INFORMATION TO USERS

Order Number 8814883

Beliefs, attitudes, and political behavior of selected Michigan forest recreationists concerning forest management in Michigan

Nelson, Charles Martin, Ph.D.

Michigan State University, 1988

PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark __✓__ .

1. Glossy photographs or pages _____

2. Colored illustrations, paper or print _____

3. Photographs with dark background _____

4. Illustrations are poor copy _____

5. Pages with black marks, not original copy _____

6. Print shows through as there is text on both sides of page _____

7. Indistinct, broken or small print on several pages __✓__

8. Print exceeds margin requirements _____

9. Tightly bound copy with print lost in spine _____

10. Computer printout pages with indistinct print _____

11. Page(s) _____ lacking when material received, and not available from school or author.

12. Page(s) _____ seem to be missing in numbering only as text follows.

13. Two pages numbered _____. Text follows.

14. Curling and wrinkled pages _____

15. Dissertation contains pages with print at a slant, filmed as received _____

16. Other_____

_____

_____

U·M·I

BELIEFS, ATTITUDES, AND POLITICAL BEHAVIOR OF SELECTED MICHIGAN
FOREST RECREATIONISTS CONCERNING FOREST MANAGEMENT IN MICHIGAN

By

Charles Martin Nelson

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Forestry

1988

ABSTRACT

BELIEFS, ATTITUDES, AND POLITICAL BEHAVIOR OF SELECTED MICHIGAN

FOREST RECREATIONISTS CONCERNING FOREST MANAGEMENT IN MICHIGAN

By

Charles Martin Nelson

This study explores relationships of the knowledge, attitudes, and political behavior of selected groups of forest recreationists concerning Michigan forests and plans for their management. A total of 1,335 forest recreationists was sampled using a mail questionnaire.

Politically active groups sampled knew more about Michigan forests and their management than those less involved in forest policy. All sampled groups rated wildlife habitat as the most important use of Michigan forests. A greater abundance of non-game wildlife, game wildlife, and fish were the most desired future outputs.

Models using knowledge about forests and their management; attitudes about scenery, wildlife, and preferred uses of the forest; and demographic variables explained small to moderate amounts of variance in attitudes about timber management practices. Similar models were more successful in explaining attitudes about timber harvest volume in Michigan.

The politically active respondents differed from the less active respondents by having higher levels of education, income, affiliation with natural resource special interest groups, knowledge about Michigan forests and forestry, and by being more likely to live or own a second home in the more forested northern two-thirds of Michigan.

of the pre-test.

My parents, Arthur and Lois Nelson, while not directly involved in this project have nevertheless given me the confidence in myself to go forward into the "unknown". Their unfailing interest in my education and my growth as a person has contributed significantly to my ability to complete this project.

The recent patience and support awards however, go to my wife, Susan DeRosa. Susan put up with my many hours at the computer center and the computer at home, discussions in my sleep about discriminant analysis, and me wondering if this was all worth it. Things began to really get exciting when I turned in the first draft the morning of our first child's birth. April 21, 1987 will live as a dramatic day for both of us as the struggle to finish a Ph. D. was successfully drawing to a close and our lives were blessed with a wonderful new dimension, Michael DeRosa Nelson. Welcome aboard Mike.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

<u>Michigan Forest History</u>

Michigan's forests have always been a source of diversified products. The forest provided Native Americans with products as diverse as game, shelter, materials for boat construction, and a home for religious deities (Quimby 1960).

Later settlement by whites still found the forest a place of multiple products, although certain uses such as logging and products such as white pine dominate our impressions of the nineteenth century. Former logging towns such as Saginaw, Muskegon, and Seney still proudly tout their heritage. The forest was the home of furbearers that attracted trappers and traders. Game from the forest was often an integral part of the settler's diet. Under the forest mineral deposits of iron ore and copper were being discovered and exploited in Michigan's Upper Peninsula (Bald 1961).

Use was characterized by its unrestrained nature where users believed forest resources were inexhaustible. But by the turn of the century, the result of such unrestrained extraction of multiple products was apparent. Devastating fires swept over much of northern Michigan and once abundant furbearers became scarce. A virgin timber resource was replaced with jack pine barrens across the mid-section of the northern Lower Peninsula and significant portions of the Upper Peninsula. The myth that agriculture would follow the ax and that the sandy soils that once supported the white pine (Pinus strobus) and red pine (Pinus resinosa) would now support pasturage and row crop agriculture was quickly dispelled by the massive failure of agriculture in the North. Almost 2 million acres of land reverted to the state for non-payment of taxes

1

during the first three decades of the 20th century (Schmaltz 1983).
These lands were retained in state ownership to be managed for forestry
under the authority of the Forest Reserve Act (PA 175 of 1903).

In 1921, Public Act 17 established the Michigan Department of Con-
servation. This act mandated that the Department of Conservation "pro-
tect and conserve natural resources of the state; provide and develop
facilities for outdoor recreation; prevent the destruction of timber and
other forest growth by fire or otherwise; promote the reforesting of
forest lands belonging to the state; prevent and guard against the pol-
lution of lakes and streams within the state, and enforce all laws pro-
vided for that purpose with all authority granted by law, and foster and
encourage the protecting and propagation of game and fish."

Much of the focus of such state management and regulatory activity
was on state owned land, principally the forest reserves. This broadened
the role of forest reserve management from reforestation, fire control,
and timber production to include recreation and fish and wildlife man-
agement. The act mandated the state to provide for diverse natural
resource uses while protecting the resource base from harm. It suggested
multiple uses without guidelines on how to accomplish such overlapping
and often conflicting use.

Current Policy Direction

In theory, multiple use is "the harmonizing of forest uses so as to
maximize the benefits" (American Forest Products Industries 1961:11).
Policy 2207 of the Michigan Department of Natural Resources (1979)
guides the Department's multiple use management. The policy states that
the Department of Natural Resources (DNR) should manage the total forest
system for a combination of products, services, and values that include
timber, fish and wildlife, minerals, recreation, and evironmental and

aesthetic values. On a system-wide basis these outputs are to be given
fair and equal consideration. However, within a specific geographic
locality, a key value system will be used to identify primary uses for a
site. Secondary uses will be developed where they are compatible with
the primary uses.

The Michigan forest management plan entitled "Michigan's Forest
Resources Direction for the Future" (DNR 1983) targets a 137% increase
in annual timber harvest volume from the year 1977 to the year 2000. It
follows a trend projection from the US Forest Service suggesting that
fish and wildlife recreation user days will increase 29% and other forms
of outdoor recreation user days will increase 25%. Targets, similar to
the one for timber harvest, are to be developed for recreation in the
near future that may differ from those trend projections. The timber
target and the recreation trend projections represent a judgement that
"a greater percentage increase is possible for timber than for wildlife,
fish, and other recreation activity." (DNR 1983:7).

The biological basis for the greater increase in timber harvest over
other uses is that timber growing stock volumes have increased 79%
between 1952 and 1980. Also, annual volume growth has been estimated at
over 2.75 times annual harvest in the 1954, 1965, and 1980 forest sur-
veys (DNR 1983). For recreation to have a similar increase, travel pat-
terns would have to change dramatically.

Public Interaction with Forest Policy

Does the recreating public understand the changes that have occurred
recently in Michigan forests? Do they understand the biological basis
for increased timber harvest? Do they understand the biological ration-
ale for various timber management practices and the objectively measur-
able effects of those practices on non-timber forest products? If they

have such understanding, do they support such management? Do they support the priorities that the plan espouses as representing the best use of Michigan forests? What situations or circumstances are most likely to characterize those who have become politically active concerning forest management in Michigan? These are the basic policy questions that will be explored in this study under the following theoretical framework.

Theoretical Framework

The theoretical framework for this study, which will be significantly expanded in the literature review chapter concerns the linkages between an individual's believes, evaluations of situations, and the political actions that may be taken in response to beliefs and evaluations.

There are three intertwined levels in which any individual interacts with an entity such as a forest or a forest management plan. The first is one's belief about the entity. There are two types of beliefs. One person may believe that sugar maples (Acer saccharum) lose their leaves each October. Another may believe that such trees lose their leaves in May. As there is an objective way to_test these beliefs, they will be called objective beliefs. Those that are correct are knowledge. A second category of belief is not currently objectively verifiable. For example one may believe that wildlife in general benefits from selective cutting. Depending on the individual's image of "wildlife in general", wildlife may or may not benefit. Further for many species of non-game wildlife, the effects of forest management actions on populations are unknown. A belief that is not objectively verifiable is defined as a speculative belief.

The second level is an evaluative level. Our evaluations are characterized as attitudes. Attitudes are partially formed on the basis of

both types of beliefs described above. They are not solely based on objectively correct or verifiable information. As the amount of information internalized concerning a subject increases, previous attitudes may undergo change. However, incoming information is often filtered by existing attitudes and is thus selectively absorbed.

The third level is overt behavior. What does one do in response to one's attitudes? Many entities clamor for our attention. One's behavioral response is based on the perceived benefit of such response. Benefit may be obviously recognizable when one sees a causal connection between one's welfare and a potential action. Often however, benefit is not so apparent and the rationale for taking or not taking action is less clear. Behavioral response is also based on a belief in the efficacy of such response and knowledge of the potential paths of response. Complaining to one's neighbor is a response which, while it may relieve stress, is not likely to change state policy. Conversely, joining a natural resource special interest group or contacting your state legislator is more likely to have an effect on policy.

Public/Manager Contacts with Forest

The recreating public's contact with the forests and their management differs from that of forest managers. The public is most likely to come in contact with the forest environment from a distance during travel, often recreational travel. At close quarters, the public is most likely to come in contact with the forest during a recreational activity such as camping, picnicking, fishing, etc., or by having a primary or secondary home site within the forest. Jackson (1986) suggests that people who have recently purchased such home sites in the rapidly growing northern Lower Peninsula of Michigan desire a naturalistic environment. Youell (1985) reports that in Connecticut a broad range of citizen

Initiated local ordinances concerning timber harvest and management have been enacted to protect natural and aesthetic values.

In contrast, the forest manager's contact with the forest is much broader. While forest managers may recreate or live in the forest, much of their business is to provide forest products or safeguard forest resources to produce products. These products include those familiar to recreationists such as campgrounds, as well as those less familiar such as timber and vegetative manipulation to support endangered species.

The consumer orientation of the public versus the supplier orientation of the forest manager can encourage different viewpoints about what products are important and whose needs are important. Available information can also influence perceived values for managers. Blossom (1985) cites a recent Michigan State University study suggesting the wood products industry contributes 4.1 billion dollars annually to Michigan's economy and employs 63,000 people. No comparable economic information is available for forest recreation activities.

Are different viewpoints important? Barber (1984) and Hendee (1984) suggest that forestry has suffered from a lack of public support and is likely to suffer further if an effort is not made to understand the public's view of forestry. They also suggest that foresters need to actively present their case for management activities and to look for ways to meet broad public goals.

Benzie et al. (1986) in their review of forestry in the North Central states predict that in the next 30 years forest managers will adopt more of a good neighbor policy. This may include coordinating management of their stands with adjacent stands under other ownership, even if objectives differ. They suggest that "managing for potentially conflicting uses will test the mettle of foresters"(Benzie et al. 1986:40).

Study Objectives

This study will use the theoretical perspective of the linkages between belief, attitude, and overt political behavior to explore the recreating public's reaction to Michigan forest policy. It is hypothesized that the beliefs of the public will be at odds with the biological facts the DNR has used to put increased emphasis on timber harvests. Further it is hypothesized that the recreating public's attitudes about management priorities may differ from the plan. Finally, it is hypothesized that those who become politically involved in forest management will have a readily demonstrable stake in forest management actions.

CHAPTER II

LITERATURE REVIEW

Definitions

The following definitions are provided at the outset to assist the reader in following the literature review.

Objective belief: Defined by the author as a fact, whose veracity can be verified by objective inquiry. When true commonly called knowledge.

Speculative belief: Defined by the author as a purported fact, believed by an individual, which has not currently been verified true or false by objective inquiry.

Perception: Sensing and gathering of information, both about focal entities and contextual background in which they occur (Kaplan and Kaplan 1982); an "on-site" activity. This information provides the basis for beliefs.

Image: A mental picture formed from past perception about an entity (Sommer 1978). A mental repository of beliefs, often intertwined in one complex image.

Schema: A series or collage of images that provide an overall mental picture of a complex environment (Lee and Uzell 1980)

Attitude: Personal evaluation of an entity (Ajzen and Fishbein 1977). If on-site, the entity is seen both as the current perception and as an image, or if more complex, a schema. If not on-site, it is seen as an image or schema, as perception is not involved.

Political behavior: Defined by the author as contact with a govern-
mental entity by a citizen concerning a forest management related
issue.

Studies such as this one explore people in "mid-stream", that is
people who already have a store of beliefs, images, and attitudes, and
have already demonstrated countless behaviors. Thus in trying to monitor
an existent population, the continuing interrelationships of these con-
cepts is important.

Beliefs

Downs and Stea (1977) define two broad classes of belief concerning
the environment: locational, or where something is, and non-locational,
or what something is. Considering what something is suggests that envi-
ronments have symbolic meanings. Harrison and Sarre (1975) suggest that
the functional use people have for an environment is the most powerful
force shaping their knowledge of the environment. An angler may construe
a forest as the place where a favorite trout stream flows. The angler's
beliefs concerning erosion from timber harvest are likely to be highly
developed. Conversely, a deer hunter would be more knowledgeable about
the types of trees that provide deer food. Such specialized, functional
beliefs may be in stark contrast to a forest manager whose training
focused on growing and harvesting timber as an agricultural crop.

Considering where something is implies spatial distribution. There
are two ways that people locate objects (O'keefe and Nadel 1978): first
by their absolute location (coordinate system) and second by their rela-
tive location (relationship to other objects). While this research is
not concerned with the coordinate locations of forested lands, the rela-
tive size of forested lands and the relationship of public to private
lands is vitally important. The relative location of something, such as

the distance of a harvest from a home or a scenic drive may have power-
ful effects on the public and result in political behavior limiting for-
est management activities (Hacker 1983).

Perception

To perceive is to gather information about focal objects (e.g., the
road one is traveling, the river one is canoeing, etc.). Information is
also gathered about the context in which this occurs, such as bulldozed
slash piled up near the road or an uncut corridor following the river
bed (Kaplan and Kaplan 1982).

Does perception record things as they actually are, or does it
represent mere impressions? Gibson (1979) suggests that perception is
indeed accurate. Kaplan and Kaplan (1982) promote the other theory. A
quick review of the children's game "telephone" seems to support the
Kaplan argument. It is hard to conceive that if perception is absolute
the mind will garble a message so quickly when it is passed from one
person to the next. Both theories however, agree that perception is
cumulative: that what you have perceived in the past is combined with
current perception to constantly form more complex cognitive structures
(such as images and ultimately, schemas). The lack of accuracy in per-
ception may help account for the false beliefs people hold about many
objects or events that are readily tested by objective methods. A tape
recording of a game of telephone can quickly establish the original mes-
sage, yet we seldom use such back-up systems in our everyday lives.

The cumulative nature of perception has two important effects.
First, it provides us with expectations of what places should be like
(Russell and Ward 1982). For instance, experience with a favorite forest
recreation spot such as a trout stream, trail, or camping site gives one
an expectation of the next experience. This is done is by setting up a

mental prototype of a campground, a trout fishing spot, etc. All other places, and the experiences we have in them, are compared to this model. Second, such experience can act as a perceptual filter which can lead us to ignore or to focus on certain stimuli (Hammitt 1983). The extent to which past experience or future expectations act as a filter mechanism is not well understood, but it poses a barrier to effectively disseminating information.

Image and Schema

The image, or mental picture, we have of an object or place is a powerful force in shaping our attitude about that object or place. As it becomes more complex this selective accumulation of perception is theorized to become a schema, a complex mental representation of a farm, forest, etc. Lee and Uzell (1980), in a study of visitors who toured interpretive displays and received interpretive programming at British farms, suggest this was effective in enlarging and increasing the accuracy of the schema visitors had about British agriculture. Through pre- and post-visit testing, they suggest that such gains in the schema can be relatively long term.

Lee and Uzell (1980) also contend that a schema is most functional if its structure has related rather than random images. Typical arrangements for such a structure are by accommodation and assimilation. For example one may know maples (Acer spp.) have opposite branching but have no information about ashes (Fraxinus sp.) also having opposite branching. When, through perception, one discovers that ashes also have opposite branching, accommodation occurs and the schema is enlarged. One also assimilates this information for future use, such as identifying a tree branch a month later and not immediately concluding because it has opposite branching it must be a maple.

Lee and Uzell (1980) suggest that the most effective schema is one in which a "building block" approach is used. Each additional piece of information is founded on a previous piece of information. This argues against a set of isolated facts being useful in constructing an effective schema.

Beliefs and Attitudes

The environmental education literature provides some insight into the relationship between knowledge and attitudes. Burris-Bammel (1979) suggests that attitudes about forestry are not correlated with knowledge about forestry. She tested knowledge and then related those test scores to attitude measures about forest management practices. However, her test of knowledge does not use the building block approach of Lee and Uzell (1980) in constructing a schema. Further, her items to assess knowledge contain value laden terms such as "good policy" and vague statements such as "properly located and constructed logging roads will reduce the quantity of soil material in forest streams." It is difficult to know if the statement compares properly located to improperly located roads, properly located roads to no roads, or if roads will take soil materials out of streams.

Ramsey and Rickson (1976) suggest that higher levels of knowledge are correlated with moderate attitudes about pollution abatement. At lower levels of knowledge polar views are more prevalent as these individuals are unaware of the tradeoffs in obtaining cleaner air and water.

Bultena et al. (1975) disagree with Ramsey and Rickson (1976). They studied a group of citizens living near a proposed reservoir and found that those who had higher levels of knowledge about the project held the most intense attitudes toward the project, pro and con. The beliefs concerned rationale for construction, opportunities for public input, and

the local response to the project.

Relatively little has been published in the forestry literature concerning the relation of belief and attitudes. Langenau et al. (1977) assessed the beliefs of samples of Roscommon County, Michigan residents in 1974 and 1976 about clearcutting and prescribed burning. The sample responded to true/false type statements. The beliefs tested were both knowledge and speculative beliefs. The statements contained evaluative terms such as "too dry", "too much", and "too close to roads" making the measures closer to attitudes than beliefs. Attitudes about clearcutting were also rated. Of those respondents who had seen the clearcut areas, 48% either agreed or strongly agreed with the cutting in 1974 and 45% in 1976. Of those who had not seen the clearcut areas, 25% agreed in 1974 and 12% in 1976. The study made some attempt to link beliefs with the overall level of agreement with clearcutting. Beliefs concerning the benefits of clearcutting for deer, deer hunting, and wildlife were most commonly linked with positive attitudes about clearcutting.

Langenau et al. (1980) also studied the attitudes of on-site forest recreationists in north central Lower Michigan in 1974 and 1976. Forest blocks nine square miles in size had differing percentages of area clearcut. The researchers found that total recreational use of experimental clearcut areas (75%, 50%, and 25% of the block clearcut) was lower than use of the control area (3 1/2% clearcut annually). The attitudes toward future clearcutting were mixed with 28% wanting more clearcutting in the areas where they were contacted. Hunters, especially small game hunters, were most supportive of clearcutting, while off road vehicle users were least supportive. The authors suggest that the past experiences of recreationists with clearcuts may be in large measure responsible for their attitudes and behavior about clearcutting.

Becker (1983) studied the attitudes of on-site recreationists in Maryland during 1974 and 1975. He found that for summer recreationists higher education levels and a shorter travel distance to the clearcut were associated with clearcut recognition. Such recognition was also associated with more positive opinions toward clearcutting. Fall recreationists, who were mainly hunters, were more likely to support clearcutting as a "proper forest management practice" than summer visitors.

Yanklovich et al. (1982), in summarizing four nationwide surveys of attitudes about the forest products industry, report that an increasing percentage of a general population sample evaluate clearcutting as a timber production practice that is subject to widespread abuse. In 1979, 28% responded that clearcutting was subject to abuse, while in 1982 that rose to 43%. Beliefs about the growth requirements of species being clearcut, effects of such cutting on wildlife, and what the practice of clearcutting entails were not probed. Neither was a definition of clearcutting provided.

They also probed the general public's attitude about prescribed burning, which they called "controlled burning". Less concern was expressed about prescribed burning. Between 1979 and 1982 concern rose only slightly from 19% of the sample to 21% of the sample. Again, no definition of the practice was provided, nor were objective beliefs about the practice measured.

Nelson et al. (1984) reported in a study of Michigan state forest campers that knowledge of the long term and annual timber volume surplus in Michigan was associated with a greater likelihood to support clearcutting. Further, when half the sample was given additional information about the positive effects of clearcutting on deer populations and aspen regeneration, they were even more likely to be more supportive of clear-

cutting. The attitude measure about clearcutting for that sub-sample was asked directly after the additional clearcutting information was supplied.

Neilsen and Buchanan (1986) in a study of visitors at Grand Teton National Park, reported that knowledge and attitudes concerning naturally caused wildfire were positively changed by interpretive programming. The post test occurred immediately after the interpretive presentation.

The author found no study that adequately measured objective beliefs about forests and forest management using a "building block" approach such as Lee and Uzell (1980) suggest. While some studies such as Burris-Bammel (1979) attempt to measure objective beliefs, often the beliefs they try to measure are not objective and may be better classified as attitudes. There is a sizeable body of attitude work in the forestry field about attitudes on controversial practices such as clearcutting (Glascock 1974; Yanklovich et al. 1980, 1981, 1982), but none of it is linked to measuring objective beliefs.

The recent work of Nelson et al. (1984) and Neilsen and Buchanan (1986) begins to support a relationship between knowledge and attitudes about controversial management practices. However, both studies provided measured attitudes immediately after they provided information about the practice. Long term change in attitude was not measured.

Cialdini et al. (1981) suggest there are two methods to change attitudes. The central method is when a person is motivated and thinks about an issue; the peripheral occurs when a person is not highly motivated and gives an issue little thought. Persuasion from the central method is most enduring. In the peripheral method individuals are more likely to focus on the source of the message (eg. a personable inter-

viewer, campground employee, etc.) or the immediate rewards for accepting the message (make the interviewer "happy"). This results in a brief attitude change unlikely to last unless supported by future persuasion efforts where the individual gives the issue serious thought. Interpretive programs and personal interviewers may encourage the peripheral type route of persuasion rather than the more effective central method.

In summary, a variety of potential links appear between beliefs about forestry and attitudes about management practices. Langenau et al. (1977) suggest that the relationship of clearcutting to deer populations, deer hunting, and wildlife populations in general is a factor in shaping attitudes about clearcutting. Langenau et al. (1980) report that recreation participation may also affect attitudes concerning clearcutting. Becker (1983) reports hunters are more favorable than other forest recreationists toward clearcutting. Nelson et al. (1984) found a relationship between knowledge of timber supply, deer populations, and aspen regeneration with attitudes about clearcutting. Neilsen and Buchanan (1986) reported information about regeneration of intolerant species and food requirements of large herbivores was correlated with more positive attitudes about fire.

Image and Attitudes

How do people's images of forests and forest management in Michigan affect their attitudes? For example, bugs, especially biting bugs, are the enemies of most campers. An initial camping trip where the participants lack the knowledge to completely close the mosquito netting on the tent, to use bug repellent, or who choose to camp at the peak of the mosquito season can create a powerful image of the forest as a painful place. In the individual's formation of an attitude about camping (evaluation of the experience) one would expect a rational individual to

place the insect infested experiences on the negative side of the led-
ger. Thus, unless the overall image of camping contains other positive
aspects, camping may be evaluated as being undesirable.

One's image of forest management relates to one's evaluation of man-
agement's effect on that individual's well-being and that of important
others. For instance, a grouse hunter who finds more grouse in fairly
recent clearcuts than in overmature aspen stands, sees clearcuts as a
practice that improves grouse hunting. This engenders a positive atti-
tude about clearcuts. Conversely, a hiker who enjoys hiking through
mature aspen stands because they are shady and provide a good field of
vision, may be dismayed by a clearcut which encourages short, brushy,
dense young growth which blocks vision, reduces his mobility, and pro-
vides little overhead shade. This engenders a negative attitude toward
clearcuts.

The link between image and attitude has been demonstrated in a num-
ber of other ways. Langenau et al. (1980) suggest that people may be
more likely to have negative opinions about clearcutting if they are
told they are in a clearcut rather than allowing them to draw their own
conclusions from what they perceive.

This suggests that the mental image of clearcutting is a negative
one. Anderson (1981) tested this suggestion using slides of the same
areas shown to different panels. The only difference was that she pro-
vided different names for the current site management strategy including
" commercial timber stand", "national forest", "national park", and
"wilderness". Areas that had natural, non-economic connotations to the
sample of college students (ie. national forest, national park, and wil-
derness) were rated as more scenic than the commercial timber stand.

The meanings people apply to the environment also have a link to

behavior. When one seeks a wilderness experience, one goes to what one believes is a wilderness. Knopp and Bruder (1985) in a study of environmental decision makers suggest that even such politically active individuals differ about the physical features and the acceptable activities on various types of forest land. The category of "state forest" showed the broadest divergence of views. The category of "national park" showed the least divergence.

These behavioral and environmental expectations of a place are contained in what has been termed a script (Schank and Ableson 1977). When such expectations are not met, it may result in an alteration of a person's expectations, a "re-write" of the script. It may also result in a political behavior designed to make the situation match the script.

Attitude and Behavior

The link of attitude to behavior has been hotly debated for the past 25 years. Wicker (1969) suggested a weak and uncertain relationship between attitude and behavior. Heberlein (1973) in his analysis of an attitude study about wilderness suggested that such attitudes were of questionable value in predicting wilderness use (behavior).

In the late 1970's, however, the pendulum began to swing back in favor of attitude as a more reliable predictor of behavior (Cooper and Croyle 1984). Two schools of thought have emerged in this revival of attitude/behavior linkage. Ajzen and Fishbein (1977) argue that attitudes are relatively valid and reliable predictors of behavior if they are measured at a level of specificity comparable to the behaviors they are intended to predict. They state "A person's attitude has a consistently strong relation with his or her behavior when it is directed at the same target and involves the same action"(1977:912). Thus measuring attitudes about clearcutting and attitudes about personal involvement in

forest management issues is a valid and reliable way of predicting whether certain types of individuals will contact forest managers and what attitudes they might express about forestry.

Fazio and Zanna (1981) suggest that the comparable specificity of attitude and behavior are less important than the past behavioral experiences of the individual with the attitude object. Thus, a person who has commented once to a forest managing agency is more likely to comment in the future than one who hasn't, even if they hold similar attitudes about such contacts and forest management practices.

The marriage of these two schools seems a realistic way to approach attitude/behavior interaction. Both the correspondence between the attitude being measured and the behavior being predicted, and past experience in the behavior appear to be important considerations.

Role of Belief and Attitude in a Model of Political Behavior

How do the beliefs and attitudes of forest recreationists about forest management practices, especially as they relate to the state forest management plan, affect their political behavior? Who is likely to comment to his legislator, attend a public hearing, or contact the DNR about forest management practices? Hooper (1983) suggests that there are four motivational bases for political action. First is the fear of loss of a right, privilege, or property (penalty avoidance). The second motivation is that the behavior is a means to an end (instrumental orientation). The third motivation is that it is a duty or obligation (duty orientation). The fourth motivation is that the person "believes in" what they are doing (internalization). This may take the form of a person advocating causes as widely variable as stopping legal abortion to maintaining private ownership of firearms.

Each of these motivations may be seen in people who comment about

forest management. Penalty avoidance can be seen from landowners adjacent to a clearcut or a landing where logs are loaded onto trucks. Even though they do not own the property being logged, they are losing a view they may have cherished. The instrumental orientation is found in special interest group employees who comment about situations because the issue may assist the group's cause. The duty orientation may be seen in a special interest group member who responds to an alert in the group's newsletter and feels it a duty to write the requested letter. The person who has internalized the need for forests and believes that harvest means a long term loss of forests may feel compelled to write because it is the right thing to do when such forests may be cut. Hooper (1983) suggests that writing a letter to a governmental entity is most often associated with the internalization motivation.

These motivations may be heightened when they occur in concert with five other factors. The first is beliefs. If the beliefs of citizens, especially beliefs concerning objectively verifiable situations are inaccurate, the outcome citizens project from management actions may be drastically different from that of forest managers. If a citizen can identify aspen trees, yet believes they commonly grow in the shade from seed, then an aspen clearcut may indeed seem like improper management, regardless of any preferences they may have about scenery.

Second, as attitudes grow stronger, the probability that an individual may join a special interest group increases. Kellert (1979) suggests that special interest group members are more likely to have polar attitudes about wildlife than those not involved with a wildlife special interest group. Special interest groups also provide benefits to their members in the form of additional information, often unavailable or very expensive to the individual citizen (Schmid 1978). This additional

information allows members to be more knowledgeable than non-members, provided the information is true.

Third, Russel and Ward (1982) suggest that territoriality is important in what one views as acceptable uses of an environment. Territories are based on who owns the territory, who belongs there, and who should be excluded. The three types of territories defined are primary territory (suggesting individual or small group principal ownership and strong exclusionary powers), secondary territory (where a large, but still defined group has ownership but less exclusionary power) and public territory (a place open to all). Individuals who view a forest area as a primary territory would be more likely to comment because their commitment to such an area is stronger. Examples of those who might view a forest as a primary territory are those owning adjacent lands or are one of the few residents living on a certain road. Some less obvious examples may also be important. These include those who have fished, hunted, or camped in the same location for many years.

Fourth, Sharpe (1982) suggests that citizen contact of government officials is positively related to socio-economic status. Thus an individual who is more highly educated and has a higher income is more likely to contact a governmental entity.

Fifth, Maggiotto and Bowman (1982) suggest that there is an overarching perceptual framework about broad topics within which individuals evaluate and act on any specific issue. For example, an individual may feel that humanity's influence is negative on the environment. Thus a specific forest management action, while it might accomplish a specific goal of which the individual is in favor, is evaluated negatively because nature is "better off without human interference".

The overarching framework that the general public has of the forest

products industry has been measured since 1979 by Yanklovich et al.
(1982) and the American Forest Institute (1985). They suggest that the
general public has a greater concern for protection of the water supply,
wildlife habitat, and scenery than it does for timber based economic
uses of the national forests.

Does an overarching framework extend to attitudes and actions about
specific forest management issues, e.g., the preferred level of timber
harvest in Michigan in the next five years? Olsen (1981) suggests that
an overarching framework in favor of energy conservation is not a good
predictor of participation in specific energy conservation measures.
Maggiotto and Brown (1982) in their study of Florida legislators suggest
that the overarching framework of the legislators concerning air pollu-
tion was indeed a reliable predictor of their attitudes and actions con-
cerning specific air pollution issues.

A combination of the above mentioned factors may be even more likely
to result in a comment to a governmental unit. For example a long time
angler and contributor to Trout Unlimited who retires to northern Michi-
gan near a favorite stream appears be more likely to comment about an
upstream clearcut he perceives causing erosion than a first time trout
angler unfamiliar with the area.

CHAPTER III

RESEARCH QUESTIONS

Based on the literature review, the following five research questions have been identified as the specific focus of this study.

Knowledge of Michigan Forests and Forestry

1. What do forest recreationists know and believe about Michigan forests and their management?

Webster and Olmstead (1982) see one of the major problems in forest planning as the lack of public understanding of forestry and forest resources. Since the basis for much of this understanding in the education of a forester is related to silviculture, a basic working knowledge of trees and the management practices that harvest and promote regeneration should be valuable to the public.

As the literature review noted, no systematic attempt has been made to longitudinally measure the public's knowledge and beliefs about forestry. This study will provide such a baseline for Michigan that can be repeated to measure change and the influence of educational initiatives.

Forest Output Mix

2. Do forest recreationists and the DNR have the same priorities for outputs from Michigan forests?

The DNR (1983) plan proposes to increase all outputs, with a large increase in timber harvest and moderate increases in outdoor recreation. Nelson et al. (1984, 1985) in their study of Michigan state forest campers suggest that the preference of forest campers is for wildlife, recreation, and timber in that order. Are other groups of forest recreationists also oriented in a similar direction rather than in the direction of the plan? Are citizens politically active in forest management issues likely to have priorities closer to the DNR's than those who

23

are less active?

Modeling Management Practice Attitudes

3. What combination of beliefs and attitudes about Michigan forest management and what demographic profile of forest recreationists can best model preferences for future management practice levels?

The literature review notes a number of possible model components of belief and attitude that appear to influence attitudes about management practices. Langenau et al. (1977) reported that beliefs about wildlife impacts from clearcutting were associated with attitudes about clearcutting. Nelson et al. (1984, 1985) suggest that beliefs concerning timber supply were associated with attitudes concerning clearcutting and plantations. Hummel (1986) in his script for a DNR contracted video tape to educate interested publics about Michigan forest management, places great stress on the identification and regeneration characteristics of Michigan trees as the rationale for many management practices.

Langenau et al. (1977) question whether educational campaigns designed to make clearcutting more tolerable would be effective especially as they relate to older individuals who may have a strong overarching framework about forests and their management. Maggiotto and Bowman (1982) report on the importance of overarching framework in influencing specific attitudes in a broad natural resource area. Langenau et al. (1977) report that northern Michigan landowners were likely to have negative attitudes about clearcutting and prescribed burning because subsequent regeneration was less desirable to them than some of the harvested species.

Demographic variables that may influence attitude include home ownership in the forest environment (Ward and Russel 1982). Schmid (1978) suggests special interest group membership provides unique access

to information, thus influencing attitudes of group members. Kellert (1979) reports that the attitudes of special interest group members tend to be more polar than non-members. Langenau et al. (1980) reports hunters, especially small game hunters are more receptive to clearcutting than other types of recreationists.

Modeling Preferred Harvest Levels

4. What combination of beliefs and attitudes about Michigan forest management and what demographic profile of forest recreationists can best model preferences for future timber harvest levels in Michigan?

While management practices may be the visible tool used to provide a wood supply, the extent to which various practices are used is difficult to measure and difficult to explain to the public. Harvest volume is a less complex measure and may relate quite well to broad public attitudes about resource shortages (Yanklovich et al. 1982; American Forest Institute 1985). No other literature was found that suggests factors that may influence preferences about harvest levels.

Modeling Political Participation

5. What combination of beliefs and attitudes about Michigan forest management and demographic profile can be used to distinguish between forest recreationists active or inactive in the policy process?

Sharpe (1982) suggests that individuals with a higher socio-economic standing are more likely to be politically active. Kellert (1979) in a study of attitudes concerning animals, suggests that special interest group members are likely to be better informed about their subject than the general public. Ward and Russel (1982) suggest that territoriality is important in what an individual sees as an acceptable use of an environment. Individuals are likely to be much more active concerning their primary territory, i.e., the area where they live, own property, or have

a long history of recreation. Schmid (1978) suggests that special inter-
est group members better know when and whom to contact for maximum effi-
cacy.

CHAPTER IV

METHODS

Sample Selection

Four sample populations of forest recreationists were chosen to answer the research questions. The criteria used in selecting the sample populations were:

1. A high level of interaction with the forest;

2. Political involvement or consideration in forest management and planning;

3. A sizeable economic impact or the potential to significantly impact the forest related economy;

4. A representative sample or a census of the group can be generated efficiently.

The groups evaluated for study were: Michigan state park users; Michigan state forest campground users; people who hunt in Michigan; people who fish in Michigan; people who snowmobile in Michigan; people who ride off road vehicles in Michigan; people who have responded to requests for state forest planning inputs; people who have contacted the governor of Michigan about forest management issues; people who have contacted the director of the DNR about forest management issues; people who have contacted legislators about forest management issues; people who hike in Michigan; people who cross country ski in Michigan; and the general public.

When measured against the criterion of a high level of interaction with the forest, all were judged by the author to have a high level of interaction except the general public. While the use of wood products is universal by Michigan residents, many people never visit the forest.

All groups mentioned above except for the general public were judged

by the author to be either politically involved or to receive direct political consideration in forest planning. While attempts to improve the Michigan economy by increasing forest outputs are designed to benefit the general public in Michigan, planning is much more likely to consider segments of the public when specific management and program decisions and strategies are being formulated and executed. The most politically powerful broad group, in terms of numbers and acknowledged political influence, was judged by the author to be hunters and anglers. The snowmobiler and off road vehicle user groups, while represented by special interest groups, were judged by the author to be narrow in their influence on overall forest policy. Hikers, park and campground users, and cross country skiers, while to some extent represented by preservation groups, were seen as less powerful in Michigan state forest policy than hunters and anglers. Those who had commented to a governmental official about a management issue or about a management plan were judged by the author to be the most politically active groups.

Most groups were judged by the author to have a sizeable economic impact on the forest related economy. Studies of state park users (Fridgen et al. 1986); hunters (Nelson 1985); anglers (Mahoney et al. 1985); state forest campers (Nelson et al. 1985) suggest that all these groups contribute millions of dollars to Michigan's economy through their recreational activities. However, hunters and anglers appear to spend the most. Those who comment to government officials or those who comment about planning efforts, while not spending large amounts, may have the greatest potential to affect the mix of forest outputs. Such influence could greatly affect the forest based economy.

A representative sample or a census was judged by the author to be available from all groups. However, all those who register more than

once for an activity, such as state park users and state forest campers, would require a weighting procedure or the sample would be biased in favor of frequent users. Hunters, anglers, snowmobilers, and off road vehicle users register once with the state of Michigan, regardless of their frequency of activity participation. Hikers and cross country skiers are not required to register and would require a general public or an on site sampling approach to distinguish them. Those who have con- tacted legislators would be difficult to contact due to the 148 legisla- tors in this state. Those who contact the governor or the director of the DNR would be relatively easy as the state forester routinely receives the assignment to answer forestry related letters for both. A general public sample, while moderately easy to contact using random digit dialing, voter records, or telephone books, may mask the impor- tance of segments which are numerically small yet politically large in influencing forest policy.

The author judged these groups met the criteria and allowed compari- son of demonstrated politically active groups with broader forest recre- ation populations.

1. Those who requested information or provided input in writ- ing on the Pere Marquette or the Escanaba River forest planning process in response to an article and attached postcard in the November/December 1985 issue of the Michi- gan Natural Resource Register, an official publication of the DNR;

2. Those who wrote a letter to the governor of Michigan or the director of the Michigan DNR concerning forest manage- ment issues between June 1983 and June 1986;

3. Those who purchased a Michigan firearm deer license in

1985 and who did not purchase a Michigan trout and salmon

stamp in 1985;

4. Those who purchased a Michigan trout and salmon stamp in

1985 and who did not purchase a Michigan firearm deer license

in 1985;

The sample selected from each population was:

1. A census of the 174 persons who responded to a request for

public input on two Michigan state forest management plans.

This census excludes all those who responded who were known

or readily identifiable government employees. Throughout

this dissertation this group will be called requestors.

2. A census of the 161 persons who wrote the governor of Michi-

gan or the director of the DNR between June 1983 and June

1986 about a forest management issue as judged by the

author. Throughout this dissertation this group will be

called commentors.

3. A 1985 randomly generated sample of 500 firearm deer

hunters who did not purchase a trout and salmon

stamp that same year. Throughout this dissertation they

will be called hunters.

4. A 1985 randomly generated sample of 500 anglers

who purchased a trout and salmon stamp but did not

purchase a firearm deer license that same year. Throughout

this dissertation they will be called anglers.

These hunter and angler sample groups were each generated from a

list with 600 randomly selected names. Because of past experience by

the author with numerous non-deliverable addresses using hunter and ang-

ler lists generated by the DNR, the extra 100 was to insure that a full

500 from each group would be sampled.

Questionnaire Design

The questionnaire was designed to be free of technical jargon; therefore technical accuracy suffered somewhat. Common forestry terms such as regeneration, tolerance, intolerance, suckering, even-age management, all-age management, etc. were not used. Common English substitutes were adapted in the interest of achieving broad understanding among those sampled. Minor technical inaccuracies occur in questions about oak, as questions were not directed at any specific species of oak. It was felt that few respondents would have a frame of reference for distinguishing red oak from white oak, burr oak, or black oak. Also concerning oak, a question concerning the fruit of the oak (acorns) referred to them as seeds, which was thought to be more understandable even though technically incorrect.

References used to develop knowledge questions were Harlow and Harrar (1969), Tubbs (1975), Hacker et al. (1983), Schone et al. (1984), James et al. (1982), Ostrum (1984), Spencer and Hahn (1984), and personal communication from Dr. Gerald Thiede, Dr. Lee James, Dr. Jon Haufler and Mr. Joseph Vogt. These references provided information concerning Michigan forest acreage, deer populations and food habits, long term and annual timber surplus, distinguishing characteristics of trees, tree regeneration, forest management practices, and tree species selected practices often promote.

Pre-test

A mail questionnaire format was chosen to elicit information for three reasons. First, an extensive pre-test of both mail questionnaires (253) and researcher-administered questionnaires (208) indicated that those receiving a mail questionnaire were more likely to follow direc-

tions and complete the questionnaire than those given self-administered questionnaires. The main problem was that when researcher-administered questionnaires were distributed at recreation related sites, respondents were often engaged in other activities and less interested in completing and following directions for this complex questionnaire.

Second, researcher-administered questionnaires could be highly biased if respondents were intimately involved in a single site, eg. a campground, yet were being asked questions concerning statewide policy. The forest they could see around them might unduly influence their vision of Michigan's forest resources and management practices on a macro scale.

Third, if these sample populations were to be sampled in the future on a regular basis by the State of Michigan or some other entity, a mail questionnaire to readily definable, widely dispersed populations can be repeated with relative ease. There is also less opportunity for inter-viewer bias or bias in selection of a sample due to extensive travel costs with a mail questionnaire than a personal interview or researcher-administered questionnaire.

Response Rate from Samples

The questionnaire was revised based on the pre-test results and guidance committee input and mailed on June 30, 1986. The question-naire, with its integral cover letter, is included in Appendix A. After 12 days the first reminder post card was sent (Appendix A). Twenty-eight days after the original mailing a second mailing of the questionnaire with a revised, separate cover letter answering concerns raised by respondents to the first mailing was sent (Appendix A). Sixty-two days after the original mailing, a third and final mailing of the question-naire was sent by certified mail using a separate, additionally revised

cover letter as recommended by Dillman (1978). The cutoff date for responses was October 13, 1986.

The sample sizes of the requestor and commentor groups were slightly reduced by non-deliverable addresses. The requestor group dropped 2% to 171 and the commentor group declined 3% to 156. The additional 100 names generated for the hunter and angler samples maintained the size of those groups at 500. Hunters had 40 (8%) non-deliverable addresses and anglers, 46 (9%). of the first 500 sampled from each group.

Table 1 shows the response rate for each of the sample groups for all mailings described above. Those groups most actively involved in the political process, requestors and commentors, had response rates considerably higher than the hunter and angler groups.

Of these responses, 27 (3%) were immediately deemed unusable. This was primarily due to blank questionnaires returned, those with less than five questions completed or those who did not respond to half or more of the objective belief questions. The response rate relative to the potential number of respondents for each mailing is displayed in Table 2. The certified mail mailing was most effective at eliciting responses, especially when considering these respondents had not responded to three previous mailings. This parallels experiences cited by Dillman (1978).

No non-response followup was initiated beyond the certified third mailing. With the requestor and commentor groups, excellent response rates had been achieved and hunter and angler responses were deemed adequate to represent their sample populations.

Table 1. Response rate for all sample groups.

| Sample group | Number and (percent) of sample group responding | | | | |
	Original mailing	First reminder	Second mailing	Third cert. mailing	Total response
Requestors	110 (64)	24 (14)	24 (14)	7 (4)	164 (96)
Commentors	77 (49)	21 (14)	26 (17)	13 (8)	137 (87)
Hunters	112 (22)	32 (6)	95 (19)	88 (18)	327 (65)
Anglers	89 (18)	48 (10)	98 (20)	88 (18)	323 (65)

Table 2. Response rate of remaining sample for each mailing by group.

| Sample group | Percentage of remaining sample responding | | | |
	Original mailing	First reminder	Second mailing	Third certified mailing
Requestors	64%	39%	65%	54%
Commentors	49	27	45	41
Hunters	22	8	27	34
Anglers	18	12	27	33

CHAPTER V

DESCRIPTIVE RESULTS AND DISCUSSION

Knowledge of Michigan Forests and Forestry

In this section a test was done to eliminate responses from further
consideration where questionnaire directions were not followed. Specif-
ically for the statement in question 10 (Appendix A) "It loses its
leaves every fall", if the respondent did not correctly check at least 2
of the 3 deciduous species (aspen, sugar maple, and oak) the respondent
was eliminated from further analysis. This reduced the number of respon-
dents by 6 (3.7%) for requestors, 9 (6.6%) for commentors, 20 (6.1%) for
hunters, and 25 (7.7%) for anglers.

If a respondent checked none of the species or practices for a spe-
cific statement in question 10 or 11 (other than the above screening
statement) it was assumed that the respondent had no knowledge concern-
ing that statement. For example, the statement "Rarely grows from seed"
is true only for aspen. Many respondents put a question mark or wrote "I
don't know" in the margin without checking any of the five species. This
was interpreted to indicate that respondents had no knowledge about the
statement for any of the selected tree species. If the respondent failed
to respond to more than half of the statements in either question 10 or
11, they were also deleted from all analysis. For all knowledge section
tables, all percentages reported will be those whose beliefs were objec-
tively true in response to the statement listed.

Recent Forest History

Table 3 describes the knowledge of respondents concerning Michigan's
past (20 years previous) forest situation compared to 1986. Requestors
and commentors show a better understanding of Michigan's forest situa-
tion as it compares to 20 years ago than do hunters and anglers. Michi-

Table   3. Knowledge of Michigan's past and present forest sitution by sample group.

Situation statement	Percentage with knowledge			
	Requestors n=158	Commentors n=126	Hunters n=307	Anglers n=296
Forest acreage similar to 20 years ago @	30.3	39.5	32.5	37.5
Deer population greater than 20 years ago @	63.3	47.9	43.2	41.8
Volume of wood in forests greater than 20 years ago @	42.9	28.1	11.5	12.6
Harvest volume the past 5 years less than volume of growth @	38.6	31.1	19.9	24.0

@ Statement is objectively true

gan's forest acreage has slightly declined (5.2%) over the past 20 years. The principal reason is a smaller amount of marginal agricultural land has reverted to forest while more forest land has been converted through development (Ostrom 1982; Spencer and Hahn 1984). Deer populations have risen from 500,000 animals in the mid 1960s to over a million animals in 1986 according to Joseph Vogt, deer specialist with the Michigan DNR. The volume of timber found in Michigan forests has increased substantially since 1955. James et al. (1982), citing Forest Service data, reported a 78% increase in growing stock volume and an even larger increase in saw timber volume between 1955 and 1980. They also reported that net annual timber growth was approximately 4 times greater than harvest volume annually for both growing stock and saw timber in 1980.

Aspen

Selected tree species were readily distinguished from one another by most respondents. Aspen appears to be the tree with the lowest recognition level (Table 4). Considering that aspen is a staple deer food in Michigan, hunters unexpectedly had the lowest recognition levels of aspen. Generally, however, respondents were aware that aspen was a deciduous species that was short lived.

The regeneration characteristics of aspen were less well known to respondents (Table 5). Requestors, and to a lesser extent, commentors, had a relatively accurate set of beliefs concerning aspen. Hunters and anglers had lower levels of knowledge. Of greatest concern is that barely half the hunters and anglers believed that aspen was a highly intolerant species and that less than half believed that aspen sprouted suckers from the roots of the original tree after harvest. With such beliefs, many might see little rationale for clearcutting and no visible

38

Table 4. Knowledge of distinguishing characteristics of aspen by sample group.

| Distinguishing statement | Percentage with knowledge | | | |
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Is often called an evergreen	94.3	97.6	87.9	89.1
It loses its leaves every fall @	91.8	96.8	65.5	69.3
Seeds are commonly in cones	97.5	96.8	93.8	95.3
Seeds are commonly called acorns	97.5	100.0	97.4	95.3
Sap is valuable for making syrup	100.0	100.0	99.3	99.0
Often lives more than 100 years	97.5	91.3	82.4	91.6

@ Statement is objectively true

Table 5. Knowledge of aspen regeneration characteristics by sample group.

| Regeneration statement | Percentage with true belief | | | |
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Young trees need strong sunlight to grow @	75.9	77.8	57.0	55.7
Often sprouts new young trees from the stump or roots after cutting @	78.5	65.9	46.6	46.3
Rarely grows from seed @	56.9	42.9	37.8	29.4
Fire often improves the ability of seeds to sprout	86.1	73.0	58.6	56.4

@ Statement is objectively true

Table 6. Knowledge of management practices often prmoting aspen regeneration by sample group.

| Management practice | Percentage with knowledge | | | |
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting @	79.1	68.3	42.7	38.5
Selective cutting	85.4	76.2	69.1	58.4
Prescribed burning	90.5	87.3	81.8	72.6
Plantations	84.8	82.5	73.6	66.2

@ Effect of practice is objectively true

replanting efforts.

Requestors and commentors were most likely to believe that aspen regenerates through clearcutting (Table 6). Less than half of the hunters or anglers however, believed that clearcutting often promoted aspen.

Red Pine

Knowledge concerning characteristics that distinguish red pine was relatively well developed for all groups with the exception of red pine life span (Table 7). This was unexpected as solitary red pine of 75 feet or more in height and over 100 years of age are readily visible from major highways in the northern Lower and the Upper Peninsula of Michigan. Further, along with the white pine, red pine provided much of the raw material for Michigan's booming timber industry in the late 1800s (James et al. 1982).

Regeneration characteristics of the red pine in terms of tolerance proved difficult to measure with the questionnaire (Table 8). Red pine is a tree whose level of tolerance falls between the highly intolerant jack pine and the moderately tolerant white pine (Harlow and Harrar 1969). Respondents may have been in a quandary considering the two statements about tolerance . The first statement "Young trees need strong sunlight to grow" is not true for red pine. However, red pine does grow best in full sun (Benzie 1976). The other tolerance statement on the questionnaire, "Young trees can grow well in weak sunlight or shade" appeared to leave no middle ground where red pine should be. Therefore, only the first statement was used in assessing the objective beliefs of respondents about tolerance of red pine or any other tree species. More than half of every group believed that red pine is not highly intolerant of shade.

Requestors, and to a lesser extent, commentors, had higher levels of

Table 7. Knowledge of distinguishing characteristics of red pine by sample group.

Distinguishing statement	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Is often called an evergreen @	89.2	92.1	73.3	72.0
It loses its leaves every fall	100.0	100.0	98.4	98.6
Seeds are commonly in cones @	95.6	92.9	88.3	89.9
Seeds are commonly called acorns	97.5	98.4	97.1	95.9
Sap valuable for making syrup	100.0	100.0	99.0	98.6
Often lives 100 or more years @	42.4	35.7	24.8	19.9

@ Statement is objectively true

Table 8. Knowledge of red pine regeneration characteristics by sample group.

Regeneration statement	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Young trees need strong sunlight to grow	60.1	52.4	59.3	63.5
Often sprouts new young trees from the stump or roots after cutting	92.4	88.1	79.8	75.3
Rarely grows from seed	65.8	54.8	53.7	43.6
Fire often improves the ability of seeds to sprout	81.6	54.8	38.8	40.9

@ Statement is objectively true

Table 9. Knowledge of management practices often promoting red pine regeneration by sample group.

Management practice	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting @	22.2	12.7	14.0	11.8
Selective cutting @	25.3	26.2	19.5	17.6
Prescribed burning @	34.8	29.4	36.8	31.1
Plantation @	55.7	42.1	33.9	24.3

@ Effect of practice is objectively true

knowledge about red pine regeneration characteristics than hunters or anglers. However, levels of knowledge about red pine growing from seeds were relatively low for all groups.

The practices that often promote red pine regeneration are diverse (Table 9). Clearcutting, selective cutting, prescribed burning, and plantations are all used and all often promote red pine in Michigan (Benzie 1976; Schone et al. 1984). Apparently few respondents understood this range of options with red pine. Plantations were the most commonly recognized practice by requestors and commentors, while prescribed burning was the practice most commonly recognized by hunters and anglers.

Sugar Maple

The levels of knowledge about distinguishing characteristics for sugar maple were high for all groups (Table 10). Only in terms of the longevity of the tree were respondents likely to hold false beliefs. This was unexpected as beech-maple forests represent one of the most common types of climax forests in Michigan, especially in the northern parts of the state where many respondents own forested property (DNR 1983).

Regeneration beliefs showed distinct differences between the groups with requestors having much higher levels of knowledge (Table 11). In terms of tolerance, sugar maple is one of the most tolerant trees found in Michigan forests (Harlow and Harrar 1969). However, many respondents, including the majority of commentors, anglers, and hunters believe sugar maple needs strong sunlight to grow. Few respondents from any group were aware that sugar maple is a stump sprouter while most correctly did not believe fire induces seeds to sprout.

The majority of every group except anglers believed selective cut-

42

Table 10. Knowledge of distinguishing characteristics of sugar maple by sample group.

Distinguishing statement	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Is often called an evergreen	97.5	98.4	97.7	96.3
It loses its leaves every fall @	94.9	93.7	91.9	90.2
Seeds are commonly in cones	99.4	98.4	98.4	96.3
Seeds are commonly called acorns	97.5	99.2	97.4	97.3
Sap is valuable for making syrup @	100.0	99.2	98.7	98.6
Often lives 100 or more years @	56.3	45.2	33.9	32.4

@ Statement is objectively true

Table 11. Knowledge of sugar maple regeneration characteristics by sample group.

Regeneration statement	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Young trees need strong sunlight to grow	70.9	49.2	37.8	35.8
Often sprouts new young trees from the stump or roots after cutting @	32.3	32.5	38.4	34.1
Rarely grows from seed	73.4	61.1	59.9	47.6
Fire often improves the ability of seeds to sprout	93.7	84.1	71.7	72.0

@ Statement is objectively true

Table 12. Knowledge of management practices often promoting sugar maple regeneration by sample group.

Management practice	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting	74.7	63.5	58.6	53.0
Selective cutting @	73.4	65.9	50.2	47.0
Prescribed burning	79.7	73.8	67.4	60.1
Plantations	74.7	70.6	62.9	54.4

@ Effect of practice is objectively true

ting was likely to promote sugar maple (Table 12). Comparing sugar maple to the other four selected species, the level of knowledge about regeneration practices was higher for sugar maple than any other tree species. While it is tempting to believe that this shows a high degree of knowledge about practices that promote sugar maple, it contradicts the belief of most commentors, hunters, or anglers that sugar maple needs strong sunlight to grow. This response may show that respondents from those groups prefer selective cutting and to support their preferences attribute a wide variety of benefits to selective cutting.

Jack Pine

Jack pine was readily distinguished by all groups (Table 13). Even in terms of longevity, most respondents were aware it is a short-lived species.

In Table 14 the level of knowledge concerning tolerance of jack pine to shade was low for all groups. Only slightly more than half of the most knowledgeable group (requestors) believed that jack pine was highly intolerant (Harlow and Harrar 1969). More than half of each group knew fire improved the ability of jack pine seeds to sprout. This may be where an isolated fact is internalized through numerous news articles concerning habitat improvement for the Kirtland's warbler. However, without the knowledge that jack pine is intolerant of shade, the rationale for the clearcutting that often precedes a prescribed burn may be missing. Overall, requestors and to a lesser extent commentors, consistently had higher levels of knowledge about jack pine regeneration than hunters or anglers.

Table 15 shows that few from any group had accurate beliefs concerning practices that promote jack pine regeneration. While most knew selective cutting did not promote jack pine, few knew that clearcutting

Table 13. Knowledge of distinguishing characteristics of jack pine by sample group.

Distinguishing statement	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Is often called an evergreen @	91.8	89.7	87.9	87.8
It loses its leaves every fall	98.1	100.0	99.3	98.3
Seeds are commonly in cones @	95.6	93.7	90.9	86.1
Seeds are commonly called acorns	98.1	98.4	96.4	95.6
Sap is valuable for making syrup	100.0	100.0	99.0	99.0
Often lives 100 or more years	92.4	88.1	76.5	83.8

@ Statement is objectively true

Table 14. Knowledge of jack pine regeneration characteristics by sample group.

Regeneration statement	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Young trees need strong sunlight to grow @	52.5	42.9	31.6	24.3
Often sprouts new young trees from the stump or roots after cutting	88.6	84.9	75.9	73.0
Rarely grows from seed	67.1	59.5	56.0	42.6
Fire often improves the ability of seeds to sprout @	89.9	73.0	54.7	51.7

@ Statement is objectively true

Table 15. Knowledge of management practices often promoting jack pine regeneration by sample group.

Management practice	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting @	17.7	18.3	17.6	12.2
Selective cutting	83.5	81.7	66.8	55.1
Prescribed burning @	78.5	69.0	48.9	43.6
Plantations @	25.3	23.8	27.0	18.9

@ Effect of practice is objectively true

or plantations did (Hacker et al. 1983).

Oak

Oak was readily distinguished by all sample groups (Table 16). Of the long lived species (sugar maple, red pine and oak) only oak was recognized as such by a majority of all sample groups.

The recognition that oak is not a highly intolerant species was highest among requestors and lowest among hunters and anglers (Table 17). Few from any group were aware that oak is a prolific stump sprouter (Tubbs 1975; L. James, pers. comm.). Many respondents did not recognize the falseness of the statement "oak rarely grows from seed". This was unexpected as over 93% of each group recognized that oak "seeds" are commonly called acorns.

Requestors and commentors were likely to correctly believe that selective cutting often promotes oak (Table 18). Few from any group however, were likely to believe that clearcutting also promotes oak (G. Thiede, pers. comm.). Oak and its many other associates, especially in northern hardwood stands, present a complex situation for oak regeneration. While oak is moderately tolerant of shade, it is a slow growing species that is favored for browse by deer and is often choked out or has its already slow growth further slowed by competing vegetation. Because of its stump sprouting characteristics and to get more sprouts per acre by providing more sunlight, small clearcuts are often used to regenerate oak. Tubbs (1975) notes that no one truly effective way has been found for favoring oak over its associates in northern hardwoods.

Practices

Four common practices used in Michigan forest management were identified and defined in non-technical terms. The most common name currently in use for these practices was used to designate them throughout

Table 16. Knowledge of distinguishing characteristics of oak by sample group.

	Percentage with knowledge			
Distinguishing statement	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Is often called an evergreen	96.2	98.4	96.4	96.3
It loses its leaves every fall @	92.4	95.4	88.3	84.8
Seeds are commonly in cones	99.4	98.4	97.1	96.6
Seeds are commonly called acorns @	96.2	98.4	94.5	93.6
Sap is valuable for making syrup	100.0	99.2	98.7	99.0
Often lives 100 or more years @	96.8	94.4	85.3	91.6

@ Statement is objectively true

Table 17. Knowledge of oak regeneration characteristics by sample group.

	Percentage with knowledge			
Regeneration statement	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Young trees need strong sunlight to grow	65.2	51.6	44.0	43.2
Often sprouts new young trees from the stump or roots after cutting @	39.2	33.3	37.1	28.3
Rarely grows from seed	74.1	61.9	56.7	47.0
Fire often improves the ability of seeds to sprout	91.1	81.7	67.1	65.2

@ Statement is objectively true

Table 18. Knowledge of management practices often promoting oak regeneration by sample group.

	Percentage with knowledge			
Management practice	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting @	20.3	21.4	17.3	16.6
Selective cutting @	67.1	61.9	49.2	42.6
Prescribed burning	72.2	70.6	61.2	53.7
Plantations	80.4	74.6	68.1	57.4

@ Effect of practice is objectively true

the questionnaire. The first practice was a clearcut, defined in the questionnaire as "an area of at least an acre where all the trees of one or more types are harvested at the same time".

As with regeneration and practices that promote regeneration, requestors and commentors were more knowledgeable about clearcutting than hunters or anglers (Table 19). However, a majority of all sample groups believed correctly that clearcutting provides strong sunlight to the forest floor. A majority of requestors and commentors also believed that clearcutting results in an even-aged forest.

Knowledge levels were even higher with selective cutting (Table 20) which was defined as "an area where only scattered, selected trees are harvested at one time". At least 69% of each group knew that selective cutting provides only weak sunlight to the forest floor and that it results in an all-aged forest.

Knowledge levels about prescribed burning were lower than those about clear cutting or selective cutting (Table 21). Prescribed burning was defined as "a fire set by trained forest managers only under certain weather and fuel conditions burning a specified forest area". Slightly more than half of the requestors and commentors correctly believed that it allows strong sunlight to reach the forest floor. Its promotion of an even aged forest was only known by half the requestors and fewer of the other groups. This lack of knowledge was unexpected considering the recent increase in publicity and information about prescribed burning after the Mack Lake fire of 1980 (Simard et al. 1983) and the more stringent procedures agencies must now follow to burn (Johnson 1984).

A plantation was defined as "an area of trees planted in rows and maintained in an orderly manner" (Table 22). Statements about weak and strong sunlight were not asked concerning plantations as the true

Table   19. Knowledge of selected effects of clearcutting by sample group.

Effects	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Immediately allows strong sunlight to reach forest floor @	88.6	85.7	72.0	61.8
Immediately allows only weak sunlight to reach forest floor	91.1	84.1	78.5	69.9
Results in all trees in an area being a similar size and age @	74.7	57.9	42.3	39.2
Results in trees in an area being different sizes and ages	85.4	82.5	78.5	73.3

@ Statement is objectively true

Table 20. Knowledge of selected effects of selective cutting by sample group.

Effects	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Immediately allows strong sunlight to reach forest floor	84.8	81.0	68.7	61.5
Immediately allows only weak sunlight to reach forest floor @	89.2	84.1	77.5	69.3
Results in all trees in an area being a similar size and age	89.9	82.5	73.0	72.3
Results in trees in an area being different sizes and ages @	84.2	84.9	77.5	73.3

@ Statement is objectively true

Table 21. Knowledge of selected effects of prescribed burning by sample group.

| | Percentage with knowledge | | | |
Effect	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Immediately allows st: sunlight to reach fores. floor @	57.6	59.5	47.2	43.2
Immediately allows only weak sunlight to reach forest floor	86.7	84.9	79.8	71.6
Results in all trees in an area being a similar size and age @	50.0	42.1	31.6	32.8
Results in trees in an area being different sizes and ages	75.9	84.1	77.9	73.3

@ Statement is objectively true

Table 22. Knowledge of selected effects of plantations by sample group.

| | Percentage with knowledge | | | |
Effects	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Results in all trees in an area being a similar age and size @	65.2	60.3	56.7	51.7
Results in trees in an area being different sizes and ages	89.2	84.1	81.8	77.4

@ Statement is objectively true

response would vary depending on the age of the plantation. More than half of all the groups correctly believed plantations to be even-aged.

The relationship between management practices and deer appears best understood by requestors (Table 23). The majority of requestors knew that clearcutting benefits most deer populations and plantations harm most deer populations. Surprisingly, relatively few from any group knew that other actions to bring light, even moderate light to the forest floor thus encouraging intolerant species, shrubs, and forbs is beneficial to deer. Only more than half to the hunters knew that selective cutting often improves an area for deer. Less than half of any group knew that prescribed burning often improves an area for deer.

Knowledge Discussion

The level of knowledge for respondents steadily decreases from distinguishing characteristics, to practices, to regeneration characteristics, to which tree species are promoted by which practices (Table 24). Using a computer "select if" procedure for each respondent in each group, over half the respondents in every group had their percentage of knowledge decrease from distinguishing characteristics, to regeneration characteristics, to practices that promote regeneration. This suggests that structures within the schema are usefully arrayed in a related manner for a substantial number of respondents (Lee and Uzell 1980). Further it suggests that a broad range of forest recreationists can indeed distinguish between trees but that a large gap occurs in their knowledge when considering regeneration. This may define a useful starting place for forestry education programs such as the video tape with script currently being formulated for the DNR (Hummel 1986).

Those who are most politically active, requestors and commentors, have a knowledge base closer to the forest manager's than do hunters and

Table 23. Knowledge concerning the effect of management practices on deer by sample group.

Practice statement	Percentage with knowledge			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting often improves an area for deer @	73.4	60.3	43.0	29.4
Selective cutting often improves an area for deer @	38.0	38.9	54.1	48.3
Prescribed burning often improves an area for deer @	43.7	25.4	21.5	18.9
Plantations often improve an area for deer	81.6	69.8	64.2	60.1

@ Statement is objectively true

anglers. However, sizeable differences exist between our sample groups and forest managers. A minority, and in some groups a very small minority, believe that we have more timber volume now than we did in the past. Further, most believe that we currently harvest as much or more wood volume than is grown each year. These two supply issues could literally cast a pall over whatever else respondents may believe about how trees should be managed. If harvest is seen as a loss, even as just a temporary loss, and people already believe we have less today than we did yesterday, it is not hard to understand why they are not sympathetic to increased harvest. This is especially true if they have any conception of Michigan history and past unrestrained exploitation of timber resources.

Comparing knowledge about practices that promote regeneration , all groups are least knowledgeable about clearcutting (Table 25). This may indicate a bias against clearcutting. Considering that Michigan was clearcut on a statewide basis in the late 1800s and that many areas of the state still suffer from the cutting and the disastrous fires and erosion that followed the cutting, prejudice from a historical standpoint is understandable (Schmaltz 1983). This possible word picture bias against clearcutting appears similar to the bias Anderson (1981) noted in evaluations of scenic beauty when showing the same slide and only altering the name of the area from "commercial timber stand" to "wilderness". Yet clearcutting is the common language term, even-age management is not.

A lack of knowledge about clearcutting may also arise from its relatively recent reappearance on the silvicultural scene. It was outlawed in the Forest Reserve Act of 1897 by Congress. Now however, clearcutting is seen as a cost effective method of harvesting and regenerating many

Table 24. Means of knowledge scores for distinguishing characteristics, regeneration, management practices, and regeneration promoted by practice by sample group (a).

	Mean and (standard deviation)			
Category	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Tree identification	*28.1 (2.2)	27.8 (2.0)	26.4 (2.9)	26.4 (3.0)
Regeneration characteristics	*14.4 (3.6)	12.2 (4.4)	10.6 (4.1)	9.8 (4.5)
Management practices	*11.1 (3.4)	10.6 (3.7)	9.4 (3.9)	8.7 (4.6)
Regeneration promoted by practice	* 12.2 (4.3)	11.2 (4.4)	9.7 (4.8)	8.4 (5.3)

(a) potential scores: distinguishging characteristics 30; regeneration 20; managment practices 14; regeneration promoted by practice 20.
* Significant difference in row between two or more groups by T-test of sample means p<.05.

Table 25. Means of knowledge scores concerning influence of practices on selected species regeneration by sample group (a).

	Mean and (Standard deviation)			
Practice	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting	2.1 (1.1)	1.8 (1.1)	1.5 (1.1)	1.3 (1.2)
Selective cutting	3.5 (1.2)	3.1 (1.3)	2.6 (1.5)	2.2 (1.5)
Prescribed burning	3.6 (1.4)	3.1 (1.4)	3.0 (1.6)	2.6 (1.8)
Plantations	3.2 (1.3)	2.9 (1.3)	2.7 (1.5)	2.2 (1.6)

(a) Potential score 5 for each practice.

intolerant and moderately tolerant species. Also, with advances in the wood products industry such as oriented strand board and the press dry process for paper manufacture, the emphasis on obtaining saw timber has lessened as wood fiber and chips are increasingly utilized (DNR 1983).

Many respondents appear to have a simplified view of the options available for regeneration. Indeed, the options presented in the questionnaire were simplified. For instance, a shelterwood system is a combination of selective cutting and clearcutting that the author thought would be too complex to explain to respondents. Of the practices that were presented, respondents were most likely to correctly identify appropriate management strategies for aspen and sugar maple, the only species where one practice was likely to promote regeneration. With jack pine, red pine, and oak, where more than one practice may commonly promote regeneration, many respondents only had knowledge of one.

Speculative Beliefs

Practices and Wildlife

Table 26 illustrates the speculative beliefs of each group about the effect of practices on wildlife in general. Unlike deer, the impacts of management practices on many non-game species are not known. Further, wildlife in general may have a wide variety of images among the respondent population. For these reasons, beliefs about the relationship of practices to wildlife in general are classified as speculative. Requestors are most likely to believe clearcutting and prescribed burning have benefits to wildlife in general. Hunters and anglers are most likely to believe that plantations benefit wildlife in general. Two-thirds of each group believes that selective cutting benefits wildlife in general. Selective cutting is seen as the management practice most likely to benefit wildlife in general by every respondent group.

Table 26. Speculative beliefs concerning the effect of practices on wildlife in general by sample group.

Practice statement	Percentage believing			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting often improves an area for wildlife in general	*49.0	43.5	38.2	24.7
Selective cutting often improves an area for wild- in general	64.4	61.7	63.6	69.6
Prescribed burning often improves an area for wild- life in general	*45.6	39.1	28.7	27.5
Plantations often improve an area for wildlife in general	*18.8	18.3	28.7	27.5

* Significant difference in row by chi-square analysis p<.05.

Practices and Scenery

The relationship between practices and scenery is judged by the author as a speculative belief. However, scenic beauty estimation literature such as Patey and Evans (1979) and Daniel and Schroeder (1979) suggest that the characteristics of selective cutting are likely to be more appealing to the public than clearcutting or prescribed burning. These characteristics include relatively few saplings and seedlings, many large trees, little visible slash, a carpet of herbaceous ground cover, and a clear line of vision through the forest. The scenic beauty literature also suggests that the longer the time period following treatment, especially if the participants in the experiment have not been told about the treatment, the more likely they are to rate the site as scenic (Benson and Ulrich 1981).

Table 27 shows the speculative beliefs of respondents concerning the short term and the long term effects on scenery from the various practices. Clearcutting in the short term is not seen to positively affect scenery by many respondents. In the long term, however, over a third of the respondents from each group believe that clearcutting improves the scenery of the cut area. Langenau et al. (1977) found that land owners in Roscommon county Michigan were likely to believe that new growth was fast in clearcuts. They also report regeneration up to 15 feet high in aspen stands two years after harvest.

Selective cutting is seen by over 60% of the respondents from each group as improving scenery in the short term. In the long term, selective cutting is seen as less likely to improve scenery than clearcutting. The perceived scenic benefit in the short term may be related to the respondents desire to see dense growth thinned. This thinning allows a moderate amount of sunlight to reach the forest floor promoting

Table 27. Speculative beliefs concerning the effects of practices on scenery by sample group.

	Percentage believing			
Practice and belief	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting often improves scenery in one year	*7.4	4.3	15.8	9.9
Clearcutting often improves scenery after ten years	49.7	39.1	42.8	36.8
Selective cutting often improves scenery in one year	*67.1	78.3	61.5	65.6
Selective cutting often improves scenery after ten years	34.9	40.0	27.3	29.2
Prescribed burning often improves scenery in one year	*20.8	10.4	20.1	13.8
Prescribed burning often improves scenery after ten years	51.0	47.8	46.8	47.4
Plantations often improve scenery in one year	*12.1	12.2	18.7	21.3
Plantations often improve scenery after ten years	40.9	42.6	47.1	39.9

* Significant difference in row by chi-square analysis $p < .05$.

many forbs. The abundance of forbs in an eastern Tennessee study was the most important variable in predicting scenic beauty (Patey and Evans 1979).

Prescribed burning in the short term is not believed by most respondents to be beneficial to scenery. Over the long term, however, almost half of each group believes prescribed burning is beneficial to scenery. Benson and Ulrich (1981) found that visible burned residue within a year after a harvest had a highly detrimental effect on scenic beauty ratings. However, after undergrowth began to cover the residue, scenic beauty ratings increased significantly.

Plantations a year after they are planted are believed to be no more scenic than prescribed burns. In the long run, the proportion of respondents in each group who believe plantations improve the scenery is similar to the proportion who believe clearcutting improves scenery over the same time span.

Little difference was noted between the groups about which practices enhanced scenery. This reinforces contentions in the scenic beauty literature that broad ranges of the public have similar scenic preferences (Schroeder and Daniel 1981). The lack of differences about scenery sharply contrasts with the differences among groups in their knowledge about forests, forestry, and deer and speculative beliefs about wildlife in general.

With scenery or visual resources, the policy directions of the DNR are not as clear as they are with wildlife management. Little effort has been made to assess the visual preferences of Michigan residents or visitors outside of situations where conflicts over such resources become heated. Proactive efforts to shape harvest activities to promote fall color resources or to encourage forest pleasure driving

have been scattered. Rather, most efforts have been more reactive,

such as leaving unharvested strips next to roadways to screen clearcuts.

Negative Impact of Increased Harvest

Table 28 illustrates the proportions of the sample groups believing

increased timber harvest in Michigan would impair some common recre-

ational activities. Wildlife viewing is the activity seen as most likely

to be negatively impacted by increased harvest.

A high percentage of hunters and anglers (many of whom hunt small

game and a quarter of whom are archery deer hunters) believe that hunt-

ing will be negatively impacted by increased harvest. This is highly

unexpected and potentially disconcerting as the DNR has promoted

increased harvest as a way to fuel a growing wood products industry and

provide more game wildlife. Yet those beneficiaries of game wildlife

population increases believe their sport will be harmed by more timber

harvest.

Requestors were most likely to believe that none of the listed acti-

vities would be damaged. This agrees with the DNR policy approach that

increased harvest properly managed will not negatively impact recreation

(DNR 1983).

Attitudes

Overarching Framework

The overarching framework of the importance respondents attribute to

uses of Michigan forests shows remarkable consistency among groups

(Table 29). Fish and wildlife habitat is consistently rated as highly

important on a scale of 1 to 5 where 1 is not important and 5 is cru-

cial. Also, the fish and wildlife habitat rating has the smallest stan-

dard deviations of any rating for each group. The forest products indus-

try is consistently rated between crucial and moderate importance and

60

Table 28. Speculative beliefs that selected recreation activities will be negatively impacted by increased Michigan timber harvest by sample group.

	Percentage believing negative impact			
Activity	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Wildlife viewing	* 41.1	51.2	58.3	59.3
Hiking/walking	34.4	46.3	39.0	38.9
Hunting	* 31.1	39.7	67.5	57.8
Driving for pleasure	33.8	38.0	32.2	33.1
Camping	31.1	33.1	32.2	41.8
Fishing	* 24.5	29.8	25.8	40.8
Picking wild berries	16.6	21.5	26.2	20.4
Snowmobiling	7.3	14.9	12.2	11.3
Off road vehicle riding	5.3	10.7	12.2	9.8
None of above activities negatively effected	* 38.7	29.8	22.4	25.8

* Significant difference in row by chi-square analysis p <.05.

Table 29. Rated importance of major uses of Michigan forests in overarching framework by sample group.(a)

	Mean and (standard deviation)			
Use of forest	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Place for fish and wildlife to live	4.8 (0.5)	4.8 (0.6)	4.8 (0.6)	4.8 (0.6)
Place for outdoor recreation *	4.5 (0.7)	4.4 (0.8)	4.5 (0.8)	4.3 (0.9)
Forest related recreation industry	4.0 (1.0)	3.8 (1.1)	3.9 (1.1)	4.0 (1.0)
Wood products industry *	3.9 (1.1)	3.8 (1.2)	3.8 (1.1)	3.6 (1.2)
Oil and gas industry*	2.3 (1.2)	2.2 (1.1)	2.6 (1.3)	2.4 (1.3)

* Significant difference between two or more groups in row by T-test of sample means p<.05.
(a)Importance rating scale of 1 to 5: 5 defined as crucial, 3 as moderately important, and 1 as not important.

slightly lower than the forest related recreation industry (e.g., commercial campgrounds, canoe liveries, etc.). The lowest ratings and the highest standard deviations are found for the oil and gas industry, indicating a wide range of importance ratings leaning toward a lower level of importance. The ratings for fish and wildlife, recreation, and timber were in the same rank order as Nelson et al. (1984, 1985) reported for campers in Michigan state forests.

Desired Future Levels of Forests and Forest Products

Respondent groups differed when asked about their preferences for future deer populations and acreage of forest land in Michigan (Table 30). All groups were supportive of maintaining or increasing the amount of forest acreage in Michigan. Most deer hunters and anglers showed strong support for maintaining or increasing the deer herd. A sizeable minority of requestors and commentors supported decreasing the deer herd. Considering that requestors were much more likely to believe that the deer herd had increased in the past 20 years, their preference appears rational. Conversely, hunters and anglers were the least likely to know the deer herd had increased, thus their desire for more deer also appears rational.

More sugar maple and oak were desired by respondents in Michigan forests (Table 31). Respondents were least likely to desire more jack pine. Trees that respondents preferred less were most likely to be jack pine and aspen (Table 32). These preference ratings are analogous to those expressed by Roscommon county land owners in Langenau et al. (1977).

Sample groups differed sharply over the volume of timber harvest they desired in Michigan over the next five years (Table 33). Support for increased harvest was most likely to be found in requestors and

Table 30. Preference for forest acreage and deer abundance in 1991 in Michigan by sample group.

| | Percentage desiring level | | | |
| | Requestors | Commentors | Hunters | Anglers |
Resource abundance	n=158	n=126	n=307	n=296
More forest acreage	58.0%	59.2%	54.5%	51.4%
Similar forest acreage	41.4	39.2	44.8	47.2
Less forest acreage	0.6	1.6	0.7	1.4
More deer	* 18.1	35.5	55.4	38.4
Similar amount of deer	* 67.1	52.9	41.0	57.0
Less deer	* 14.8	11.6	3.6	4.7

* Significant difference in row by chi-square analysis p<.05.

Table 31. Preference for more of selected tree species in Michigan forests by sample group.

| | Percentage favoring more of species | | | |
| | Requestors | Commentors | Hunters | Anglers |
Tree species	n=158	n=126	n=307	n=296
Aspen	45.5	34.1	37.3	39.5
Red pine	39.1	56.9	39.9	45.0
Sugar maple	67.3	70.5	64.0	64.2
Jack pine	19.9	28.9	27.8	32.6
Oak	73.7	77.0	80.9	77.0

* Significant difference in row by chi-square analysis p<.05.

Table 32. Preference for less of selected tree species in Michigan forests by sample group.

| | Percentage favoring less of species | | | |
| | Requestors | Commentors | Hunters | Anglers |
Tree species	n=158	n=126	n=307	n=296
Aspen	19.4	17.2	17.9	19.6
Red pine	19.4	12.3	12.6	8.2
Sugar maple	2.6	2.5	3.3	3.9
Jack pine	41.3	39.7	34.9	29.1
Oak	3.2	4.9	3.3	4.3

* Significant difference in row by chi-square analysis p<.05.

least likely to be found in anglers. Greatest support for maintaining
the status quo was found with anglers, while hunters were most likely to
prefer a decrease in harvest volume.

The position of hunters presents a quandary to forest managers. The
managers often view hunters, especially deer hunters, as allies in lim-
iting areas where no timber harvesting is allowed. Indeed, the Michigan
United Conservation Clubs (MUCC), a group which numbers a large percen-
tage of hunters among its more than 100,000 members has joined the DNR
in appealing the Huron Manistee National Forest plan to establish a
series of semi-primitive roadless areas off limits to timber harvest.
DNR and MUCC have contended that such a harvest restriction would
decrease game populations in the area and endanger timber supplies to
attract and sustain the forest products industry in Michigan (Leefers
1986). Many hunters in this study however, support limiting timber harv-
est or maintaining existing harvest levels.

Attitudes about preferred levels of selected forest management prac-
tices in 1991 are shown in Table 34. All groups desire the greatest
decrease in clearcutting and the largest increase in selective cutting
over 1986 levels. Standard deviations for clearcutting and plantations
are the largest for all groups, indicating the widest range of attitudes
over their future levels. Requestors are the most supportive of clear-
cutting and the least supportive of plantations. Preferred levels of
prescribed burning are somewhat higher than clearcutting. Considering
the Mack Lake fire of 1980 which was a result of a US Forest Service
prescribed burn in the Huron National Forest (Simard et al. 1983) and
the negative publicity that followed it, this essentially neutral stance
toward prescribed burning is unexpected (Johnson 1984).

The level of products respondents prefer from Michigan forests in

Table 33. Preferred level of Michigan timber harvest volume from 1986 to 1991 by sample group.

| Level of harvest | Percentage preferring | | | |
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Increase harvest	* 36.8	20.2	12.0	9.8
Similar harvest	* 47.1	55.5	60.5	64.7
Decrease harvest	16.1	24.4	27.5	25.6

* Significant difference in row by chi-square analysis p<.05.

Table 34. Preferred level of selected Michigan forest management practices from 1986 to 1991 by sample group.(a)

| Practice | Mean and (standard deviation) | | | |
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Clearcutting *	2.8(1.3)	2.3(1.2)	2.7(1.2)	2.6(1.1)
Selective cutting *	4.0(1.0)	3.9(1.1)	3.9(1.0)	3.7(1.0)
Prescribed burning *	3.1(1.0)	2.9(1.1)	2.6(1.2)	2.6(1.0)
Plantations *	3.1(1.3)	3.3(1.5)	3.8(1.2)	3.7(1.2)

* Significant difference between two or more groups in row by T-test of sample means p<.05.

(a) Preferred level scale: 5=large increase; 4=moderate increase; 3= same as now; 2=moderate decrease; 1=large decrease.

the near future is illustrated in Table 35. Non-game wildlife, fish, game wildlife, and scenery are products in which all groups appear to want substantial increases. Wood for wood products is desired to be produced at levels similar to those now occurring. Only two products are desired by all groups to be produced at lower levels. These are oil and natural gas and motorized recreation opportunities for snowmobiles and off road vehicles. Motorized recreation ratings also have the highest standard deviations, suggesting a wide variation of opinion on the product. The ratings of all groups tend to support the Michigan Forest Management Plan (DNR 1983) which states that Michigan forests are underutilized.

However, the orientation of all respondent groups is different from the DNR. Respondent groups desire the largest increases in fish, wildlife, and passive recreational opportunities. They prefer that the wood products industry stay relatively static and the oil and gas industry decrease. While such an arrangement may be able to meet the DNR's goal of economic development, development would have to come from the tourism sector, not the wood products industry or the oil and gas industry. This respondent orientation also suggests that these groups may view the forest uses of timber, oil and gas, recreation, and fish and wildlife as mutually exclusive.

Demographics

Table 36 illustrates selected demographic variables for the respondents. Some striking differences can be noted between the groups. The requestor group has a very high mean education level (equivalent to a bachelors degree) and a high income level. The commentor group is similar in education and income. Hunters are the youngest, least educated, and lowest income group. All groups are heavily skewed toward males. For

66

Table 35. Preferred level of products from Michigan forests in 1991 by sample group (a).

Product	Mean and (standard deviation)			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Non-game wildlife *	4.2 (0.8)	4.3 (0.9)	4.0 (1.0)	4.2 (0.9)
Fish *	4.0 (0.9)	4.1 (0.9)	4.4 (0.8)	4.5 (0.8)
Scenery	4.0 (0.8)	4.1 (0.8)	4.0 (0.9)	4.1 (0.9)
Non-motorized rec- reation oppor- tunities *	4.0 (0.9)	4.0 (0.8)	3.7 (0.9)	3.8 (0.9)
Game wildlife *	3.8 (1.0)	3.9 (1.0)	4.4 (0.8)	4.1 (0.8)
Access to lakes and streams *	3.6 (1.1)	3.7 (0.9)	4.0 (1.0)	4.0 (1.0)
Wilderness/road- less areas	3.7 (1.2)	3.6 (1.2)	3.7 (1.1)	3.6 (1.0)
Campgrounds *	3.6 (0.8)	3.5 (0.9)	3.5 (0.9)	3.7 (0.9)
Wood for lumber, paper, etc. *	3.4 (1.1)	3.2 (1.1)	3.2 (1.0)	3.2 (1.0)
Oil and natural gas	2.4 (1.1)	2.4 (1.0)	2.5 (1.1)	2.6 (1.1)
Motorized recreation opportunities *	1.9 (1.0)	2.5 (1.4)	2.6 (1.2)	2.4 (1.2)

* Significant difference between two or more groups in row by T-test of sample means p<.05.

(a) Preferred level scale: 5=much more 4=somewhat more 3=same amount 2=somewhat less 1=much less

anglers this is somewhat artificial as 1985 was the last year spouses of licensed anglers in Michigan received a free spouse license. In the future, the percentage of female trout anglers should increase as all anglers 17 or over must purchase a license. Deer hunting has been a male dominated sport and is expected to continue that way. The requestors and commentors are self selected and no barriers were known to restrict women from these populations.

Table 37 shows the percentage of respondents who had participated in a selected list of forest recreation activities during the past year. Obviously, certain activities for certain groups had very high levels of participation such as deer hunting for hunters and fishing for anglers. Other than those variations due to sampling, a surprisingly similar picture of forest recreation participation emerged for the requestor and commentor groups and the hunter and angler groups. Differences between these two combinations are most noticeable in more "naturalistic" pursuits. The requestor/commentor groups were more likely to participate in canoeing, backpacking, picking wild berries, hiking, nature photography, nature observation, and cross country skiing than hunter/anglers. The requestor/commentor group is also likely to be involved in more total pursuits than is the hunter/angler.

The region of principal residence, using the Upper Peninsula as Region I, the northern Lower Peninsula as Region II (approximately north of a line from Bay City to Muskegon and including all those counties through which the line passes in Region II), southern Lower Michigan as Region III, and all area outside of Michigan as Region IV is shown in Table 38. In contrast to the general population of Michigan, requestors and commentors are much more likely to have their principal residence in the northern two thirds of the state (Michigan Statistical Abstract

Table 36. Selected demographic characteristics of respondents by sample group.

| | Mean or percentage as noted | | | |
Category	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Mean age in years	43.3	50.2	38.7	50.2
Mean education level in years *	15.6	14.5	12.6	13.4
Percentage with 1985 family income greater than $25,000 after taxes (*)	75.0%	72.2%	62.0%	63.9%
Percentage male (*)	84.7%	76.6%	88.1%	88.7%

(*)Significant difference in row by chi-square analysis p<.05
* Significant difference between two or more groups by T-test of sample means p<.05.

Table 37. Michigan forest recreation activities in which the respondents participated during the previous 12 months by sample group.

| | Percentage participating | | | |
Activity	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Fishing *	63.9%	69.0%	78.8%(a)	90.9%
Canoeing *	48.1	43.7	33.0	28.0
Deer hunting *	47.5	46.8	94.4	25.7(b)
Camping *	64.6	45.2	56.9	47.0
Picnicking *	64.6	50.0	44.4	41.9
Boating *	46.2	55.6	53.3	64.2
Backpacking *	17.7	15.1	5.6	8.8
Pick wild berries *	55.1	57.1	35.0	30.1
Pick wild mushrooms *	32.3	39.7	29.4	15.9
Walking/Hiking *	84.2	75.4	57.8	50.3
Off road vehicle use*	10.1	22.2	35.3	10.1
Driving for pleasure	61.4	57.9	61.4	54.7
Ruffed grouse hunting*	38.0	30.2	28.8	13.9
Squirrel hunting *	20.3	10.3	34.3	14.2
Nature photography *	48.1	50.8	22.9	21.3
Nature observation *	79.1	66.7	44.1	37.5
Rabbit hunting *	29.1	15.9	44.1	20.6
Cross country skiing*	51.9	44.4	14.4	16.2
Horse back riding *	2.5	11.1	10.5	5.4
Snowmobiling *	12.0	32.5	29.1	12.5

* Significant difference in row by chi-square analysis p<.05.
(a)Hunters who fished did not purchase trout stamp.
(b)Anglers who deer hunted did so only with archery equipment.

1985). Hunters and anglers within the state are distributed more like Michigan's general population with only a slightly higher percentage living in northern Michigan. Non-residents made up the greatest percentage of the angler respondents. This likely reflects the appeal the Great Lakes salmon/trout fishery has for anglers from nearby states such as Illinois, Ohio, and Indiana.

Table 39 illustrates second home ownership in the northern two-thirds of the state and of forested acreage in Michigan. Commentors are by far most likely to own a second home. Other than anglers, over 40% of the respondents from each group have one or more acres of Michigan forest land under ownership by their immediate families. Many respondents are literally forest "stewards" themselves.

Table 40 shows political involvement of respondents. Special interest group membership in both preservation and conservation oriented organizations is highest in the requestor group, closely followed by the commentor group. Only the Michigan United Conservation Clubs, a conservation group, is a common membership for all four groups.

Table 41 shows the voter registration and proportion of respondents who have, in their own estimation, become involved to some extent in the political arena concerning forest management. While a majority of all groups are registered Michigan voters, requestors have the highest level of voting registration. Considering that 6% of the requestors are non-residents not legally entitled to vote in Michigan, over 97% of the resident requestors are registered Michigan voters. In contacting a government agency concerning forest management, commentors were most likely to have made previous contact. Unlike hunters and anglers, commentors were much more likely to have complained rather than complimented. Requestors, while having a somewhat lower level of contact than com-

Table 38. Region of principle home of respondents by sample group.

Ownership category	Percentage owning			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Principle home in Region I *	17.1%	10.4%	8.2%	3.9%
Principle home in Region II *	31.8	43.2	25.8	15.2
Principle home in Region III *	44.8	40.8	61.7	71.3
Non-resident of MI	6.3	5.6	4.3	9.6

* Significant difference in row by chi-square analysis p<.05.

Table 39. Ownership of northern Michigan second home and one or more acres of Michigan forest land by sample group.

Ownership category	Percentage owning			
	Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Second home in northern Michigan *	18.6	43.4	23.7	24.4
One or more acres of Michigan forest *	43.2	56.1	46.6	26.4

* Significant difference in row by chi-square analysis <.05.

Table 40. Membership in selected special interest groups oriented toward forest management by sample group.

Group		Percentage members			
		Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Preservation oriented					
Audubon Society	*	22.8%	13.8%	0.8%	2.0%
Nature Conservancy	*	14.1	11.9	0.4	2.4
Sierra Club	*	12.8	9.2	0.8	1.2
Wilderness Society	*	6.7	7.3	1.6	1.6
Trout Unlimited	*	6.0	6.4	0.8	3.5
East Michigan Environ-mental Action Council (a)		5.4	1.8	0.4	0.0
West Michigan Environ-mental Action Council (a)		4.7	2.8	0.4	0.0
Membership in > one pre-servation group	*	31.5	21.1	2.7	5.1
Conservation oriented					
Michigan United Conservation Clubs	*	33.6	21.1	10.9	8.2
Ruffed Grouse Society (a)		4.7	7.3	0.4	0.8
Membership in > one con-servation group	*	36.2	22.9	11.3	8.2

* Significant difference in row by chi-square analysis p<.05.
(a) Chi-square cannot be performed due to empty cells or those with too few cases in cell.

Table 41. Michigan voter registration and self reported commenting behavior of respondents on forest management issues by sample group.

Political behavior		Percentage			
		Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Registered Michigan voter	*	91.2%	88.3%	77.5%	85.0%
Have complimented govern-ment agency on forest management issue	*	38.6	45.8	11.7	8.3
Have complained to govern-ment agency on forest management issue	*	46.9	75.6	11.0	9.2
If comment, most recent comment was a letter	*	39.3	71.3	10.4	20.0
If comment, most recent comment was at a public hearing		13.1	17.0	8.3	8.6

* Significant difference in row by chi-square analysis p<.05.

Table 42. Single most important forest recreation activity for respondents by sample group.

Activity		Percentage participating			
		Requestor n=158	Commentor n=126	Hunter n=307	Angler n=296
Fishing	*	17.9%	16.5%	13.0%(b)	58.2%
Canoeing	(a)	0.7	0.0	1.5	0.4
Deer hunting	*	13.1	9.7	43.9	6.1(c)
Camping		9.7	7.8	3.7	10.6
Picnicking	(a)	0.0	0.0	0.0	0.8
Boating	(a)	0.7	4.9	1.5	3.0
Backpacking	(a)	2.8	0.0	0.0	0.8
Pick wild berries	(a)	0.0	1.9	0.0	0.4
Pick wild mushrooms	(a)	1.4	1.0	0.0	0.0
Walking/Hiking	*	9.0	13.6	3.0	3.4
Off road vehicle use	(a)	0.0	1.0	2.2	0.8
Driving for pleasure	(a)	0.7	1.0	1.9	2.7
Ruffed grouse hunting	(a)	3.4	4.9	0.7	0.4
Squirrel hunting	(a)	0.7	0.0	0.7	0.0
Nature photography	(a)	3.4	1.9	0.0	0.8
Nature observation	*	20.7	16.5	4.1	4.6
Rabbit hunting	(a)	0.0	0.0	0.7	0.0
Cross country skiing	(a)	7.6	6.8	1.1	1.9
Horse back riding	(a)	0.7	1.9	1.1	0.0
Snowmobiling	(a)	0.7	4.9	0.7	1.1
Hunting in general	*	6.9	5.8	20.1	4.2

* Significant difference in row by chi-square analysis p<.05.
(a) Chi-square analysis cannot be performed due to too few in a cell or empty cells.
(b)Believed to be non-trout fishing as no hunter respondents had purchased a trout stamp.
(c)Believed to be archery deer hunting as no anglers had purchased a firearm deer license.

mentors, were also more likely to have complained than complimented.

Table 42 shows the most important forest recreation activity of respondents. Requestors and commentors have the broadest range of most important activities. Some type of hunting is the most common most important activity closely followed by nature observation and fishing for these two groups. For hunters, hunting is by far the most important activity with some type of hunting accounting for over 65% of the respondents. For anglers, fishing is by far the most important.

Descriptive Summary

In terms of knowledge about Michigan forests and their management, requestors and commentors are clearly more accurate than hunters or anglers. Considering speculative beliefs, requestors and commentors also hold beliefs that appear to match more closely the forest management strategy of clearcutting for wildlife benefit and the Wildlife Division position of resisting pine plantations due to a negative impact on wildlife. Requestors and commentors are also less likely to believe that increased harvest will damage a broad range of common forest recreation activities.

At the attitude stage however, a divergence from DNR policy is apparent. All groups have a very similar overarching framework concerning the importance of broad types of forest uses. Consistently, forests are seen as most important as fish and wildlife habitat. Second in importance is individual forest recreation. Third is the forest tourism industry closely followed by the forest products industry. Last is the oil and gas industry. Such priorities are not the same as those stated in the forest management plan for timber, recreation, and wildlife (DNR 1983).

When asked about the level of products desired in the future from Michigan forests, commentors and requestors most desired non-game wildlife, fish, scenery, and non-motorized recreation. Hunters most desired game wildlife, fish, non-game wildlife, scenery, water access, and campgrounds. Anglers favored more fish, non-game wildlife, game wildlife, scenery, and water access.

Despite a strong leaning toward wildlife and recreation, requestors and to a lesser extent commentors are more supportive of DNR aims to increase timber harvest than hunters or anglers. Requestors are also more supportive of DNR concerning clearcutting than commentors. Both requestors and commentors tend to favor fewer plantations than do hunters and anglers. However, plantations are more likely to be favored than clearcutting. No group is strongly in support of increased timber harvest or an increasing use of clearcutting as a forest management practice. It had been expected that firearm deer hunters would be likely to favor strongly both increased clearcutting and increased harvest as principle ways to increase and sustain a populous deer herd.

In terms of political behavior, requestors and commentors have shown themselves to be more deeply involved in the political process than hunters or anglers. They do not appear to be merely a subset of anglers or hunters. A number of demographic and commitment variables appear likely to be related to political activity. For instance, commentors and requestors are more likely to vote, to have higher income and educational levels, to have commented in the past concerning forest management issues with contacts skewed toward complaints, to be special interest group members in natural resource oriented groups, to live in a forested area of Michigan, and to have nature observation and non-motorized trail activities as most important recreational activities.

CHAPTER VI

PREDICTIVE RESULTS AND DISCUSSION

Introduction

This chapter will present models to predict attitudes about future
levels of selected management practices and timber harvest volume in
Michigan. Two linear modeling techniques will be used, multiple linear
regression and linear discriminant analysis.

Modeling Management Practice Attitudes

Multiple linear regression will be used to answer the research ques-
tion, "What combination of beliefs and attitudes about Michigan forest
management and what demographic profile of forest recreationists can
best model preferences for future management practice levels?". Multiple
regression is used because the dependent variable, preferred practice
levels, was measured on an interval scale. (See question 12 of the
questionnaire, Appendix A.) The scale had 5 numeric points with distances
between the numbers equal and a word picture description that reinforced
that equal distance notion. The distribution of the dependent variable
across the samples was also relatively normal.

The independent variables analyzed for possible model inclusion were
derived from the literature review and the author's conception of the
relationship of belief, attitude, and political behavior discussed in
Chapter I. For quick reference, the independent variables, whether they
are nominal or interval, their hypothesized influence on the dependent
variable, and their literature source are listed in Table 43.

Neilsen and Buchannan (1986), Courtner et al. (1984), and Nelson et
al. (1984) suggest that knowledge can influence attitude. Hummel's
(1986) apparent hypothesis in his education video about Michigan for-
estry is that improved knowledge of silviculture in Michigan will lead

Table 43. The type, hypothesized influence, and reference for independent variables used to model attitudes about preferred Michigan forest management practice levels in 1991.

Variable description	Type of variable	Direct or inverse influence on attitude	Reference
Knowledge of timber supply	Nominal	Direct	Nelson et al.(1984,1985)
Knowledge of distinguishing characteristics of trees	Interval	Direct	Neilsen and Buchannan(1984) Courtner et al. (1986) Nelson et al. (1984)
Knowledge of regeneration characteristics	Interval	Direct	Same as above
Knowledge of the dependent variable practice	Interval	Direct	Same as above
Knowledge of tree species dependent practice promotes	Interval	Direct	Same as above
Speculative belief about practice/wildlife in general relationship	Nominal	Direct	Nelson et al. (1985)
Speculative belief about the practice/scenery relationship	Nominal	Direct	Patey and Evans (1979) Benson and Ulrich (1981) Daniel and Schroeder (1981)
Speculative belief about harvest/recreation relationship	Nominal	Inverse	Author hypothesis
Preference for deer and forest abundance	Interval	Both	Author hypothesis
Overarching framework of importance of use	Interval	Both	Maggiotto and Bowman(1982)
Desired abundance of selected tree species	Nominal	Both	Langenau et al. (1977)
Recreational activity participation	Nominal	Both	Langenau et al. (1980)
Location of principal and second home and forested property	Nominal	Both	Russell and Ward (1982)
Conservation and preservation group member	Nominal	C=Direct P=Inverse	Kellert (1979) Schmidt (1978)
Age and education	Interval	A=Inverse E=Direct	Author hypothesis
Income, sex, and vote	Nominal	I=Direct S=Male Dir. V=Direct	Author hypothesis

to more support, or at least tolerance, for silviculture. A number of different knowledge independent variables were used in the following models. They include interval measures of knowledge of: distinguishing characteristics of common Michigan trees; regeneration characteristics of those trees; management practices; and management practices commonly associated with those trees. Nominal measures of knowledge concerned the effect of each practice on deer populations, the Michigan timber supply, and the harvest to growth ratio.

Patey and Evans (1979), Benson and Ulrich (1981), and Schroeder and Daniel (1981) suggest that management practices can affect scenic beauty. In general they suggest that selective cutting, by only moderate alteration to the visual resource, is likely to be seen as most scenic. They also suggest that any practice that radically alters the visual resource, especially when evidence of that alteration remains (e.g., slash), is likely to evoke negative attitudes. The models used nominal measures of the respondent's speculative beliefs about the effect of the practice on scenery.

Nelson et al. (1985) noted that concerns about wildlife in general were most important in determining the attitude of state forest campers about management practices. They suggest that people will have more favorable attitudes about practices they believe promote wildlife in general. These models used nominal measures of speculative beliefs about the effect of practices on wildlife in general.

The author hypothesized that a speculative belief that no common forest recreation activity would be harmed by increased harvest would influence opinions about clearcutting and selective cutting. Those who believed no activities would be harmed would be more likely to support these activities. A nominal measure of belief about the effect of

increased harvest on forest recreation was used.

Attitudes can also influence other attitudes. Maggiotto and Bowman (1982) suggest that the overarching framework or attitude one has about the environment and the influence of people on the environment influences one's attitudes about specific issues relating to the overall environment. Interval measures of overarching framework used were ratings about the importance of these Michigan forest uses: fish and wildlife habitat; timber industry; forest recreation industry; oil and gas industry; and individual outdoor recreation.

Langenau et al. (1977) suggested the like or dislike of some tree species influence preferences for management practices that promote desired or undesired species. He suggests that dislike of aspen may result in attitudes unfavorable to clearcutting. A nominal measure of desire for more or less of a species was used for the trees that the modeled practice commonly promotes. An interval measure of preference for future forest acreage was also used.

Demographic variables may also influence attitudes. Langenau et al. (1980) suggest recreational activity participation can influence attitude about clearcutting. They report that small game hunters are likely to favor clearcutting while off road vehicle users are likely to oppose it. Snowmobilers may be neutral because the snow has an ameliorating effect on scenic changes wrought by cutting. Nominal measures of participation in common forest recreation activities were included in models.

Russel and Ward (1982) suggest territoriality affects attitude about appropriate uses of different types of territory. The nominal variables of home location and second home location in the northern two-thirds of Michigan , and ownership of Michigan forest land were used to ascertain the influence of principal territories on attitudes about management

practices. Those who have Michigan forests as part of their primary territory are hypothesized by the author to be more resistant to management efforts in their primary territory as such efforts mean change. Those who own second homes in the northern two-thirds of Michigan are hypothesized to be the most resistant to increased management.

The interval variables of age and education were hypothesized by the author to relate to attitudes about practices. Those with higher education levels may be more likely to have been exposed to the science of forestry and information concerning it. Those who are older are likely to have a sharper image of impacted forest resources due to past forest management.

The author hypothesized that the nominal variables of sex and income also influence attitudes about practices. Women were believed to be less likely to have been exposed to forestry. Those with higher incomes are likely to travel more and have a more accurate image of Michigan forests and forestry.

Kellert (1979) and Schmid (1978) suggest that special interest group members are likely to be better informed and have more polar opinions about issues upon which they focus. Special interest group members were divided into nominal groups of conservation (thought to favor increased management) and preservation (thought to favor less management) members. Conservation groups were: Michigan United Conservation Clubs and Ruffed Grouse Society. Preservation groups included: Nature Conservancy; Sierra Club; Audubon Society; and Wilderness Society.

The nominal variable of Michigan voter registration was hypothesized by the author to be influence attitude about practices as registered voters were thought to be better informed than non-registered individuals.

All these variables were used in combination to derive a multiple regression model for each practice: clearcutting; selective cutting; prescribed burning; and plantations for each sample group. The rationale for this large range of independent variables is that the literature presents a wide range of factors that appear to influence attitudes. Such a broad modeling effort is designed to look for independent variables that influence attitudes of all sample groups. It is also intended to explore the relative strength of these variables when considered in combination, rather than individually, in explaining variance in attitude.

Multiple Regression

In the stepwise multiple regression process a fixed significance level of 0.05 probability of F-to-enter was used and a probability of 0.10 was specified for F-to-remove. Independent variables also had to pass minimum tolerance and tolerance tests to be entered into the equation. Tolerance is the amount of variance in the independent variable to be entered not explained by the other independent variables already in the equation. To meet the minimum tolerance test, an independent variable must have a tolerance level equal to or exceeding the tolerance of the variable with the smallest tolerance already in the equation. The tolerance test is that a variable must have a tolerance of greater than 0.01 (Norusis 1986).

Independent variables were checked for correlation using a correlation matrix. Relatively low levels of correlation were found among variables. An area of special concern was correlations between recreational activities. Those with the highest levels of correlation were among different types of small game hunting: grouse, squirrel, and rabbit. However these levels (.60) were deemed low enough that all hunting vari-

ables were included as separate variables rather than being combined as one category of small game hunting. This was also done because these game species are not dependent on the same types of habitat. For example, squirrels are more likely to be found in mature oaks rather than aspen clearcuts which are more likely to harbor grouse.

Caution must be exercised in interpreting the regression models. Those independent variables found to be significant in a model must be considered in light of all other independent variables that were included in the equation. These models do not state that these are the only factors influencing attitudes about the future level of the practice. Rather they show the amount of variance in the dependent variable explained by those independent variables considered significant in concert with the other independent variables in the equation.

Clearcutting

Tables 44 and 45 model future clearcutting preferences for requestors and commentors. For both groups a sizeable amount of the variance is explained by the equation. For requestors, the largest beta coefficients (standardized regression coefficients) indicate that, for variables in the equation, speculative beliefs are the most important variables. The largest change in R squared occurs with the speculative belief that clearcutting benefits wildlife in general. Participation in grouse hunting is also important in explaining much of the variance. The signs of the beta coefficients are all intuitively logical. Those who logically perceive benefit from clearcutting, e.g., those who believe it benefits wildlife, improves the scenery, and who hunt ruffed grouse, are more supportive of it. Only participation in cross country skiing, which may be viewed as a naturalistic activity, is negative.

82

Table 44. Regression model for requestors with preference for future
clearcutting dependent.

Variable	B	Beta	Adj. R2
Speculative belief clearcutting benefits wildlife in general	.8000	.3077	.208
Hunts grouse	.8242	.3050	.328
Speculative belief increased harvest will not negatively impact recreation activities	.4950	.1872	.381
Cross country skis	-.4214	-.1608	.405
Speculative belief clearcutting improves scenery in one year	.9240	.3727	.429
Speculative belief clearcutting improves scenery in ten years	.4067	.1896	.448
Constant	1.8359		

F (6,103)=15.7452 Sig. F=.0000 Se=.9701

Table 45. Regression model for commentors with preference for future
clearcutting dependent.

Variable	B	Beta	Adj. R2
Speculative belief clearcutting improves scenery in 10 years	.9291	.3662	.259
Speculative belief increased harvest will not impact recreation activities	.9939	.3658	.390
Snowmobiles	.7172	.2786	.454
Camps	-.4392	-.1771	.496
Knowledge deer benefit from clearcutting	.6518	.2399	.531
Forest importance as a place for fish and wildlife to live	-.4230	-.1924	.562
Constant	3.1994		

F (6,64)=15.9508 Sig. F=.0000 Se=.8286

For commentors, the scenic implications of clearcutting and a specu-
lative belief that increased harvest will not impair forest recreation
have the highest beta coefficients. Those variables which indicate an
opposition to increased clearcutting are participation in camping and a
rating of forests as highly important as wildlife habitat. People par-
ticipating in camping are theorized not to support drastic changes to
their camping setting (Langenau et al. 1980). Snowmobilers were posi-
tive about clearcutting, perhaps indicating the scenic effects are less
harsh when cloaked in winter snow. Those who highly rate the forest as
fish and wildlife habitat may desire to minimize what they perceive as a
disturbance to wildlife or the setting in which they interact with wild-
life.

For hunters and anglers (Tables 46 and 47) the equations are less
successful at explaining variance in clearcutting attitude. However, in
both hunters and anglers, knowledge concerning the clearcutting is
included in the models. Negative beta coefficients for knowledge suggest
that when modeled with other variables in the equation, those knowledge-
able about clearcutting are less likely to support it. Speculative
beliefs about scenery, wildlife in general, or that increased harvest
will not negatively impact forest recreation are important in supporting
more clearcutting.

Selective Cutting

Tables 48 to 51 illustrate the models for preferred levels of selec-
tive cutting. The model for each group explains a relatively small
amount of the variance. The independent variables in each model vary
considerably among the sample groups.

Prescribed Burning

Tables 52 and 53 model requestor and commentor preferences for pre-

Table 46. Regression model for hunters with preference for future clear-cutting dependent.

Variables	B	Beta	Adj. R2
Speculative belief that clearcutting benefits wildlife in general	.7862	.3262	.074
Knowledge of clearcutting	-.2198	-.1811	.110
Lives in the Upper Peninsula	-.6388	-.1523	.126
Constant	3.2036		

F (3,158)=8.7453   Sig. F=.0000   Se=1.1048

Table 47. Regression model for anglers with preference for future clear-cutting dependent.

Variable	B	Beta	Adj. R2
Speculative belief that clearcutting improves scenery in one year	.7340	.2431	.080
Speculative belief that increased harvest will not impact recreation activities	.7998	.3433	.166
Income level over $25,000	-.4627	-.2137	.194
Knowledge of clearcutting	-.1522	-.1656	.218
Speculative belief that clearcutting benefits wildlife in general	.5533	.2456	.245
Own one or more acres of forest in Michigan	-.3380	-.1602	.265
Live in the Northern Lower Peninsula	-.4974	-.1719	.286
Constant	3.0579		

F (7,142)=9.5102   Sig. F=.0000   Se=.8516

Table 48. Regression model for requestors with preference for future
selective cutting dependent.

Variables	B	Beta	Adj. R2
Speculative belief that selective cutting improves scenery in one year	.6652	.3117	.077
Prefer more deer in the future	.4615	.2578	.123
Speculative belief harvest will not impact forest recreation activities	.4797	.2419	.174

F (3,104)=8.5294   Sig. F=.0000   Se=.8896

Table 49. Regression model for commentors with preference for future
selective cutting dependent.

Variables	B	Beta	Adj. R2
Male	.9142	.4083	.080
Live in Southern Lower Peninsula	-.6102	-.2963	.137
Knowledge of oak regeneration	-.2703	-.3042	.209

F (3,71)=7.5222   Sig. F=.0002   Se=.8394

Table 50. Regression model for hunters with preference for future selective cutting dependent.

Variable	B	Beta	Adj. R2
Fishes	.5835	.2412	.050
Speculative belief that selective cutting improves the scenery in 10 years	.4724	.2264	.104
Want more deer in the future	-.2654	-.1598	.129
Own one or more acres of forest land in Michigan	.2885	.1517	.146
Constant	3.7587		

F (4,154)=7.7763   Sig. F=.0000   Se=.8771

Table 51. Regression model for anglers with preference for future selective cutting dependent.

Variable	B	Beta	Adj. R2
Speculative belief that selective cutting benefits wildlife in general	.5482	.2666	.062
Live in the Northern Lower Peninsula	.5487	.2047	.112
Prefer less oak in Michigan forests	1.0275	.1780	.140
Knowledge of characteristics that distinguish oak	.2530	.1684	.162
Conservation group member	.4635	.1538	.180
Constant	1.7932		

F (5,144)=7.5197   Sig. F=.0000   Se=.8452

Table 52. Regression model for requestors with preference for future prescribed burning dependent.

Variable	B	Beta	Adj. R2
Knowledge of increased timber supply	.4752	.2457	.113
Wants more deer in the future	-.4845	-.2652	.169
Canoes	.4670	.2413	.218
Speculative belief prescribed burning benefits wildlife in general	.4115	.2124	.241
Lives in Southern Lower Michigan	.3842	.1985	.272
Constant	3.1309		

F (5,101)=8.9300   Sig. F=.0000   Se=.8296

Table 53. Regression model for commentors with preference for future prescribed burning dependent.

Variable	B	Beta	Adj. R2
Speculative belief prescribed burning improves scenery after 10 years	.6543	.3621	.088
Speculative belief prescribed burning improves scenery in one year	.9464	.3296	.170
Own one or more acres of Michigan forest land	.3671	.1983	.245
Household income exceeds $25,000 annually	-.6520	-.3297	.283
Squirrel hunts	.7401	.2578	.325
Lives in the Northern Lower Peninsula	-.5784	-.3194	.368
Cross country skis	.4493	.2466	.414
Constant	2.6737		

F (7,64)=8.1654   Sig. F=.0000   Se=.6955

Table 54. Regression model for hunters with preference for future prescribed burning dependent.

Variable	B	Beta	Adj. R2
Knowledge deer benefit from prescribed burn	.7217	.2724	.090
Knowledge of increased timber supply	.6949	.1860	.116
Knowledge timber volume growth > annual harvest	.4207	.1531	.136
Snowmobiles	-.3781	-.1492	.153
Constant	2.3962		

F $(4,158)$=8.3190   Sig. F=.0000   Se=1.0526

Table 55. Regression model for anglers with preference for future prescribed burning dependent.

Variable	B	Beta	Adj. R2
Speculative belief prescribed burn benefits wildlife in general	.7350	.3130	.065
Wants more deer in future	-.5434	-.2591	.118
Wants more forest acreage in future	-.4283	-.2103	.161
Preservation group member	-.9395	-.2015	.181
Boats	-.4227	-.1895	.205
Participates in nature observation	.3634	.1723	.229
Constant	5.0331		

F $(6,144)$=8.4183   Sig. F=.0000   Se=.9203

Table 56. Regression model for requestors with preference for future plantations dependent.

Variable	B	Beta	Adj. R2
Prefer less red pine in Michigan	-1.2826	-.3795	.147
Subjective belief plantations improve scenery in 10 years	.5312	.1899	.218
Drives for pleasure	.4968	.1768	.257
Household income greater than $25,000 annually	-.6473	-.2128	.292
Age	.0293	.2668	.325
Camps	.7530	.2586	.348
Rated importance of forest as a recreation site	-.3902	-.1524	.369
Rides horses	1.6735	.1659	.394
Squirrel hunts	-.6803	-.2046	.415
Knowledge timber volume growth > annual harvest	.4727	.1713	.436
Speculative belief plantations benefit wildlife in general	.6224	.1704	.457
Constant	3.0819		

F (11,95)=9.1141 Sig. F=.0000 Se=1.0112

Table 57. Regression model for commentors with preference for future plantations dependent.

Variables	B	Beta	Adj. R2
Rated importance of the forest tourism industry	.3107	.2243	.121
Knowledge plantations do not benefit deer	-.9177	-.2931	.194
Prefers less red pine in Michigan	-1.0950	-.2852	.244
Snowmobiles	.6385	.2244	.284
Constant	2.6968		

F (4,68)=8.1337 Sig. F=.0000 Se=1.1706

centage of the variance, but has a large number of independent variables. Preference for less red pine has the largest beta coefficient. Even though there are many variables, the beta signs show an expected trend with activities oriented to scenery indicating a preference for more plantations (driving, camping, horse back riding) and an activity oriented to the abundance of a game species (squirrel hunting) indicating a preference for less plantations.

The beta signs show an expected trend for commentors as those who believe deer do not benefit from plantations and those who prefer less red pine, also prefer fewer plantations. Those who snowmobile favor more plantations as do those who feel the forest tourism industry is important. Snowmobilers benefit from plantations which provide innumerable lanes of travel, and the tourism industry may benefit from plantations if one believes that they improve scenery and the image of Michigan as a forested state.

Tables 58 and 59 model preferred future levels of plantations for hunters and anglers. They explain less variance than the requestor or commentor models. The signs of the beta coefficients are also less rational. Here squirrel hunters support increased plantations. Yet these areas would not support squirrels the hunters seek. However, those who believe there is an annual timber surplus do not support more plantations. For anglers, those who speculatively believe that plantations benefit wildlife in general and scenery are more likely to support them.

Discussion of Regression Models

Requestor and commentor models explained more of the variance in preferred future levels of management practices than hunter or angler models. This suggests that for requestors and commentors the variables identified through the literature review and measured by the question-

Table 58. Regression model for hunters with preference for future plantations dependent.

Variable	B	Beta	Adj. R2
Speculative belief that plantations benefit wildlife in general	.6837	.2538	.064
Drives for pleasure	.6536	.2556	.089
Knowledge that timber volume growth > annual harvest	-.5151	-.1727	.112
Age	-.0170	-.1933	.132
Hikes/Walks	-.6549	-.2614	.155
Prefers more red pine in Michigan	.5195	.2058	.187
Squirrel hunts	.4937	.1892	.215
Rated importance of forest products industry	.1884	.1720	.236
Speculative belief that timber harvest will not impact recreation activities	-.4627	-.1719	.253
Constant	3.3179		

F (9,151)=7.0340   Sig. F=.0000   Se=1.0681

Table 59. Regression model for anglers with preference for future plantations dependent.

Variables	B	Beta	Adj. R2
Speculative belief plantations improve scenery in 10 years	.5901	.2599	.116
Speculative belief plantations benefit wildlife in general	.5051	.2093	.142
Knowledge timber volume growth > annual harvest	.4570	.1700	.165

F (3,147)=10.8758   Sig. F=.0000   Se=1.0186

naire better account for the factors that influence attitudes about practices than for hunters and anglers. It also suggests that requestors' and commentors' past expressions of their views in political forums may have resulted in a more ordered, logical thought process about forestry issues.

Three broad implications from the individual equations deserve discussion. First, speculative beliefs are important in most models. The perceived benefit of practices to wildlife in general and to improving scenery in either the short or the long term appears in every regression model but one (selective cutting for hunters). Speculative beliefs concerning the effect of increased harvest on common forest recreation activities also occurred in three of the four models on clearcutting.

Second, knowledge concerning practices, tree regeneration, and distinguishing characteristics of trees only appear in models for hunter and angler groups. There is great variance in these knowledge levels among hunters and anglers. Requestors and commentors, who have significantly higher levels of knowledge about trees, have smaller variances in this knowledge within their sample groups. Yet for requestors and commentors, the variances within their groups for preferred levels of practices, especially clearcutting and plantations, is higher than for hunters and anglers. This suggests that having a more accurate schema about silviculture does not guarantee support for management practices. It also suggests that when individuals are generally knowledgeable about silviculture, other factors, such as the effect of practices on scenery and wildlife, are likely to be more influential in shaping attitudes about management practices.

Third, there is little similarity among the models. This indicates there may be little in common among groups in how such attitudes are

derived. This would require persuasive messages to change attitudes to be carefully tailored to each audience.

Modeling Preferred Harvest Levels

Linear discriminant analysis will be used to answer the research question "What combination of beliefs and attitudes about Michigan forest management and what demographic profile of forest recreationists can best model preferences for future timber harvest levels in Michigan?". Three possible harvest levels: more, similar, and less were the dependent variable choices for respondents. (See question 14 in the questionnaire, Appendix A.) Since no numeric, interval scale was used in the dependent variable, multiple linear regression is not a proper modeling technique. Discriminant analysis was chosen as each harvest response (more, similar, or less) is a distinct, exclusive category. This technique allows the use of interval and nominal variables to predict category membership.

The author found no literature concerning factors theorized to influence attitudes about desired harvest levels. However, through adaptation of some literature concerning attitude in general, factors suggested to influence attitudes about practices, and the author's hypotheses the following independent variables are thought to impact on preferences for timber harvest levels (Table 60).

Knowledge of the Michigan timber supply was hypothesized by the author to directly influence preferred harvest levels. This is viewed in a resource shortage concept as Yanklovich et al. (1982) and the American Forest Institute (1985) questioned a general public sample about which resources they believed were likely to be more scarce in the future. Nelson et al. (1984, 1985) also found that knowledge of Michigan's annual timber volume surplus of growth versus harvest and the higher

Table 60. The type, hypothesized influence, and reference for independent variables used to model attitudes about preferred Michigan timber harvest levels in 1991.

Variable description	Type of variable	Direct or inverse influence on attitude	Reference
Knowledge of Michigan timber supply	Interval	Direct	Yanklovich et al.(1982)
Knowledge of silviculture	Interval	Direct	Author hypothesis
Speculative belief about harvest/recreation relationship	Nominal	Inverse	Author hypothesis
Overarching framework of importance of wood products industry	Interval	Direct	Maggiotto and Bowman (1982)
Member of conservation or preservation group	Nominal	C=Direct P=Inverse	Kellert (1979)
Desired amount of wilderness in 1991	Interval	Inverse	Author hypothesis
Age	Interval	Inverse	Author hypothesis
Education	Interval	Direct	Author hypothesis
Home ownership in northern two-thirds of MI	Nominal	Both	Russell and Ward (1982)
Forest property ownership in Michigan	Nominal	Both	Russell and Ward (1982)
Income	Nominal	Direct	Author hypothesis
Sex	Nominal	Direct for males	Author hypothesis

standing timber volume in the mid 1980s versus the 1950s was associated with greater likelihood to support increased clearcutting, a timber harvest practice. An interval knowledge scale was constructed of knowledge about annual and long term timber volume surplus.

Knowledge of silviculture was hypothesized by the author to directly influence preferred harvest levels. A single interval knowledge measure was constructed from knowledge about distinguishing between common trees, regeneration characteristics of those trees, common forest management practices, and which practices are commonly used with which trees.

The author hypothesized that the speculative belief that common forest recreation activities would not be negatively impacted by increased harvest would strongly influence harvest level preference. A nominal measure of whether increased harvest would impact recreation was used.

Maggiotto and Bowman (1982) suggest that the overarching framework with which one views the environment influences attitudes about specific policy issues affecting that environment. The author selected only the importance respondents placed on the forest products industry as an interval measure of overarching framework.

Kellert (1979) suggests that special interest group members are likely to have polar opinions about the issues of group interest. The author hypothesized that conservation group members (Michigan United Conservation Clubs and Ruffed Grouse Society) support additional harvest to provide optimum habitat for game species. Preservation group members, including those in the Sierra Club, Wilderness Society, and the Nature Conservancy are hypothesized to support less harvest as they generally do not support active management.

The author hypothesized that the desired amount of wilderness, roadless areas with no timber harvest, would influence the preferred harvest level. The desire for wilderness in Michigan was measured on an interval scale.

The author hypothesized that age and education would influence the preferred level of harvest. Age was thought to influence harvest as those who were older would be more resistant to increased harvest as they have stronger recollection of past intensive harvest. Those with a higher education level were hypothesized to be more supportive of increased harvest as they were believed more likely to be knowledgeable about silviculture.

Russell and Ward (1982) hypothesized that people would have stronger preferences about appropriate actions in their principal territories. The nominal variables of living in the northern two-thirds of Michigan, owning a second home in the northern two-thirds of Michigan, and owning forested property in Michigan were thought to denote principal territories.

Income level is hypothesized by the author to influence preferences about harvest because those with higher incomes are likely to better understand the forest situation in Michigan because of more extensive travel. Sex is hypothesized by the author to influence harvest preferences as females are less likely to be involved than men with common harvest activities such as firewood cutting and employment in the forest products industry, especially in woods-related employment.

Discriminant Analysis

Discriminant analysis uses linear combinations of independent variables to predict membership in groups defined by the dependent variable. The Wilks' Lambda statistic was used to determine which independent

variables were included in discriminant functions. It is the ratio within each category (eg. less harvest, similar harvest, and more harvest) of the sum of squares of an independent variable compared to the total sum of squares (within category plus between categories). As this ratio approaches 1.0, little of the difference between the groups of the dependent variable is explained by the independent variable. For example, if the mean age of those who prefer more harvest is very similar to those who prefer a similar harvest or a smaller harvest, the ratio approaches 1.0. However, if the mean age of those who prefer more harvest is much lower than those who prefer a similar harvest or more harvest, then the ratio will be much less than 1.0.

Lambda is also computed for each discriminant function, of which there are the number of categories of the dependent variable minus one. For a function, lambda is the ratio of the sum of squares of discriminant scores within dependent variable categories compared to the total sum of squares for within category and between categories. Thus a lambda of close to 1.0 indicates that the function explains little of the variance between groups, while a lambda closer to 0.0 indicates that a function explains much of the variance between groups. Lambda is tested for significance after being transformed using a chi-square distribution. Cannonical correlation is also used to show association between the discriminant scores and the categories of the dependent variable once the discriminant function is constituted. When it is squared it shows the amount of total variability explained by the between category differences for each function (Norusis 1986).

As with the regression analysis, a fixed significance level for entry of independent variables of .05 F-to-enter and .10 F-to-remove was used. A minimum tolerance level (degree of association between indepen-

dent variables) of .001 was used. This would not allow variables that were strongly correlated to enter the analysis. A tolerance test for variables already in the equation being affected by a new independent variable being inserted was also used with the same .001 limit.

Preferred Harvest Level

Table 61 shows the discriminant analysis for requestors with harvest as dependent. The model correctly classified 68.4% of the cases. Considering that chance is 33.3% that a classification will be correct, this model provides a considerable improvement. The second function was not included because its chi-square significance level for lambda was low and cannonical correlation suggested it explained little of the variance.

The standardized function coefficients can be interpreted in a way similar to beta coefficients in regression analysis. Thus, believing that forest recreation will not be negatively affected by increased harvest was the most important variable in considering the other two variables in the equation.

For commentors (Table 62), two variables found in the requestor model appear. The commentor model correctly classified over 72% of the cases which utilized two functions (both judged significant using chi-square). The standardized coefficients are more evenly distributed than the requestor model with knowledge about a Michigan timber surplus the largest coefficient.

The sample group of hunters had the lowest percentage of cases correctly classified (Table 63). This performance is similar to the small amount of variance in management practice attitudes explained by regression models in the previous section. However, in modeling harvest preference, three of the four variables in the commentor model, and two of

Table 61. Discriminant analysis for requestors with harvest wanted in near future dependent (more harvest/similar harvest/less harvest).

Variable	Wilks' Lambda	Standardized discriminant function coefficients	
		Function 1	Function 2
Speculative belief that increased harvest will not impact recreational activities	.572	.7328	(a)
Knowledge of long term and annual timber volume surplus	.500	.5280	(a)
Preservation group member	.474	-.3256	(a)
Cannonical correlation		.7175	.1537
Chi-squared (significance)		89.64 (.000)	2.87 (.238)

(a) Second function standardized coefficients not computed due to lack of chi-squared significance (p<.05)

Correctly classified 68.4% of cases.

Table 62. Discriminant analysis for commentors with harvest wanted in near future dependent (more harvest/similar harvest/less harvest)

Variable	Wilks' Lambda	Standardized discriminant function coefficients	
		Function 1	Function 2
Knowledge of long term and and annual timber volume surplus	.580	.6938	-.4920
Rated importance of the forest products industry	.439	.5282	.5956
Speculative belief that increased harvest will have not impact recreational activities	.394	.4263	-.0410
Male	.360	.2123	.6003
Canonical correlation		.7519	.4142
Chi-squared (significance)		79.16 (.000)	14.59 (.002)

Correctly classified 72.8% cases

the four in the requestor model are also found in the hunter model. The standardized coefficients suggest that speculative belief that forest recreation will not be impaired by increased harvest and the rated importance of the forest products industry are the most important variables in the model.

The discriminant model for anglers is shown in Table 64. It correctly classified almost 70% of the cases and used two functions. The variables used in the model include all that have been utilized in other models with the exception of residence in northern Michigan. The largest standardized coefficient is for a speculate belief that increased harvest will not negatively impact forest recreation.

Discussion of Preferred Harvest Level

Unlike the regression models concerning practices, all these models are reasonably successful at classifying cases based on a few predictor variables. Perhaps more important, the predictor variables are similar in all models. Believing increased harvest will not impair common forest recreation activities is found in all models, while knowledge of long term and annual Michigan timber volume surplus and the importance rating of the wood products industry is found in three of four. This indicates that these sample populations may be relatively homogeneous concerning what influences their preferences for harvest levels. This differs from models of preferences for future practice levels. Those indicate the sample populations were heterogeneous for that dependent variable.

None of the harvest models included the level of knowledge about trees and the practices that support them. This suggests that only educating people about silviculture would be unsuccessful in persuading forest recreationists to support increased harvest levels. However, timber volume supply was found in three of the four models. This sug-

Table 63. Discriminant analysis for hunters with harvest wanted in near future dependent (more harvest/similar harvest/less harvest).

Variable	Wilks' Lambda	Standardized discriminant function coefficients	
		Function 1	Function 2
Rated importance of the forest products industry	.879	.5888	-.6207
Speculative belief that increased harvest will not impact recreational activities	.782	.6574	-.0563
Knowledge of long term and annual timber surplus volume	.724	.4452	.8529
Cannonical correlation		.4989	.1903
Chi-squared (significance)		59.44 (.000)	6.78 (.034)

Correctly classified 61.3% of the cases

Table 64. Discriminant analysis for anglers with harvest wanted in near future dependent (more harvest/similar harvest/less harvest).

Variable	Wilks' Lambda	Standardized discriminant function coefficients	
		Function 1	Function 2
Speculative belief that increased harvest will have no negative impact on recreation activities	.843	.7861	.1117
Rated importance of forest products industry	.760	.5918	-.4765
Live in northern 2/3 of state	.708	.1624	.8533
Cannonical correlation		.4739	.2956
Chi-squared (significance)		57.05 (.000)	15.09 (.000)

Correctly classified 69.3% of the cases

gests that providing information that Michigan is on an upward trend in timber supply is more effective than a silviculture lesson at gaining support for increased timber harvest.

Modeling Political Participation

Linear discriminant analysis will be used to answer the research question, "What combination of beliefs and attitudes about Michigan forest management and demographic profile can be used to distinguish between forest recreationists who are active and those who are inactive in the policy process?". The dependent variable will be political activity in the forest policy process.

By the author's definition, those active in the policy process are either commentors (those who within the past three years have written a letter to the governor of Michigan or the director of the Michigan DNR about a forestry issue) or requestors (those who responded to a DNR request to provide planning input concerning two Michigan state forest management plans). Those who are defined by the author as inactive are those sampled as hunters and anglers. While a small percentage of these responded they had contacted a governmental entity concerning a forestry issue, their responses to subsequent questions concerning the details of the contact suggested these contacts were generally passing remarks to a DNR employee concerning hunting, fishing, or camping conditions.

Politically active respondent groups, requestors and commentors will be separately compared to hunters and anglers combined. This combination of hunters and anglers is done because both groups are inactive. Commentor and requestor political activity is sufficiently different to require a separate analysis because commenters initiated government contact unbidden while requestors were invited.

The independent variables used to classify whether a respondent was

Table 65. The type, hypothesized influence, and reference for independent variables used to model political participation in Michigan forest management policy.

Variable description	Type of variable	Direct or inverse influence on participation	Reference
Knowledge of silviculture in Michigan	Interval	Direct	Kellert (1979)
Home ownership in northern two-thirds of Michigan	Nominal	Direct	Russell and Ward (1982)
Forest land ownership in Michigan	Nominal	Direct	Russell and Ward (1982)
Education	Interval	Direct	Sharpe (1982)
Income	Nominal	Direct	Sharpe (1982)
Member of conservation or preservation group	Nominal	Direct	Hooper (1983)
Age	Interval	Direct	Author hypothesis
Sex	Nominal	Direct for males	Author hypothesis

politically active are from the literature review and the author's conception of the relationship between belief, attitude, and political behavior. They are summarized for quick reference in Table 65.

Kellert (1979) suggests that members of animal oriented special interest groups are more knowledgeable about animals than the general public. The author hypothesizes that politically active individuals are more knowledgeable about Michigan forests and their management than those inactive. Interval measures of knowledge about Michigan silviculture and timber surplus are used.

Russel and Ward (1982) suggest that individuals take a greater role in defining appropriate use for principal territories than other territories. The author hypothesizes that politically active individuals are likely to have principal homes or second homes in the more heavily forested northern two-thirds of Michigan and to own forested property in Michigan. The models used nominal variables of each ownership.

Sharpe (1982) suggests that people are more likely to participate in the political process the higher their socio-economic standing. The author hypothesizes that the interval variable of education and the nominal variable of income are positively related to political participation.

Schmid (1978) suggests that special interest group members are better informed about effective participation in decision making due to unique information provided by the group. Hooper (1983) suggests that a duty motivation also encourages special interest group members to be politically active. The author hypothesizes that the nominal variables of membership in a conservation or preservation special interest group positively influence political action.

The author hypothesizes that the interval variable of age influences

political activity as those who are older are likely to be more active
because they are more likely to be registered voters. The author hypoth-
esizes that the nominal variable of sex influences political activity as
most politicians and DNR forest managers are male and many forest recre-
ation activities are dominated by males.

Table 66 shows the discriminant analysis model for the requestor and
hunter/angler groups. The model has one function because there are only
two groups. It correctly classified over 84% of the cases. From the
standardized coefficients a number of variables have a similar level of
importance in the equation. The discriminating variables portray the
requestor as a highly educated individual, likely to be a member of a
conservation special interest group, to live in northern Michigan, and
to have a high level of knowledge about silviculture and the forest
situation in Michigan.

Table 67 portrays the model for the commentor and hunter/angler
groups. This model also correctly classifies more than 84% of the
cases. This model depicts commentors more likely to live or own a second
home in northern Michigan. They are also more likely to be members of a
preservation special interest group, to be older, have a higher income,
be female, and to have a higher level of knowledge about silviculture.

Requestors and commentors, while they engage in a wide variety of
outdoor recreation activities including hunting and fishing, are much
more likely to express themselves in a political forum than randomly
selected hunters and anglers. From the political science and psychology
literature many of their motivations are highly rational.

As background for their political expression, they are likely to
bring with them a knowledge of forestry and membership in a natural
resource oriented special interest group (Kellert 1979; Hooper 1983).

Table 66. Discriminant analysis for classification of requestors and
hunters/anglers.

Variable	Wilks' Lambda	Standardized discriminant function coefficients Function 1
Level of education	.838	.3781
Preservation group membership	.763	.4729
Knowledge of Michigan silviculture	.718	.2966
Conservation group membership	.690	.3056
Knowledge of long term and annual timber surplus volume	.670	.2858
Principal home in northern two-thirds of Michigan	.656	.2519
Cannonical correlation		.5863
Chi-squared (significance)		225.32 (.000)

Correctly classified 84.4% of the cases

Table 67. Discriminant analysis for classification of commentors and
hunter/anglers.

Variable	Wilks' Lambda	Standardized discriminant function coefficients Function 1
Principle home in the northern two-thirds of Michigan	.933	.4703
Preservation group member	.884	.4392
Second home in northern two-thirds of Michigan	.841	.4016
Male	.824	-.3722
Knowledge of Michigan silviculture	.811	.3231
Age	.796	.3237
Household income > $25,000 annually	.787	.2429
Cannonical correlation		.4619
Chi-squared (significance)		117.22 (.000)

Correctly classified 84.2% of the cases

They are also likely to live in the forested areas of Michigan. These areas may be seen as a principal territory, which heightens interest in land use options (Ward and Russell 1982).

Sharpe (1982) has reported that citizens who contact a government agency are likely to have a higher socio-economic status than the general populace. Such a phenomenon occurs with both commentors and requestors. Educational level was entered in the requestor model and income was entered in the commentor model.

CHAPTER VII

CONCLUSION

This study has had two major thrusts. The first is better under-
standing the linkages among beliefs, attitude, and political behavior in
relationship to Michigan forests and forest management. The second is to
provide accurate information on the views of politically important
groups concerning forest policy preferences in Michigan.

The sample groups chosen for this study are those who are involved
directly in the political process. Requestors are individuals who
responded to a DNR request for forest planning input. Commentors are
those who, unbidden, provided input to the DNR or the governor of Michi-
gan concerning forest management issues. Hunters, those who hunt deer
with firearms in Michigan, are a major management focus of DNR forest
management efforts to maintain the aspen timber type and with it a deer
herd of one million or more animals. Anglers, those who fish for trout
in Michigan, rely on the forest as the source of clean, cold water to
provide the necessary habitat for their quarry and setting for pursuit
of brook, brown, and rainbow trout.

Information about the sample groups' beliefs, attitudes, and politi-
cal behavior concerning Michigan forests and their management was gath-
ered through an extensive mail questionnaire. A total of 1,335 individu-
als were sampled. Of that group, 951 (71%) responded.

Research Question Summary

Knowledge of Michigan Forests and Forestry

Respondents knowledge of forestry in Michigan varied considerably
among sample groups. Requestors were most knowledgeable while anglers
were least knowledgeable. The smallest deviation in knowledge measures
was found in the requestor group while the largest deviation was noted

110

in the angler group.

Respondents knowledge of Michigan forests, past and present, also varied widely among sample groups. Requestors had the most accurate beliefs while hunters and anglers had the least accurate. Especially disturbing is that the sizeable growth in Michigan's timber supply, on which the state forest management plan (DNR 1983) bases its rationale for increased harvest, was known by less than half of any group.

The concern expressed by Webster and Olmstead (1982) that a lack of understanding concerning forestry and forest resources hinders public participation in planning appears valid in the sense that broad segments of the forest recreating public have low levels of knowledge about forestry. However, requestors, the sample group that responded to a DNR request for planning input, had levels of knowledge about forestry considerably higher than a random sample of hunters and anglers. While requestor's knowledge levels may not be as high as resource planners desire, they do provide planners with a group much more knowledgeable about forestry and forest resources than any other group sampled.

Forest Output Mix

The mix of products these sample groups desire from Michigan forests differs from that proposed in the Michigan forest management plan (DNR 1983). The plan projects moderate increases in recreation and targets large increases in timber harvest. No specific goals are set for wildlife populations, but since much of the recreation discussed in the plan is wildlife related, it is assumed that wildlife is scheduled for increases similar to recreation.

Nelson et al. (1984, 1985) reported to the DNR that state forest campers appear to have priorities different from the DNR plan, with wildlife rated as the most important product of Michigan forests. This

view was also found in all sample groups of this research study. Fish and wildlife habitat was rated the most important forest use by the four sample groups in an overarching framework of attitude about forest uses. The four sample groups also had the smallest standard deviations of any use in their rating of the importance of fish and wildlife habitat. The four groups sampled ranked the uses in the same descending order of importance: fish and wildlife habitat, outdoor recreation, forest recreation industry, wood products industry, and the oil and gas industry.

The products most desired at increased levels of supply from Michigan forests over the next five years for the four sample groups were: non-game wildlife (requestors and commentors) game wildlife (hunters) and fish (anglers). All products with the exception of oil and natural gas and motorized recreation opportunities were suggested for some lesser increase in the amount provided than the previously mentioned top rated choices. This desire for an increase in the productivity of Michigan's forests for a variety of outputs agrees with the general premise of the Michigan forest management plan that the state's forests are generally underutilized (DNR 1983).

Modeling Management Practice Attitudes

The four sample groups preferred a substantial increase in selective cutting and a moderate increase in plantations. All groups preferred some decrease in clearcutting, with the commentors preferring the largest decrease and requestors the smallest. The greatest differences in attitudes about practices among groups occurred concerning prescribed burning and plantations. Requestors and commentors were more likely to support increased prescribed burning and less likely to support increased plantations than hunters and anglers.

Modeling to predict preferences for future use of these management practices was partially successful. Models were most predictive with requestor and commentor groups and least predictive with hunter and angler groups. Models predicting attitudes concerning clearcutting were most predictive and predicting attitudes concerning selective cutting were least predictive. The models for each sample group for a given practice bore little resemblance to models for the other sample groups for the same practice.

In most models, independent variables concerning the effect of the practice on scenery and on wildlife in general were most important. Modeling preferences for practices based solely on knowledge about silviculture showed little predictive relationship.

Modeling Preferred Harvest Levels

For the four sample groups, the most preferred level of timber harvest volume in the future was for a harvest level similar to the present. This was most pronounced in the hunter and angler groups. Requestors were most likely to support increased harvest, while anglers were least likely to support it. Hunters were most likely to support decreased harvest, while requestors were least likely to support it.

Modeling to predict preferred future levels of harvest was more successful than modeling to predict preferred future levels of management practices. With three future harvest options, models were able to predict the preferences of two-thirds of the respondents.

The models also had many common independent variables among groups. These included a speculative belief that increased harvest will have no negative impact on common forest recreation activities, the rated importance of the forest products industry, and knowledge of the long term and annual timber surpluses in Michigan.

Modeling Political Participation

Modeling to predict the types of people most likely to comment on forest management issues was also moderately successful. Requestors and commentors, by definition, have commented on forest management issues. These two groups were compared separately to the combined non-commenting groups of hunters and anglers. The separate comparison was done because the mode and the stimulus for commenting between requestors and commentors differed substantially. Requestors differed from the combined hunters and anglers in their greater level of membership in conservation special interest groups, higher levels of education, higher level of knowledge about Michigan forestry and forest situation, and residing in the northern two-thirds of the state. Commentors differed from hunters and anglers by being more likely to be members of preservation special interest groups, to know more about forestry in Michigan, to be female, to be older, to have higher income levels, and to both live and own second homes in the northern two-thirds of the state.

Management Implications for the DNR

The varying levels of knowledge among sample groups concerning Michigan forests and forestry have two primary implications. First, it appears key political groups of forest recreationists may be unfamiliar with the facts the DNR uses to make forest management decisions. Second, those who are involved in the political process appear to represent more knowledgeable rather than less knowledgeable forest recreationists. So, a criticism of public participation with the rationale that those who participate in the process do not understand Michigan's forests or forestry may be unwarranted. If nothing else, they may be some of the best educated about forests and forestry that the recreating public has to offer.

The four sample groups differ from the DNR on the future output mix of products from Michigan forests and on the importance of various basic forest uses. The four sample groups rate wildlife habitat as the most important basic use of Michigan forests. The four sample groups would prefer the greatest increase in outputs in non-game wildlife, game wildlife, and fish, not in timber as the plan states.

While one could argue that planners are forced to view the world in broader terms than those of an activity group, e.g., consider the economic benefits of new wood products industries in the state rather than merely measure public opinion about management options, this does not mean that those citizens who feel their needs aren't being met will stay out of the political process. The commentors have entered the process unbidden by the DNR. The requestors, in response to the DNR's published desire for public input, are also in the process. In brief, they are suggesting that wildlife receive more consideration in forest planning and management.

One may argue that wildlife receives a high level of consideration already in Michigan forest management and planning. A population of 1.2 million deer in 1986, the restoration of moose to the Upper Peninsula, and an increasingly active non-game wildlife program are examples of a major wildlife orientation in forest management. However, is information about these actions reaching the important publics? This study showed that many believed that Michigan's deer herd had decreased over the past 20 years rather than the 140% increase that has occurred. More closely tying forest management actions to wildlife, in planning, in implementation, and in the public mind may improve the image of many forest management actions.

However, explaining management actions in silvicultural terms appears unlikely to insure public support for management actions. High levels of knowledge about silviculture alone were poor predictors of preferences for future levels of management. It is not difficult to understand an individual with a basic background in ecology who desires a diverse forest objecting to quarter township clearcuts such as Langenau et al. (1977, 1980) studied in the northern Lower Peninsula of Michigan. While the individual may be well aware that such cutting will result in rapid aspen regeneration to benefit deer and woodcock, they are also aware of the lack of diversity in these large areas. More closely tying forest management actions to a broad range of wildlife, both in actual planning and implementation of plans and in the public mind may improve the reception given to forest management actions.

The models of preferred harvest levels strengthen the contention that providing people with information about their interests, not the process of forestry, may be effective in molding public opinion. Showing how increased harvest will not damage common recreational activities, demonstrating that we are in a timber surplus period (as measured against the recent past), and better describing the importance of the forest products industry appears to hold significant promise for generating support for increased harvest. Fortunately all these ideas are relatively simple in nature, especially when compared to explaining silviculture to the public.

The DNR has a number of vehicles and settings to carry these messages. Campgrounds, especially the 150 state forest campgrounds operated by the Forest Management Division, provide an excellent, relatively long term situation, to communicate with the public in a relaxed manner. Because of their location within Michigan's forests, demonstrations of

how wildlife viewing benefits from timber management (such as elk in the Pigeon River Country Forest), where raspberries and blueberries thrive after prescribed burning or harvesting, how harvest can improve firewood supplies, the care taken to protect lakes and streams from sedimentation due to harvest activities, etc., can be shown on a first-hand basis to the public.

Outdoor writers and outdoor related television shows present another opportunity to communicate with the recreating public. These information sources can quickly reach an audience over a wide geographical area. They can also be used to target specific segments of the recreating population through an article in a special interest group publication. Many outdoor publications have eduction/information sections and often seek information on forests. Many outdoor related television shows are operated on a non-profit basis as educational programs and are bound by tax law to present natural resource related information.

When politically active groups, such as the requestor group, identify themselves, DNR personnel have an "invitation" to present their case. For instance, they may illustrate with simple field exercises the volume of timber today versus the recent past. They can also explore the importance of the forest products industry with a tour of a manufacturing facility or sawmill operation.

In working with politically active individuals however, caution needs to be taken to understand the nature of these individuals. This study suggests that those active in forest policy issues are well educated, generally live and often own second home property in northern Michigan, have a decent working knowledge of forestry and Michigan forests, have higher than median incomes, and are likely to be members of special interest groups.

Each of these factors provides a "guide" for interaction. The level of education, especially for the requestor group suggests that many of these individuals may be more highly educated than many forest managers in Michigan. In particular, such education may lead them to resist flimsy arguments and to be articulate in supporting their positions.

Ownership of first and second homes in northern Michigan suggests that these people view the forest as a vital part of their environment. Using the territory analogy of Ward and Russel (1982) forests may often be considered principal territories. Further, as Petty and Cacioppo (1979) suggest, high issue involvement (due to the principal territory nature of forests) enhances message processing. This enhanced message processing means that such committed people will evaluate the content of a message more critically than an individual with low issue involvement. Thus weakly supported arguments will be less likely to be accepted by such individuals.

The working knowledge of forestry and the forest situation is generally favorable to interaction with forest managers. This appears to be the case in terms of understanding a long term and an annual timber volume surplus.

Special interest group membership introduces more complexity into the situation. Special interest group members have rapid, unique, and sometimes biased sources of information about forest management activi- ties. These can include newsletters and magazines, telephone "hotlines", written alerts to members in a certain geographic area concerning situa- tions in their area, and editorials that suggest who to contact, how to contact them, and what message to convey. It is incumbent for forest managers to provide such special interest groups with timely, accurate, well substantiated information concerning forest management situations

and activities. Further, it is important to be willing to spend extra time with such individuals due to their powerful political role.

One problem in working with special interest groups is that few natural resource managers receive training directed at communicating with the public in general, let alone highly interested and sometimes volatile special interest group members. Most college natural resource programs are weak in communication, psychology, and sociology. This suggests that agencies should institute training programs to better improve the communication skills of their employees and their understanding of the way individuals and groups operate and form attitudes.

Future Research

While this study has provided a baseline of objective and speculative beliefs, attitudes, and demographic characteristics of some readily identifiable groups of forest recreationists and those politically active in determining forest policy, it is only a baseline. Such research should be repeated on a regular basis to gauge changes in these segments of the public.

In addition, the range of individuals as part of this sample should be broadened to include other politically important groups. These may include second home owners, those employed in the forest products industry, elected governmental officials (e.g., the legislature), and a general public sample. The general public sample however, should be conducted with caution. To some, forests may have little importance. Yet, without careful interpretation of a general population sample, conclusions may be drawn for the general public that do not reflect the desires of the forest oriented public. This could lead to serious misjudgment of the political consequences of management actions. In a political world, having the nominal support of a majority of the general

public, but the vehement opposition of the minority who are politically oriented toward Michigan forests, means a decision destined for much visible opposition and little visible public support.

Finally, a carefully designed experiment should be conducted using the types of educational messages recommended previously in this chapter to gauge their power to alter attitude and political behavior. Settings may include a campground or a series of campgrounds where educational programs or messages are presented to campers with initial measurement of beliefs and attitudes. At the same time similar information should be gathered from a control group. At a later date, such as six months hence, experimental and control group attitudes and political behaviors concerning forest management are again measured and compared. This would provide information on the initial reception of such messages and their power in encouraging long term change in attitude and behavior.

Conclusion

While this study suggests that many forest recreationists may have a less than desirable level of knowledge about Michigan forests and forestry, and that the product mix they desire may be somewhat different than the DNR plans to provide, there is a strong underlying support for forests and the benefits they offer to society. As we live in an increasingly urbanized state, nation, and continent, forest recreationists may become an ever more important ally to the forest products industry and forest managers in protecting Michigan's forest resources.

Politically combatting the forces that resist control of acid pollution of the atmosphere or staving off urban expansion from engulfing forest land may require all users of Michigan forests to cooperate rather than to regard each other as adversaries. The DNR as the principal forest manager in the state can play a critical role through the

planning process and the implementation of its plans to better assure

such a cooperative relationship.

APPENDIX

Dear Outdoor Recreationist: Card # 1 __ __ __ __ __
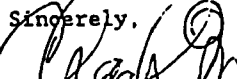   1 2 3 4 5

    Forests and their management play a vital role in the outdoor recreation experiences of people in Michigan. We would like your help in better understanding the viewpoint of people who camp, fish, hike, hunt, canoe, etc. about the management of all of Michigan's forests, public and private.

    Much of the information we seek relates to what you believe about forestry. This is not a test. Rather, it is a way to measure how the public sees Michigan forests. Your response is important as the information you provide will help shape future forest management programs in Michigan.

    Your responses will not be connected with your name in any way. Please complete the questionnaire without the input of others and without using references. When you are done, please return the completed questionnaire to us in the postage paid envelope. THANKS.

Sincerely,

Charles M. Nelson   Maureen H. McDonough
Project Director   Project Coordinator
Departments of Forestry and Park and Recreation Resources, Michigan State University
****

1. Please check ALL of the following activities in which you have   OFFICE USE ONLY
   participated during the past 12 months in Michigan forests.
( )Fishing   ( )Picking wild berries   ( )Nature photography   __ __ __ __ __ __ __
( )Canoeing   ( )Picking wild mushrooms   ( )Nature observation   6 7 8 9 10 11 12
( )Deer hunting( )Walking/Hiking   ( )Rabbit hunting
( )Camping   ( )Off road vehicle use   ( )Cross country skiing
( )Picnicking   ( )Driving for pleasure   ( )Horseback riding   __ __ __ __ __ __ __
( )Boating   ( )Ruffed grouse hunting   ( )Snowmobiling   13 14 15 16 17 18 19
( )Backpacking ( )Squirrel hunting

                                                                         __ __ __ __ __ __
2. Which above activity is most important to you? _____   20 21 22 23 24 25   __ __
                                                                                              26 27

3. YEARS you have done most important activity   _____YEARS
   Favorite Michigan COUNTY for the activity_____COUNTY 28 29
   Most used Michigan COUNTY for the activity_____COUNTY   __ __
**   30 31
4. How does the acreage of forests in Michigan today compare with   __ __
   the acreage 20 years ago? Is today's acreage ...   32 33
 ( )More than 20 yr. ago ( )Similar to 20 yr. ago ( )Less than 20 yr ago   __
                                                                              34

5. What portion of Michigan would you like to be forests in 5 years?
   ( )More as forests ( )Similar portion forests   ( )Less as forests
                                                                              __
                                                                              35

6. How does the population of deer in Michigan today compare with
   20 years ago? Is today's population ...
 ( )More than 20 yr. ago ( )Similar to 20 yr. ago ( )Less than 20 yr ago
                                                                              __
                                                                              36

7. What population of deer would you like in Michigan in 5 years?
   ( )More deer   ( )Similar amount of deer ( )Less deer
                                                                              __
                                                                              37

8. How does the amount (volume) of wood in Michigan forests today
   compare with the amount of wood 20 years ago? Is today's amount...
 ( )More than 20 yr. ago ( )Similar to 20 yr. ago ( )Less than 20 yr ago   __
                                                                              38

9. In the past 5 years, how does the amount(volume) of wood cut each
   year in Michigan forests compare to the amount (volume) of wood
   grown there each year? Is the cut ...   __
   ( )More than growth   ( )Similar to growth   ( )Less than growth   39

121

10.The following statements are to explore how you mentally distinguish between types of trees. Each statement refers to one, two, three, four, or all the types of trees listed and commonly found in Michigan forests. Please put a check mark in the appropriate box(es) after EACH STATEMENT FOR THE TREES YOU BELIEVE IT APPLIES TO as shown in the example. Leave the boxes the statement doesn't apply to blank.

STATEMENTS	Aspen	Red Pine	Sugar Maple	Jack Pine	Oak	
EXAMPLE:Tree name ends in "e"		X	X	X		
Is often called an ever-green						40 41 42 43 44
It loses its leaves ev-ery fall						45 46 47 48 49
Seeds are commonly in cones						50 51 52 53 54
Seeds are commonly called acorns						55 56 57 58 59
Sap valuable for making syrup						60 61 62 63 64
Often lives 100 or more years						65 66 67 68 69
Young trees need strong sun-light to grow						70 71 72 73 74
Young trees can grow well in weak sunlight or shade						75 76 77 78 79
Often sprouts new, young trees from the stump or roots after cutting						card 2 1 2 3 4 5 6 7 8 9 10
Rarely grows from seed						11 12 13 14 15
Fire often improves the ability of seeds to sprout						16 17 18 19 20
Twigs or seeds are a principal, important deer food						21 22 23 24 25
I would prefer to have more of these trees in Michigan forests						26 27 28 29 30
I would prefer to have less of these trees in Michigan forests						31 32 33 34 35

11.The following statements are to explore how you distinguish forest management practices now used in Michigan forests. Each statement refers to one, two, three, or all the practices. Please put a check mark in the appropriate box(es) AFTER EACH STATEMENT as shown in the example. Leave the boxes to which each statement doesn't apply blank.

The practices are defined as:

Clearcut- An area of at least an acre where all the trees of one or more types are harvested at the same time.
Selective cut- An area where only scattered, selected trees are harvested at one time.
Prescribed burn- A fire set by trained forest managers only under certain weather and fuel conditions burning a specified forest area.
Plantation- An area of trees planted in rows and maintained in an orderly manner.

	PRACTICES			
Statements	Clear-cut	Selective cut	Prescrib-ed burn	Plan-tation
EXAMPLE:Practice name ends in "t"	X	X		
Immediately allows strong sun-light to reach the forest floor				Doesn't apply
Immediately allows only weak sun-light to reach the forest floor				Doesn't apply
Results in all trees in an area being a similar age and size				
Results in trees in an area being different sizes and ages				
Often promotes ASPEN regrowth				
Often promotes OAK regrowth				
Often promotes RED PINE regrowth				
Often promotes SUGAR MAPLE regrowth				
Often promotes JACK PINE regrowth				
Often improves an area for deer				
Often improves an area for wildlife in general				
Often improves scenery in 1 year				
Often improves scenery after 10 or more years				

36 37 38

39 40 41

42 43 44 45

46 47 48 49

50 51 52 53

54 55 56 57

58 59 60 61

62 63 64 65

66 67 68 69

70 71 72 73

74 75 76 77

$\frac{3}{1}$ 2 3 4 5 6 7 8 9

12. For the forest management practices as defined above, indicate the level of the each practice you prefer to be used in Michigan during the next 5 years. Use a scale of 1-5 with 5 being a large increase in the practice, 3 staying at the same level, and 1 being a large decrease. Please circle your choice for each practice.

10 11 12 13

PRACTICE	Large Increase	Moderate Increase	Same as Now	Moderate Decrease	Large Decrease
Clearcut	5	4	3	2	1
Selective cut	5	4	3	2	1
Prescribed burn	5	4	3	2	1
Plantations	5	4	3	2	1

14 15 16 17

13. There are 5 major uses people make of Michigan forests. Please rate the importance of these uses to you, using a scale of 1-5, where 5 is crucial, 3 is moderately important, and 1 is not important.

BENEFITS	Crucial		Moderately important		Not important
Wood products industry (paper, lumber, firewood, etc.)	5	4	3	2	1
Forest-related recreation industry (campgrounds, guest services,etc)	5	4	3	2	1
Oil and gas industry	5	4	3	2	1
Place for fish and wildlife to live	5	4	3	2	1
A place for outdoor recreation	5	4	3	2	1

$\overline{18}\ \overline{19}\ \overline{20}\ \overline{21}\ \overline{22}$

14. Do you feel that the amount (volume) of timber harvested in Michigan over the next 5 years should ...

( )Increase   ( )Stay similar   ( )Decrease

$\overline{23}$

15. Do you believe an increased harvest of timber in Michigan will have a significant, negative impact on any of the following forest recreation activities? If you believe none will be affected, check ONLY none. If one or more will be affected, check all you believe will be affected.

$\overline{24}\ \overline{25}\ \overline{26}$

( ) Wildlife viewing   ( ) Hunting   ( )Driving for pleasure
( ) Camping   ( ) Fishing   ( )Hiking/Walking
( ) Off road vehicle   ( ) Snowmobiling   ( )Picking wild berries
    riding   ( )None

$\overline{27}\ \overline{28}\ 2$

$\overline{30}\ \overline{31}\ \overline{32}\ \overline{33}$

16. Below is a list of products Michigan forests can provide. Show the level of each product you want by circling the appropriate number in each row.

PRODUCTS	Much More	Somewhat More	Same Amnt.	Some-what Less	Much Less
Game wildlife(deer, grouse,etc.)	5	4	3	2	1
Non-game wildlife(songbirds, endangered species, etc.)	5	4	3	2	1
Wilderness/roadless areas	5	4	3	2	1
Wood for lumber, paper, etc.	5	4	3	2	1
Motorized recreation opportunities (ORV, snowmobile trails,etc.)	5	4	3	2	1
Non-motorized rec. opportunities (hiking trails, etc.)	5	4	3	2	1
Campgrounds	5	4	3	2	1
Scenery	5	4	3	2	1
Access to lakes and streams	5	4	3	2	1
Oil and natural gas	5	4	3	2	1
Fish	5	4	3	2	1

$\overline{34}\ \overline{35}\ \overline{36}\ \overline{37}\ \overline{38}$

$\overline{39}\ \overline{40}\ \overline{41}\ \overline{42}\ \overline{43}\ \overline{44}$

****
We are interested in COMPLAINTS or COMPLIMENTS YOU HAVE EXPRESSED about forest management to government agencies, such as the DNR or the US Forest Service, or to an elected official, such as the governor or a legislator. This DOES NOT INCLUDE "how to" questions about growing or caring for trees, reporting fish and game violations, etc. Rather, it concerns contacts about such issues as cutting or logging, forest management plans, forest road construction, etc.

17. Have you ever contacted a government agency or elected official with a
        COMPLIMENT about forest management? ( )Yes   ( )No
        COMPLAINT about forest management? ( )Yes   ( )No
(If NO to BOTH, skip to Question 28;if YES to EITHER, go to next Ques)

$\overline{45}\ \overline{46}$

18. In your MOST RECENT such contact, who did you contact? Please
    check the ONE agency or elected official.
( )US Forest Service   ( )State legislator   ( )Governor
( )Federal congressman   ( )Local government official ( )DNR $\overline{47}$

19. How did you contact them? Check all that apply.
( )Telephone ( )Letter ( )Public hearing ( )Personal meeting
( )Other (please explain_____) $\overline{48}\ \overline{49}\ \overline{50}\ \overline{51}\ \overline{52}$

20. Was the contact generally a..( )Compliment or a ( )Complaint? $\overline{53}$

21. Who owned the land your comments applied to?
( )Public   ( )Private   ( )Public and private   ( )Don't know $\overline{54}$

22. Where is the land? _____Principal county of interest $\overline{55}\ \overline{56}$

23. Do you own property in the principal county? ( )Yes   ( )No $\overline{57}$

    23a.If yes, what type of property is it?
( )Principle home   ( )Second home/cottage ( )Land with no home $\overline{58}$

    23b.How many acres is this property?_____acres $\overline{59}\ \overline{60}\ \overline{61}$

    23c.What percentage of this property do you feel is forest?____% $\overline{62}\ \overline{63}\ \overline{64}$

24.Which practice(s) did your contact concern? Check ALL that apply.
    ( )Cutting   ( )Herbicide/Pesticide use
    ( )Burning   ( )Planting
    ( )Logging road construction ( )Other (Please explain_____ $\overline{65}\ \overline{66}\ \overline{67}$ $\overline{68}\ \overline{69}\ \overline{70}$

25.Please check the ONE aspect of the situation most important to
    you?
    ( )Hazard of major forest fire   ( )Deer or other game
    ( )Long term gain/loss of forests   ( )Effect on economy $\overline{71}$
    ( )Appearance of the forest   ( )Wildlife in general
    ( )Outdoor recreation   ( )Other (_____

26.Please briefly explain why you commented._____

_____ $\overline{72}\ \overline{73}$

27.How satisfied were you with the results of your contact? A 5 means
    totally satisfied, a 3 partially satisfied, and a 1 not satisfied.
    Satisfaction   5   4   3   2   1 $\overline{74}$

    27a. Why?_____ $\overline{75}\ \overline{76}$ $\frac{4}{1}\ \overline{2}\ \overline{3}\ \overline{4}\ \overline{5}$

****
Finally we have a few questions about you and your household so we can compare
your answers to those in a similar situation.

28.Where is your principle home?COUNTY_____ STATE_____ $\overline{6}\ \overline{7}$

29.Does your immediate family own a second home? ( )YES ( )NO
    If YES, where is it? COUNTY_____ STATE_____ $\overline{8}$ $\overline{9}\ \overline{10}$

30.How old are you? ____AGE $\overline{11}\ \overline{12}$

31. Are you ( )Male or ( )Female? $\overline{13}$

32.Are you a registered voter in Michigan? ( )YES   ( )NO $\overline{14}$

33.Does your immediate family own 1 acre or more of forest land in
   in Michigan?   ( )YES   ( )NO (If NO, skip to Q 37) $\overline{15}$

34.Has there been a timber harvest on your forested property by a
   commercial logger in the past 10 years? ( )YES   ( )NO $\overline{16}$

35.Has firewood been cut on your property in the past 10 years?
                    ( )YES   ( )NO $\overline{17}$

36.Please check ALL of the following who have provided advice on managing
   your forested property in the past 10 years:
   ( )Cooperative Extension agent   ( )Private forester
   ( )DNR employee   ( )US Forest Service employee $\overline{18}$ $\overline{19}$ $\overline{20}$ $\overline{21}$ $\overline{22}$
   ( )Other (please explain_____)

37.Please check ALL the following groups to which you belong.
( )Wilderness Society   ( )Michigan United Conservation Clubs
( )Sierra Club   ( )National Rifle Association $\overline{23}$ $\overline{24}$ $\overline{25}$ $\overline{26}$ $\overline{27}$ $\overline{28}$ $\overline{29}$ $\overline{30}$
( )Audubon Society   ( )Ruffed Grouse Society
( )Nature Conservancy   ( )National Wildlife Federation
( )Trout Unlimited
( )East Michigan Environmental Action Council
( )West Michigan Environmental Action Council $\overline{31}$ $\overline{32}$ $\overline{33}$ $\overline{34}$
( )Bass Anglers Sportsmans Society

38.Please circle the last grade (year) you finished in school?

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
(12 is a high school diploma) (16 is a bachelors college degree) $\overline{35}$ $\overline{36}$
                    (18 is an advanced college degree)

39.Was the income of your family before taxes over $25,000 in 1985?
                              ( ) Yes   ( )No
                                                                  $\overline{37}$

If you have any additional comments about management of Michigan's public and
private forests, especially as they relate to your outdoor recreation
activities, please feel free to put them here.

0-16340

****
Thank you for your time and effort in completing the questionnaire. Please mail
it back to us in the stamped, pre-addressed envelope. If the envelope is
missing, please mail it back to our Park and Recreation Resources address
printed below. THANKS.

Department of Park and Recreation Resources   Department of Forestry
131 Natural Resources Building   128 Natural Resources Bldg.
Michigan State University   Michigan State University
East Lansing, MI 48824   East Lansing, MI 48824

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF PARK AND RECREATION RESOURCES   EAST LANSING • MICHIGAN • 48824-1222
NATURAL RESOURCES BUILDING

July 24, 1986

Hello,

Recently we sent you a questionnaire about Michigan forests and their man-
agement. At this time we have not received your response.

A number of you have written to us saying you feel that you "don't know enough"
about forest management to respond. On the contrary, it is very important that
people like you respond and complete the questionnaire! One of the goals of
our study is to improve education programs about forest management. Yet, if we
don't know what you believe, we can't design effective education programs.

Besides beliefs about how trees grow and how management practices affect for-
ests, the questionnaire provides the opportunity for you to express your
opinions on how you would like Michigan's forests to be managed in the future.
These opinions, though not connected in any way with your name, will be part of
our report to public and private forest managers in Michigan.

Please take the 10-15 minutes necessary to complete the questionnaire and let
your beliefs and opinions be heard. Then mail it back in the postage paid enve-
lope. Thank you for your help.

Sincerely,

Charles Nelson   Maureen McDonough
Project Director   Project Coordinator
Departments of Forestry   Departments of Forestry
  and Park and Recreation   and Park and Recreation
Michigan State University   Michigan State University
East Lansing, MI 48824   East Lansing, MI 48824

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF PARK AND RECREATION RESOURCES
NATURAL RESOURCES BUILDING

EAST LANSING • MICHIGAN • 48824-1222

September 2, 1986

Hello,

We are writing about our study concerning your beliefs about Michigan forests and their management. We have not received your response at this time.

The large number of questionnaires already returned has been encouraging. However, our ability to describe accurately how people who recreate in Michigan forests feel about their management depends on you and others who have not yet responded. Our past experience suggests that those of you who have not yet responded are likely to hold different opinions than those who respond quickly.
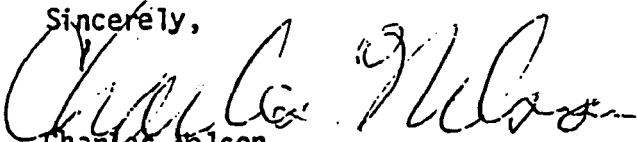
As we noted in our last letter, while many of you feel you "don't know enough" to respond, it is very important that you do respond. Since one of our goals is to develop education programs about forestry for people who enjoy the out-of-doors, knowing what you believe about how trees grow and how management practices affect various trees will help us provide programs of direct benefit to you.

Others have written that since they are satisfied with the way forests are managed there is no need to complete the questionnaire. Still others have suggested that their voice will not be heard when compared to many other respondents. The one certainty is that if you do not respond forest managers will not understand your feelings about the way forests are managed, while they may hear from those with opinions different from yours.
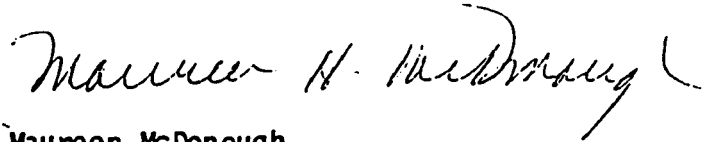
For these reasons we have sent this letter by certified mail to insure delivery. In case our other correspondence did not reach you, or you have been on vacation, a replacement questionnaire has also been enclosed. We urge you to complete and return the enclosed questionnaire in the postage paid, pre-addressed return envelope.

Thank you for your assistance in making this study most representative of those who enjoy outdoor recreation in Michigan.

Sincerely,

Charles Nelson
Project Director
Departments of Forestry and
 Park and Recreation Resources
Michigan State University
East Lansing, MI 48824

Maureen McDonough
Project Coordinator
Departments of Forestry and
 Park and Recreation Resources
Michigan State University
East Lansing, MI 48824

Enclosure

LITERATURE CITED

LITERATURE CITED

American Forest Products Industries. 1961. Why We Must Have Multiple Use Forest Management. American Forest Products Industries, Inc. Washington D. C.

American Forest Institute. 1985. The Forest Industry in Perspective. American Forest Institute, Washington, D. C.

Ajzen, I. and M. Fishbein. 1977. Attitude-behavior relations: a theoretical analysis and review of empirical research. Psychology Bulletin 84: 888-918.

Anderson, L. 1981. Land use designations affect perception of scenic beauty in forest landscapes. Forest Science 27: 392-400.

Bald, F. 1961. Michigan in Four Centuries. Harper and Rowe: New York.

Barber, J. 1984. Is there a public perception of forestry?. Journal of Forestry 82: 323.

Becker, R. 1983. Opinions about clear-cutting and recognition of clear-cuts by forest recreation visitors. Journal of Environmental Management 17: 171-177.

Benson, R. and J. Ullrich. 1981. Visual Impacts of Forest Management Activities: Findings on Public Preferences. U. S. Forest Service Research Paper INT-262. Intermountain Forest and Range Experiment Station, Ogden, UT.

Benzie, J. 1976. Manager's Handbook for Red Pine in the North Central States. U. S. Forest Service, North Central Forest Service Experimentation Station Report NC-33. St. Paul, MN.

Benzie, J., Alm, A., Curtin, T., and C. Merritt. 1986. Silviculture: the next 30 years, the past 30 years. Part V. The North Central region. Journal of Forestry 84: 35-42.

Blossom, T. Growing timber business moves back into spotlight. 1985. Detroit Free Press, January 14, 1985.

Bultena, G., Roger, D., and K. Conner. 1975. Toward explaining citizens' knowledge about a proposed reservoir. Journal of Environmental Education 7 (2): 24-36.

Burris-Bammel, L. 1979. Information's effect on attitude: a longitudinal study. Journal of Environmental Education. 11 (3): 41-50.

Courtner, H., Zwolinski, M., Carpenter, E., and J. Taylor. 1984. Public support for fire management policies. Journal of Forestry 82: 359-361.

Cooper, J. and R. Croyle. 1984. Attitudes and attitude change. Annual Review of Psychology 35:395-426.

Daniel, T. and H. Schroeder. 1979. Scenic beauty estimation model: predicting perceived beauty of forest landscapes. Proceedings of National Conference on Applied Techniques for Analysis and Management of the Visual Resource. Incline Village, NV.

Dillman, D. 1978. Mail and Telephone Surveys. John Wiley: New York.

Downs, R. and D. Stea. 1977. Maps in Minds: Reflections on Cognitive Mapping. Harper and Row: New York.

Fazio, R. and M. Zanna. 1981. Direct experience and attitude-behavior consistency. Advances in Experimental Social Psychology 14: 161-202.

Fridgen, J., Mahoney, E., Nelson, C., and D. Holecek. 1986. Michigan State Parks Study. Department of Park and Recreation Resources, Michigan State University, East Lansing, MI.

Gibson, J. 1979. An Ecological Approach to Visual Perception. Houghton-Mifflin: Boston.

Glascock, H. 1974. Attitude sampling: a forestry need. Journal of Forestry 72: 258-259.

Hacker, J. 1983. How Michigan prevented another Monongehela. Journal of Forestry 81: 665-668.

Hacker, J., Marshall, P., and A. Erickson. 1983. A Review of Jack Pine Regeneration in the Lake States. Michigan State University Agricultural Experiment Station Research Report 443. East Lansing, MI.

Hammitt, W. and C. McDonald. 1983. Past on-site experience and its relationship to managing river recreation resources. Forest Science 29: 262-266.

Harlow, W. and E. Harrar. 1969. Textbook of Dendrology. McGraw-Hill: New York.

Harrison, J. and P. Saare. 1975. Personal construct theory in the measurement of environmental images: application. Environment and Behavior 7: 53-58.

Heberlein, T. 1973. Social psychological assumptions of user attitude surveys: the case of the wildernism scale. Journal of Leisure Research 5 (3): 18-33.

Hendee, J. 1984. Public opinion and what foresters should do about it. Journal of Forestry. 82: 340-344.

Hooper, M. 1983. The motivational bases of political behavior: a new concept and measurement procedure. Public Opinion Quarterly 47: 497-515.

Hummel, M. 1986. Growing and Managing Michigan's Dynamic Forest. Forest Management Division, Michigan Department of Natural Resources, Lansing, MI.

Jackson, L. 1986. New rural residents want some timber preserved. Detroit Free Press, July, 7, 1986.

James, L., Heinen, S., Olson, D., and D. Chappelle. 1982. Timber Products Economy of Michigan. Michigan State University Agricultural Experiment Station Report 446. East Lansing, MI.

Johnson, V. 1984. Prescribed burning: requiem or renaissance?. Journal of Forestry 82: 82-90.

Kaplan, S. and R. Kaplan. 1982. Cognition and Environment. Praeger: New York.

Kellert, S. 1979. Public Attitudes Toward Critical Wildlife and Natural Habitat Issues. Phase I. U. S. Department of Interior, Fish and Wildlife Service, Washington, D. C.

Knopp, T. and M. Bruder. 1985. The language of land use. Northern Journal of Applied Forestry. 2: 9-11.

Langenau, E., Jamsen, G., and R. Levine. 1977. The stability of attitudes toward clearcutting among landowners in Roscommon County, Michigan. Forest Science 23: 437-443.

Langenau, E., O'Quin, K., and J. Duvendeck. 1980. The response of forest recreationists to clearcutting in northern lower Michigan: a preliminary report. Forest Science 26: 81-91.

Lee, T. and D. Uzell. 1980. The Educational Effectiveness of the Farm Open Day. Countryside Commission for Scotland. Perth, United Kingdom.

Leefers, L. 1986. Presentation at Spring Meeting, Michigan Chapter, Society of American Foresters, Ann Arbor, MI.

Maggiotto, M. and A. Bowman. 1982. Policy orientation and environmental regulation: a case study of Florida's legislators. Environment and Behavior 14: 155-170.

Mahoney, E., Jester, D., and G. Jamsen. 1985. Recreational Fishing in Michigan. In Travel and Tourism in Michigan: A Statistical Profile. Travel, Tourism, and Recreation Resource Center, Michigan State University, East Lansing, MI.

Michigan Department of Natural Resources. 1979. Policy 2207. Michigan Department of Natural Resources, Lansing, MI.

Michigan Department of Natural Resources. 1983. Michigan's Forest Resources: Direction for the Future. Michigan Department of Natural Resources, Lansing, MI.

Michigan Statistical Abstract. 1985. Bureau of Business Research, School of Business Administration, Wayne State University, Detroit, MI.

Neilsen, C. and T. Buchanan. 1986. Interpreting controversial management policies. Journal of Forestry 84: 60.

Nelson, C., Holecek, D., and S. Chen. 1984. Final Report: 1983 State Forest Campground Camper Interviews. Department of Park and Recreation Resources, Michigan State University, East Lansing, MI.

Nelson, C., Beatty, K., and D. Holecek. 1985. Final Report: 1984 State Forest Camper Interviews. Department of Park and Recreation Resources, Michigan State University, East Lansing, MI.

Nelson, C. 1986. Hunting in Michigan. In Travel and Tourism in Michigan: A Statistical Profile. Travel, Tourism, and Recreation Resource Center, Michigan State University, East Lansing, MI.

Norusis, M. 1986. SPSS +. SPSS Inc.: Chicago.

O'keefe, J. and L. Nadel. 1978. The Hippocampus as a Cognitive Map. Clarendon: Oxford, United Kingdom.

Olsen, M. 1981. Consumers' attitude toward energy conservation. Journal of Social Issues. 37 (2): 108-131.

Ostrum, A. 1982. Forest Area in Michigan, 1980. U. S. Forest Service North Central Experiment Station Report 289. St. Paul, MN.

Patey, R. and R. Evans. 1979. Identification of scenically preferred landscapes. Proceedings of National Conference on Applied Techniques for Analysis and Management of the Visual Resource. Incline Village, NV.

Petty, R. and J. Caccioppo. 1979. Issue involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. Journal of Personality and Social Psychology. 37: 1915-1926.

Quimby, G. 1960. Indian Life in the Upper Great Lakes: 11,000 B.C. to A.D. 1800. Holt Rhinehart: Chicago.

Ramsey, C. and R. Rickson. 1976. Environmental knowledge and attitudes. Journal of Environmental Education. 8: 10-18.

Russell, J. and L. Ward. 1982. Environmental psychology. Annual Review of Psychology. 33: 651-688.

Schank, R. and R. Ableson. 1977. Scripts, Plans, Goals, and Understand-
     ing. Erlbaum: Hillsdale, NJ.

Schmaltze, N. 1983. The land nobody wanted: the dilemma of Michigan's
     cutover lands. Michigan Natural Resource Register 3 (6): 4-12.

Schmid, A. 1978. Property, Power, and Public Choice. New York: Praeger.

Schone, J., Basset, J., Montgomery, B., and S. Witter. 1984. Red Pine
     Plantation Management in the Lake States: A Handbook. School of Nat-
     ural Resources, University of Michigan, Ann Arbor, MI.

Schroeder, H. and T. Daniel. 1981. Progress in predicting the perceived
     scenic beauty of forest landscapes. Forest Science 27: 71-80.

Sharpe, E. 1982. Citizen-initiated contacting of government officials
     and socioeconomic status: determining the relationship and account-
     ing for it. American Political Science Review 76: 109-115.

Simard, A., Haines, D., Blank, R., and J. Frost. 1983. The Mack Lake
     Fire. U. S. Forest Service North Central Experiment Station Bulletin
     NC-83. St. Paul, MN.

Sommer, R. 1978. The Mind's Eye. Dell: New York.

Spencer, J. and J. Hahn. 1984. Michigan's Fourth Forest Inventory: Tim-
     ber volumes and projections of timber supply. U. S. Forest Service
     North Central Experiment Station Bulletin NC-72. St. Paul, MN.

Tubbs, C. 1975. Manager's Handbook for Northern Hardwoods in the North
     Central States. U. S. Forest Service, North Central Forest Exper-
     iment Station Report NC-39. St Paul, MN.

Webster, H. and J. Olmstead. 1982. Forest resource planning at the state
     level: a review of promising developments. Journal of Forestry 80:
     32 and 56.

Yanklovich, Skelly, and White. 1980. Public Policy Pressures on the For-
     est Products Industry. American Forest Institute: Washington, D. C.

Yanklovich, Skelly, and White. 1981. Public Policy Pressures on the For-
     est Products Industry. American Forest Institute: Washington, D. C.

Yanklovich, Skelly, and White. 1982. Public Policy Pressures on the For-
     est Products Industry. American Forest Institute: Washington, D. C.

Youell, C. 1985. Connecticut concern: timber harvesting regulations.
     Extension Review 56 (1): 42-44.