RETAINED ON PUBLIC LANDS BECAUSE THEY MIGHT PLAY A ROLE IN MAINTAINING THE ENVIRONMENT THAT WE DEPEND ON IN SO. MICH. ?	4	3	2	1	0	U
4) THAT AIR AND WATER QUALITY IN SO. MICH. BE IMPROVED TO PROTECT THE HEALTH OF THE ENVIRONMENT THAT YOU DEPEND ON?	4	3	2	1	0	U
5) THAT PUBLIC LAND MANAGEMENT AVOID DISRUPTING ECOLOGICAL PROCESSES SUCH AS NUTRIENT CYCLING AND FOOD CHAINS IN CASE THEY ARE IMPORTANT FOR HUMAN SURVIVAL?	4	3	2	1	0	υ
6) THAT A DIVERSITY OF WILDLIFE AND ECOSYSTEMS BE MAINTAINED ON PUBLIC LANDS TO PROTECT THE HEALTH OF THE ENVIRONMENT IN SO. MICH.?	4	3	2	1	0	U

Note: Questions 7-21 ask the importance of managing our public lands for reasons other than maintenance of environmental (ecological) health.

➤ How important is it to you...

•	•	6.	•	4	•
4	3	2	1	0	U
4	3	2	1	0	บ
4	3	2	1	0	υ
4	3	2	1	O	U
4	3	2	1	0	U
4	3	2	1	0	υ
	4 4 4 4	4 3 4 3 4 3	4 3 2 4 3 2 4 3 2 4 3 2	4 3 2 1 4 3 2 1 4 3 2 1 4 3 2 1	4 3 2 1 0 4 3 2 1 0 4 3 2 1 0 4 3 2 1 0

dike the rocker, the order of the state of t

➤ How important is it to you...

4	3	2	1	0	U
4	3	2	1	0	U
4	3	2	1	0	บ
4	3	2	1	0	U
4	3	2	1	0	U
4	3	2	1	0	U
4	3	2	1	0	U
4	3	2	1	0	υ
4	3	2	1	0	U
	4 4 4	4 3 4 3 4 3 4 3 4 3	4 3 2 4 3 2 4 3 2 4 3 2 4 3 2 4 3 2	4 3 2 1 4 3 2 1 4 3 2 1 4 3 2 1 4 3 2 1 4 3 2 1 4 3 2 1	4 3 2 1 0 4 3 2 1 0 4 3 2 1 0 4 3 2 1 0 4 3 2 1 0 4 3 2 1 0 4 3 2 1 0

22) How important is it to you that <u>public lands in Southern Michigan</u> provide opportunities or access for any of the following types of recreation? (Circle <u>ONE</u> response for each activity).

	CRITICALLY IMPORTANT	VERY IMPORTANT	MODERATELY IMPORTANT	SLICHTLY IMPORTANT	UNIMPORTANT	UNDECIDED
A) SNOWMOBILING	4	3	2	1	0	U
B) BIKING	4	3	2	1	0	U
C) RIDING ORV'S	4	3	2	1	0	U
D) RIDING JET SKIS	4	3	2	1	0	U
E) BOATING	4	3	2	1	0	U
F) CROSS COUNTRY	4	3	2	1	0	U

Personal Choices

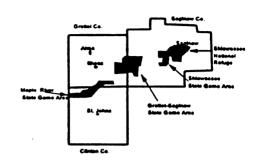
Circle one response to indicate the extent to which you agree or disagree with each statement.	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
23) OUR GENERATION HAS A MAJOR RESPONSIBILITY TO INCUR WHATEVER COSTS AND SACRIFICES ARE NECESSARY TO SUSTAIN WILDLIFE SPECIES INTO THE FUTURE.	1	2	3	4	5
24) I INTEND TO SEEK WAYS TO REDUCE WHATEVER NEGATIVE IMPACTS MY DAILY LIFESTYLE MAY POSE ON THE FUTURE WELLBEING OF WILDLIFE SPECIES.	i	2	3	4	5
25) IF I COULD BE CONVINCED THAT THE MONEY WAS BEING SPENT EFFECTIVELY, I WOULD BE WILLING TO DONATE MONEY TO AN ORGANIZATION THAT IS WORKING TO SAFEGUARD THE FUTURE WELL- BEING OF PLANT AND WILDLIFE SPECIES.	1	2	3	4	5
26) I Intend to make every effort to live my life so as to participate in the conservation of forests, wetlands, and other types of ecosystems for the future.	1	2	3	4	5

Opinions about current levels of various environmental attributes in Southern Michigan

Please circle a number to indicate your opinion about the current level of each attribute in So. Michigan.	FAR TOO MANY	SLIGHTLY TOO MANY	ABOUT THE RIGHT AMOUNT	SLIGHTLY TOO FEW	FAR TOO FEW	NO OPINION
27) PINE FORESTS	1	2	3	4	5	a
28) HARDWOOD FORESTS	1	2	3	4	5	n
29) WETLANDS	1	2	3	4	5	n
30) GRASSLANDS	1	2	3	4	5	n
31) NUMBER OF SONGBIRDS	1	2	3	4	5	a
32) NUMBER OF DEER	1	2	3	4	5	n
33) NUMBER OF FROGS AND AMPHIBIANS	1	2	3	4	5	n
34) NUMBER OF DUCKS	1	2	3	4	5	n
35) DIVERSITY OF WILDLIFE	1	2	3	4	5	n
36) PLACES TO OBSERVE & STUDY NATURE	1	2	3	4	5	n
37) PLACES TO GO HUNTING	1	2	3	4	5	n
38) ACCESS TO HIKING TRAILS	1	2	3	4	5	n
39) PLACES TO GO FISHING	1	2	3	4	5	n

Opinions of trade-offs in managing resources

<u>Directions</u>: The statements below are examples of management tradeoffs which wildlife managers must confront on public lands. The statements apply to the lands shaded on the map.



CIRCLE ONE RESPONSE FOR EACH STATEMENT. INDICATE THE EXTENT TO WHICH YOU AGREE OR DISAGREE WITH EACH STATEMENT.	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE					
ON THESE AREAS, RESOURCE MANAGERS SHOULD										
40)MAINTAIN BIODIVERSITY THROUGHOUT THE AREA, EVEN IF IT MEANS LOWERING THE POPULATION SIZES OF SOME COMMON SPECIES OF WILDLIFE THERE.	5	4	3	2	1					
41) SET ASIDE SOME FORESTED AREAS FOR 100 YEARS EVEN THOUGH OPPORTUNITIES FOR ECONOMIC BENEFITS FROM LOGGING ARE PASSED UP IN THE SHORT TERM.	5	4	3	2	1					
42)ALWAYS MAINTAIN GAME SPECIES AT HIGH POPULATION LEVELS RATHER THAN ALLOWING POPULATIONS TO GO THROUGH NATURAL FLUCTUATIONS .	5	4	3	2	1					
43)MANAGE ECOSYSTEMS TO MEET SPECIFIC PUBLIC DEMANDS FOR WILDLIFE RECREATION AND SCENIC BEAUTY EVEN IF IT CURTAILS ECOSYSTEM PROCESSES & FUNCTIONS.	5	4	3	2	1					
44) SUSTAIN ECOSYSTEM PROCESSES (E.G. NUTRIENT CYCLING, SOIL CONSERVATION, AND GROUNDWATER RECHARGE) EVEN IF IT MEANS PROVIDING FEWER OPPORTUNITIES FOR WILDLIFE RECREATION.	5	4	3	2	1					
45)ENHANCE EXISTING ECOSYSTEMS FOR WILDLIFE RATHER THAN RESTORE ECOSYSTEM TYPES THAT HAVE BEEN LOST OR DEGRADED.	5	4	3	2	1					
46)DIVERT DNR STAFF TIME AND RESOURCES FROM MANAGING WILDLIFE ON PUBLIC LANDS TO DEVELOP CORRIDORS FOR WILDLIFE THAT CONNECT PRIVATE, PUBLIC, AND COMMERCIAL LANDS.	5	4	3	2	1					
47)DIVERT EFFORTS FROM GAME SPECIES MANAGEMENT TO FOCUS MORE ON NON-GAME SPECIES OF WILDLIFE.	5	4	3	2	1					
48)INTRODUCE PLANTS FROM OTHER COUNTRIES THAT PROVIDE GOOD FOOD FOR WILDLIFE SPECIES EVEN IF THE INTRODUCED PLANTS ELIMINATE NATIVE PLANT TYPES.	5	4	3	2	1					

Opinions regarding the Michigan DNR

Circle one response to indicate the extent to which you agree or disagree with each statement.	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
49) I TRUST THE DNR TO MANAGE OUR PUBLIC LANDS TO ENSURE A HEALTHY & SUSTAINABLE ENVIRONMENT FOR MICHIGAN CITIZENS.	1	2	3	4	5
50) THE DNR IS PROFESSIONALLY COMPETENT WHEN IT COMES TO MANAGING WILDLIFE ON OUR PUBLIC LANDS.	1	2	3	4	5
51) I DO NOT TRUST THE DNR TO FAIRLY CONSIDER MY OWN INTERESTS WHEN MANAGING OUR PUBLIC LANDS.	1	2	3	4	5
52) OVERALL, THE DNR IS DOING A PROFESSIONAL & SATISFACTORY JOB MANAGING OUR NATURAL RESOURCES ON PUBLIC LANDS IN MICHIGAN.	1	2	3	4	5

53. The four public lands from the map on page #5 are listed below. Please indicate whether you have ever visited any of the four areas and also check which activities you pursued while you were there. (Check all that apply).

YES, I'VE VISITED			DEER HUNTING	DUCK HUNTING	BIRD- WATCHING	HEKENG	OTHER	
0	MAPLE RIVER STATE GAME A	REAfor:	σ	0	٥	0	o	_
0	GRATIOT-SAGINAW STATE GA	ME AREA	O	0	0	0	0	_
σ	SHIAWASSEE RIVER STATE GA	ME AREAfor:	ø	σ	0	0	0	
0	SHIAWASSEE FEDERAL WILDLE	FE REFUGE for:	0	σ	0	0	σ	
0	I HAVE NOT VISITED ANY OF TH	IESE AREAS.						
	Are you a hunter? n a typical year which o	OYES ONO		If 'No', Ski				ıat
	O ARCHERY DEER	□ WATERFOWL		() UPLAND BIRD	s			
	GUN DEER	O SMALL GAME		O BEAR				
	From the six choices list hunting.	-	-	•	e indicate y	our sin s	gle favorite type	of

Opinions about challenges to hunting

Circle one response to indicate the extent to which you agree or disagree with each statement.	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
57) Those in society who oppose recreational hunting pose a serious threat to future hunting opportunities.	1	2	3	4	5
58) ATTEMPTS TO ABOLISH OR RESTRICT HUNTING IN MICHIGAN ARE LIKELY TO INCREASE IN THE FUTURE.	1	2	3	4	5
59) ANY RESOURCE MANAGEMENT ACTION THAT REDUCES HUNTING OPPORTUNITIES IS A RESULT OF THE GROWING ANTI-HUNTING MOVEMENT IN THIS COUNTRY.	1	2	3	4	5

Background Information

We need the following information to determine whether we have sampled the Southern Michigan population adequately. This information will remain completely confidential. Your answers will not be associated with your name or address.

	☐ AUDUBON SOCIET	TY D M.U.C.C. D N.R.A. D SIERRA CLUB
	O DUCKS UNLIMITED	GREENPEACE D'NATURE CONSERVANCY
	I BELONG TO NONE	OF THESE
61. In w	hat county do you c	currently reside?
61. How	would you describ	e the area in which you currently reside?
	☐ RURAL-FARM	☐ SMALL TOWN (LESS THAN 25,000 PEOPLE)
		A
	☐ RURAL-NON-FARM	☐ URBAN AREA (MORE THAN 25,000 PEOPLE)
	□ Rural-non-farm	U URBAN AREA (MORE THAN 25,000 PEOPLE)
62. Do		n 1 mile of any of the public lands shown on page # 5?

63. Hov				
	v large is that property?	?		
	DLESS THAN 10 ACRES	☐ 10-40 ACRES	J41-100 ACRES	MORE THAN 100 ACRES
64. Wh	at is the primary use of	this property?		
	O RESIDENTIAL	☐ FARMING	☐ RESI	DENTIAL/RECREATIONAL
	O RESIDENTIAL/FARMING	☐ RECREATION	NAL () OTHER	
65. In w	vhat year were you born	? 19		
66. Wh	at is your sex? OFEMA	LE O M	IALE	
67. Wh	at is your race?			
	☐ AFRICAN-AMERICAN	□ ASIAN □ CA	LUCASIAN INTE	R-RACIAL
	O LATINO	☐ NATIVE AMERICAN	O OTHER (PLEASE	E SPECIFY):
(0 P)				
68. Plea	ase check the highest lev	vel of education you	have completed.	
	O NO SCHOOL COMPLETED		•	☐ BACHELOR'S DEGREE
	O LESS THAN 9TH GRADE OSOME HIGH SCHOOL	SOME COLLEGE OR TE ASSOCIATE DEGREE	CHNICAL SCHOOL	☐ MASTER'S DEGREE ☐ DOCTORATE
	DOOME HIGH SCHOOL	U ASSOCIATE DESIREE		Professional school degree
69. Wh	at was your gross house	shold income in 1996	5?	
	at was your gross house s THAN \$9,999	chold income in 1990	5 ? □\$ 35,000-\$49;	900 🗆 Greater than \$75,000
OLES				•
OLES	S THAN \$9,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•
O LES:	S THAN \$9,999 ,000-\$14,999	S15,000-\$24,999	\$ 35,000-\$49,	•

Thanks for completing the survey! Please return in the stamped envelope provided to:

Bob Holsman, Research Assistant, 13 Natural Resources Building, Department of Fisheries and Wildlife, Michigan State
University, East Lansing, MI 48824.

APPENDIX F NON-RESPONDENT POST CARD (ABRIDGED) SURVEY

Dear Michigan citizen,

Earlier this summer we mailed you a lengthy wildlife management opinion survey and have not received a reply. We'd like to able to compare certain opinions of people who sent back the survey with those who did not in order to better understand our results.

I ask that you take <u>2 minutes</u> to complete the attached postage paid post card. Tear it off and mail it back to us. Thank you so much for your cooperation.

Sincerely,
R. Ben Peyton
Professor, Fisheries & Wildlife
Michigan State University

P.S. If you have any questions regarding our study, call (517) 353-0877.

What was the primary reason you chose not to reply to the questionnaire?	that		ck ALL of ent your fa	avorite ty	/pe(s) of		on. ating	
Not interested in topic Survey was too long/complicated Other:	fishing			☐ birdwatching ☐ camping			none of these	
In what year were you bom? 19 How important is it to you		u	HI VERY INC	orani at	an importari	n godeni	kork skr	
(circle one for each)		Hican	"POCH"	"topour	sight.	Jriling.	under	
a)that a diversity of wildlife & ecosystems be made on public lands to protect the health of the enviror Southern Michigan?		4	3	2	1	0	U	
b) that opportunities are provided to hunt a vari wildlife on public lands in Southem. Mich?	ety of	4	3	2	1	0	U	
c) that management of our natural resources or	n public omic	4	3	2	1	0	U	

Department of Fisheries & Wildlife 13 Natural Resources Building Michigan State University East Lansing, MI 48824