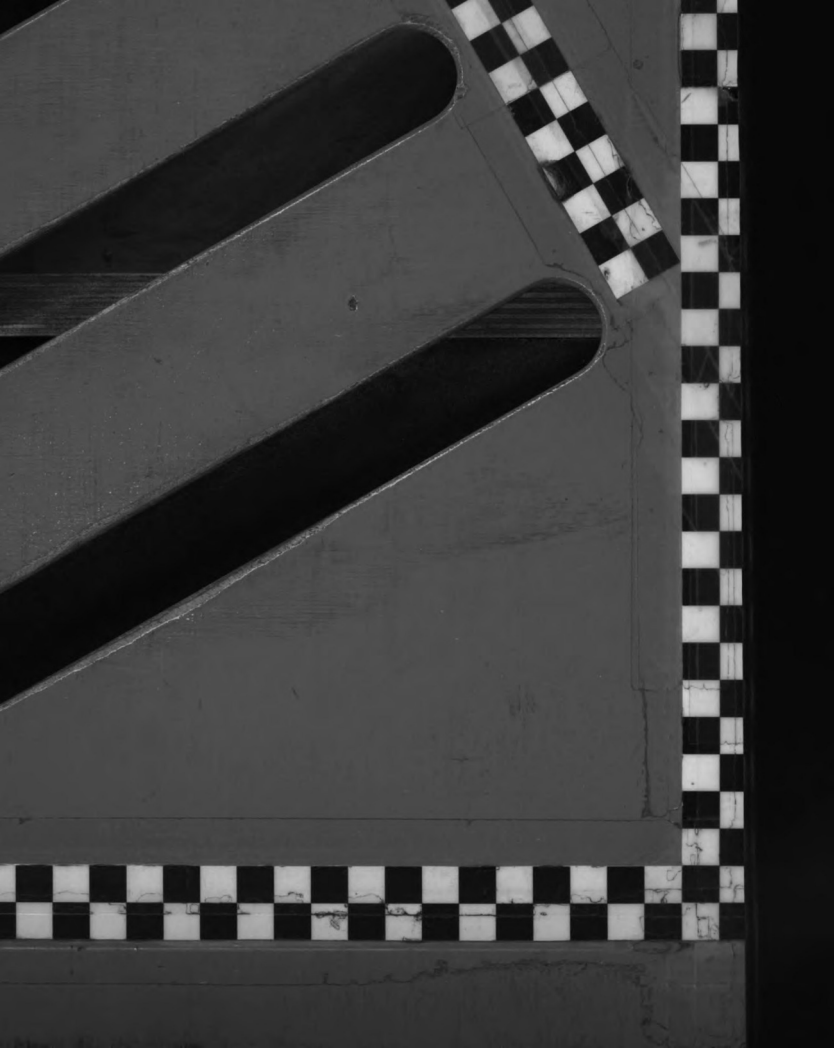

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CULTURAL CARRYING CAPACITY AND STAKEHOLDERS' ATTITUDES ASSOCIATED WITH THE DEER CROP DAMAGE ISSUE IN MICHIGAN

Volume I

By

Donna Lynne Minnis

A DISSERTATION

Submitted to
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ABSTRACT

CULTURAL CARRYING CAPACITY
AND
STAKEHOLDERS' ATTITUDES ASSOCIATED WITH
THE DEER CROP DAMAGE ISSUE IN MICHIGAN

By

Donna Lynne Minnis

The deer herd in Michigan increased almost four-fold from the fall of 1971 to the fall of 1989. As deer numbers and resultant crop damage increased, crop damage "issues" emerged. The most recent episode of crop damage controversy is different, and perhaps more complex, than past issues because of the advent of a formal Michigan Department of Natural Resources (MDNR) program of damage control permits in the late 1970s. Crop damage issues are but one example of a resource management issue involving conflicting preferences for deer among multiple stakeholders. Finding an acceptable balance among constituency interests is the ultimate challenge.

The research involved a mail survey of deer hunters and agricultural producers who hunted or farmed in one of seven agricultural counties in Michigan. A conceptual framework of Cultural Carrying Capacity (CCC) was developed to facilitate state agencies' consideration of the preferences of multiple stakeholders in wildlife management, and a conceptual model of factors influencing individuals' behaviors to seek change in a wildlife population was proposed. Measurements were evaluated in

terms of their usefulness in making the CCC framework operational. A path model for understanding deer hunters' attitudes toward state-directed special permit programs that involve killing deer to control crop damage was tested.

Few respondents held perceptions of the trend in deer numbers that were congruent with the trend as judged by the MDNR. Regardless of the actual deer density, farmers tended to say there were too many deer, and deer hunters tended to say that there were too few deer. Also, deer hunters preferred a higher deer density than did farmers regardless of the intensity of deer-management-related issues in the county. As hypothesized, there was greater overlap in tolerance levels among stakeholder segments in counties with lower issue activity than in counties with higher issue activity. It was tentatively concluded that respondents' estimates of deer densities and preferences could be used to make the CCC framework operational such that agencies may be able to monitor issue development and be proactive to prevent disruptive issue activity.

Deer hunter respondents generally disapproved of crop damage control permits but tended to be less disapproving of Block Permits than of Shooting Permits. The strongest influence on deer hunters' approval of crop damage control permits was their perception of how closely the program was overseen by the resource management agency.

To my husband and soulmate, Richard Brian Minnis.
The wind beneath my wings.

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I am grateful to the Wildlife Division of the Michigan Department of Natural Resources; Michigan State University Extension; and the Michigan Agricultural Experiment Station for funding this research. Many MDNR personnel collaborated on this project and deserve to be recognized, most notably Dr. Bill Moritz, Dr. Ed Langenau, and the field staff in the study counties whose help was invaluable and truly appreciated. Thanks, too, to the MSU-E personnel who provided crop damage expertise and guidance for this project.

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Finally, as I write this with a tear of joy in my eye to my husband, Richard, whose unconditional, steadfast love enabled me to persevere, prosper, and remain ever hopeful. Without his help, this dissertation might still be unfinished.

Each and every day I thank goodness for the opportunities that I have had and the people (and dogs) whom I have known. I am truly fortunate.

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CHAPTER 1

INTRODUCTION

Brief History of Deer and Deer Impacts in Michigan

The historical trend in the population of white-tailed deer (*Odocoileus virginianus*) in Michigan is characterized by a series of tremendous lows and incredible highs (Figure 1). Over the last quarter of the century, the deer herd has seen a dramatic increase. In fact, due to a combination of mild winters, insufficient antlerless harvest, artificial feeding, advent of the Deer Range Improvement Program, and expansion of commercial logging and agricultural activities, the deer herd in Michigan increased almost four-fold from the fall of 1971 to the fall of 1989, at which time it peaked at 2 million (Langenau 1994). Since 1989, the number of deer in the state has declined slightly to an estimated 1.8 million in the fall of 1994, with considerable variation in deer density at the local level (MDNR 1994b). The recent upswing in the number of deer has resulted in increased deer-related vehicle accidents and incidences of starvation of deer (Langenau 1993). In addition, with roughly 75% of the deer in the state inhabiting private land, deer damage to agricultural crops and orchards has become a major cause of concern for landowners (Deer Damage Committee 1989, Langenau 1993).

Damage to crops caused by deer can result in marked financial losses to individual agricultural producers (Conover et al. 1995). In 1989, about 4% of Michigan's farms and orchards experienced crop damage from deer, and, although a relatively small percent of the farming community was affected, some 2,000 agricultural producers incurred serious economic losses (Langenau 1993). Because agriculture is the second largest industry in Michigan, annually contributing $37 billion to the State's economy, the potential impact of crop damage can be significant not only for individual producers but also for the broader populous (Skjaerlund and Norberg 1994).

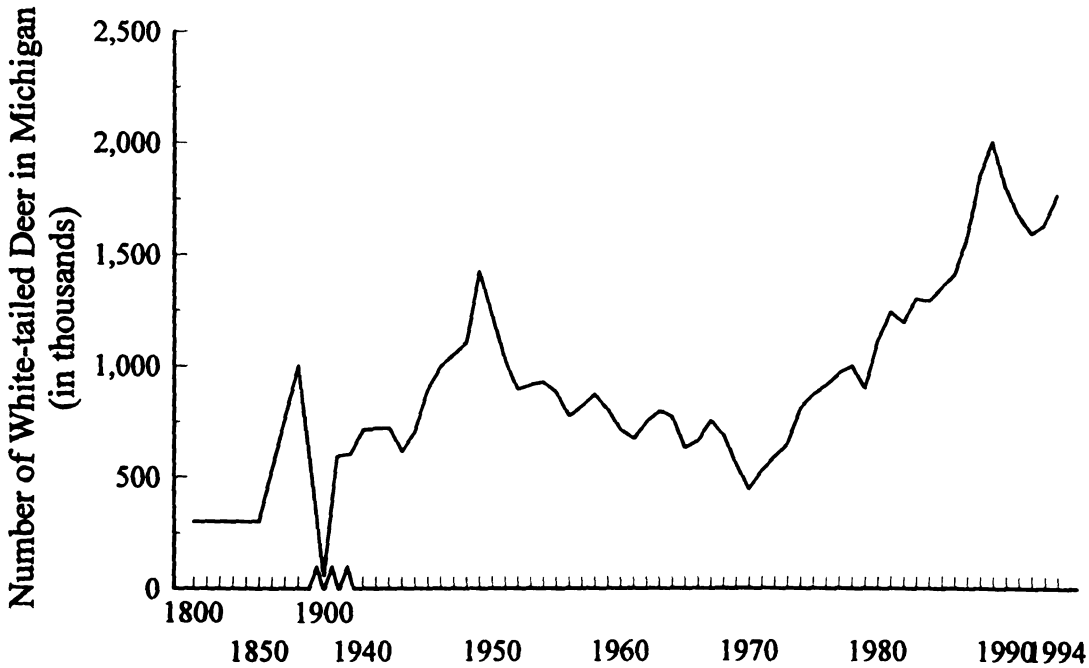

Figure 1. Trend in the white-tailed deer population in Michigan (1800-1994) (Langenau 1994) (1938 - 1994 data are fall estimates; pre-1938 data are estimates based on historical accounts; E. Langenau, Michigan Department of Natural Resources, Wildlife Division, pers. commun. 1996).

Crop Damage Issues

Definition

As deer numbers and resultant crop damage increase, crop damage "issues" tend to emerge. An issue is defined as a problem involving social conflict, and social conflicts are said to exist "when actors engage in incompatible activities and thereby consciously interfere with each other" (Freeman 1992:154). Coser's (1956:8) characterization of social conflicts as, "a struggle over values and claims to scarce status, power and resources in which the aims of the opponents are to neutralize, injure or eliminate their rivals," aptly describes the general nature of crop damage issues.

Crop Damage Issues as Social Movements

Issues can be indexed by the social movements that have organized and campaigned around them (Vanderpool et al. 1994). A social movement is a process by which members of a community that share a common concern mobilize the resources needed to address that concern (Dietz et al. 1989). At the core of this mobilization is a political struggle between the potential winners and losers from a policy under consideration, and, accordingly, it is those who have a vested interest who become the key actors (Dietz et al. 1989).

In the case of the crop damage issue, the key actors, or "stakeholders," are those who represent farming interests and those who represent deer hunting interests. The focus from the agricultural perspective has tended to be on minimizing the economic impact of deer damage, and from the hunting perspective, on maintaining recreational access and deer hunting opportunities. Although other interest groups may be affected by deer management in agricultural areas, this research was restricted to an investigation of

the farming and hunting factions.

Overview of Crop Damage Issues in Michigan

Given the three peaks in the growth of the deer herd in the State (Figure 1), it should be no surprise that the issue of crop damage is not new to Michigan. As early as the 1930s, representatives of hunting and agricultural groups came together to form a crop damage committee to address concerns related to the number of deer in the state (Langenau 1994). The recent chronology of the crop damage issue in Michigan might be said to illustrate a case of history repeating itself. However, the most recent episode of crop damage controversy is different, and perhaps more complex, because of the advent of a formal Michigan Department of Natural Resources (MDNR) program of damage control permits in the late 1970s, which is described in detail in the next section. This program in part involves two types of special kill tags ("Shooting Permits" formally adopted in the mid-1970s and "Block Permits" formally adopted in 1990) designed to reduce the number of deer on private lands with significant deer damage.

Concurrent with increases in deer numbers over the past three decades, the MDNR received an increasing number of complaints about deer damage from producers of agricultural crops, fruit trees, and nursery stock (E. Langenau, MDNR, pers. commun. 1996). In response to the complaints from producers, the number of out-of-season Shooting Permits issued increased from 42 in 1976 to 1,406 in 1989 (Langenau 1991). Public scrutiny of Shooting Permits and eventually of Block Permits ensued, and, since the mid-1980s, complaints about the special crop damage control permits from deer hunters, adjacent property owners, and farmers themselves have intensified (Langenau 1993).

Two factors amplified the intensity of the stakeholder conflict thereby accelerating the issue's development. First, media coverage of deer management and the crop damage control permits served to frame the issue as well as to incite reaction from both deer hunting and agricultural proponents. For instance, during the initial years of the Block Permit program, a variety of stories about the program appeared in the media, some alleging problems and improprieties (Nelson and Yuan 1991). Second, over the past 30 years, there has been an increase in both the frequency and intensity of deer hunting in Michigan (Langenau et al. 1994). This increased interest in hunting created more competition between hunting groups for a limited resource, serving to heighten hunters' sensitivity to other competing interests (Langenau et al. 1994).

In 1989, coinciding with the all-time peak in deer numbers, an ad hoc committee of scientists and agency representatives was formed to analyze the deer damage problem and make recommendations for research and communication about the issue (Deer Damage Committee 1989). In early 1995, a task force was created which, reminiscent of its 1930s predecessor, was composed of representatives of agricultural and hunting interests. This group was charged with identifying ways in which positive communications could be developed in communities around issues that farmers and sportsmen face (Stephens 1995). Crop damage has become such a serious concern that it has garnered its own special Subcommittee on Deer Damage within the Michigan House of Representatives Standing Committee on Agriculture and Forestry (Subcommittee on Deer Damage 1995).

Because crop damage issues are dependent not only on the temporal but also on the geographic scale (Vanderpool et al. 1994), it would be erroneous to contend that there

is a crop damage issue statewide in Michigan. Rather, the current legislative attention to crop damage has been motivated by crop damage issues in localized areas of the state. Given the small scale and local significance of most crop damage issues, they might more accurately be called, "micro-protests" (Fortmann 1988). Further, as suggested by the name of the special crop damage control permits in Wisconsin, the sites of these localized controversies could be called "hot spots" (Horton 1995). One example of a crop damage micro-protest centers in the northeastern lower peninsula of Michigan, which is an area that has more than earned its reputation as a hot spot.

The Alpena Crop Damage Issue

Fueled by concern that the deer herd in the region was severely declining, a handful of sportsmen in Alpena, Michigan, formed the group, Concerned Deerhunters, circa 1993. This group eventually coalesced under the banner of the Chamber of Commerce to become known as Concerned Sportspersons and Business People of Northeastern Michigan (CSPBP). CSPBP labeled the MDNR crop damage control permits as a major contributor to the perceived decline in deer numbers (The News 1994). Rumors about transgressions (e.g., "gut shooting" of deer) by farmers within the area served to further escalate the issue. According to the Michigan State University Extension (MSU-E) professional for Alpena county, these "coffee shop horror stories" exasperated local sportsmen's suspicion about the detrimental impact of crop damage control permits on the size of the deer herd in the area (P. R. Wegmeyer, Director MSU-E, Alpena county, pers. commun. 1994). A leader of CSPBP was quoted in a local newspaper as saying, "The curtailment of doe permits for the general public will only help solve part of the problem. The other part of the problem, the issuance of summer

kill permits and fall block permits to farmers, still goes on without control and accountability" (The News 1994:5-B).

CSPBP advocated an 11-point program to achieve their mission of maintaining a deer herd level that was sufficient to provide a quality hunting experience, which they felt in turn would "guarantee" a consistent and prosperous business climate (The News 1994). To support their side, the group went so far as to contract a study of the economic benefits of deer to the area (Forsberg and Myers 1994). One of the steps in their program was to develop a separate system for the control of the deer herd by farmers that did not include killing deer, and another step was to plant crops on state land to lure deer from farms (The News 1994).

In addition to lobbying their State Representatives for support of their program, CSPBP convened a public meeting in Alpena, Michigan, in early 1994 "to discuss the condition of our Michigan deer herd and other related issues" (LaCross 1994). This meeting was publicized in the local media as well as in southern Michigan, with feature articles on the meeting appearing in the Lansing State Journal and other major news outlets around the state (Appendix A). The meeting was attended by several hundred individuals and involved a question-and-answer session on a range of topics, most notably crop damage control, deer population size, and general issues of deer management, such as season and bag restrictions. A special report of this meeting, which compiled agency responses to questions asked during the meeting, was developed and made available to the public in April of 1994 (MSU-E 1994).

As sociological theory would predict, the strategies of the factions in the Alpena crop damage social movement co-evolved (Dietz et al. 1989). That is, the actors in each

side of the social movement responded to each other by altering their arguments and strategies in an attempt to gain tactical advantage and legitimize their position and influence (Dietz et al. 1989). For example, some local farmers began to react negatively to the perceived threat from CSPBP's proposed program, asserting that they would "have to take things into [their] own hands" to alleviate deer damage if the special permits were eliminated (Wegmeyer 1994). Long after the CSPBP town meeting, the issue over the deer population and crop damage control permits continued to brew (The News 1994). The Alpena crop damage issue served as one impetus for this research.

Crop Damage and its Control in Michigan

Damage versus Loss

For clarity, it is important to define the terms "crop damage" and "crop loss." Crop damage is defined herein as the physical injury deer cause to individual annual (e.g., herbaceous crops such as soybeans) or perennial (e.g., woody crops such as fruit trees or Christmas trees) plants grown for purposes of commercial sale through the consuming, antler rubbing, trampling, or uprooting of parts or all of the plant. Several factors influence the amount of damage caused by deer, including the density, distribution, and movements of deer; palatability of the crop to deer; relative availability of deer foods; weather; crop type; and field size, shape, and location (Deer Damage Committee 1989).

Crop damage may or may not result in crop loss, which is defined as a reduction in yield, function, and/or diminished appearance of an agricultural or horticultural product (Deer Damage Committee 1989). Crop loss is associated with a financial loss to the producer due to the decrease in quantity or quality of the commodity which results in lower market value or the need to purchase cattle feed to compensate for fodder lost to

deer. Damage may also raise operating costs, such as for fence maintenance or replantings (Hanson 1988). In this report, "loss" is used to refer to the monetary loss or, more accurately, benefits foregone to a producer due to deer damage. Crop damage and loss may or may not be judged as a problem by the producer, depending on, among other things, his/her awareness of the damage and loss and his/her values for deer.

Damage Abatement in Michigan

There are several possible approaches to dealing with deer damage, and they involve either reducing the deer population, redistributing the deer population (i.e., exclusion, repellents, translocation, lure plantings), and/or compensating farmers for losses (Matschke et al. 1984, Deer Damage Committee 1989). However, non-lethal control techniques are generally considered marginally effective, costly, or labor intensive (Matschke et al 1984). To supplement the option of non-lethal controls, the MDNR Wildlife Division implements a program of culling to help reduce the extent of deer damage to crops. This program involves three different types of permits: general antlerless permits used as part of the regular deer hunting season and two special permits issued to agricultural producers for use on sites of significant deer depredation. Because the sample for this research involves stratification by antlerless license type and because a primary objective of this research was to investigate attitudes toward the special crop damage permits, a thorough discussion of the three permit systems is warranted.

Antlerless Deer Licenses

The MDNR issues licenses for the recreational harvest of antlerless deer in select areas of the state where deer populations need to be controlled due to "excessive deer-vehicle accidents, severe crop damage, or serious shortage of winter food" (MDNR

1994c). These licenses are valid during the 3-month fall deer hunting season. A carefully controlled harvest of antlerless deer not only helps to control crop damage, but it also provides many benefits to hunters, such as improving the buck-to-doe ratio, providing better antler development, and protecting deer range from overbrowsing (MDNR 1994c).

In Michigan, deer hunters may fall into one of three categories in terms of antlerless deer licenses: those who apply for an antlerless permit and receive one (thus eligible to legally hunt both bucks and does); those who apply for an antlerless permit but do not receive one (eligible to legally hunt only bucks); and those who do not apply for an antlerless permit (eligible to legally hunt only bucks). With an antlerless license, "hunters may take an antlerless deer or a deer with antlers extending less than 3 inches from the skull within the specific area designated on the license" (MDNR 1994c).

There are two types of antlerless deer licenses in Michigan, General and Private Land (MDNR 1994c):

> "The General Antlerless Deer License may be used to take an antlerless deer from any lands within the specified deer management unit with the permission of the landowner. It is also valid on public lands within the specified deer management unit where hunting is not prohibited. The Private Land Antlerless Deer License is valid only for the property where issued and on adjoining private lands with the permission of the landowners. The Private Land Antlerless Deer License is not valid on public lands."

To be eligible for a Private Lands Antlerless Deer License, an individual must either be the legal owner of 40 or more contiguous acres in the Deer Management Unit (DMU) or rent, lease, or have permission to hunt antlerless deer upon 40 or more acres of contiguous huntable land in the DMU. In 1993, applicants could combine parcels under

different ownerships to total 40 acres, but in 1994, the 40 or more contiguous acres had to be under a single ownership. The number of General and Private Land Antlerless Deer Licenses for each DMU is established in July of the year. Quotas are based on the recommendation of wildlife biologists for the number of antlerless deer that need to be harvested to reach specific deer population objectives. "Historical data on success rates are used to prescribe the number of licenses of each type to be available" (MDNR 1994c).

A person may submit only one application per year for an antlerless deer license. In order to apply, the individual must first purchase a passbook and deer hunting license for the year and an application card for a nonrefundable $3.00 fee. All General Antlerless Deer License applications are entered in a computer program, and in areas where there are more of these applications than the number of general antlerless deer licenses available, applicants are randomly selected via the computer program. All Private Land Antlerless License applicants are also entered in a computer program, but when there are more applicants than available Private land Antlerless Deer Hunting Licenses within a DMU, individuals who apply as legal landowners will be selected before applicants who rent, lease, or have permission to hunt on private land. Antlerless kill tags are mailed to those applicants who are selected, and unsuccessful applicants are not notified.

Shooting Permits

In 1978, "Out-of-Season" permits, or "Shooting Permits," were formalized in Michigan as a means to control deer damage to agricultural crops (Department Policy and Procedure No. 2119 and 2119.9; Wildlife Conservation Act Commission Order Section 5.4) (MDNR 1983). This formalization of Shooting Permit followed several years of an informal shooting program dating at least as far back as the 1929 Game Law, which

authorized the Director of Conservation to issue special permits to control wildlife depredation (E. Langenau, MDNR, pers. commun. 1996). The first documented records of shooting permit use appeared in 1938 (E. Langenau, MDNR, pers. commun. 1996).

Since the mid-1970s, the official Shooting Permit policy has been amended several times. In 1983, regulations to govern Shooting Permits were adopted in an effort to resolve enforcement problems and provide clear guidelines to permittees (MDNR 1983). Shooting Permit guidelines were amended in 1985 to allow MDNR field personnel more flexibility to permit the taking of deer (MDNR 1985). In 1990, Shooting Permit guidelines were again modified to make the Commission Order more useful in prosecuting and fining permit violators and provide additional flexibility in permitting (MDNR 1990). The 1990 amendment also established that opportunities to take nuisance deer during the regular hunting season would be expanded in an attempt to reduce numbers of deer damage Shooting Permits (MDNR 1990).

As they appear today, Shooting Permits are valid only on the permittee's land and are free to eligible landowners. Shooting Permits are valid at times only outside of the regular fall deer hunting season, unless special approval for in-season use is obtained from MDNR administrative personnel. The permittee may designate up to three shooters to implement the provisions of the permit, unless additional shooters are approved by MDNR administrative personnel. The MDNR requires as a condition of the permit that deer killed under the authority of a Shooting Permit be turned over to the Department unless possession of deer taken under the permit is approved by MDNR administrative personnel. The permittee must keep records of deer killed and provide them for inspection upon request of an MDNR field staff member. Unused Shooting Permit tags

must be returned to the MDNR within 7 days after expiration of the permit. In 1994, over 300 farmers, orchardists, and nursery growers in Michigan received Shooting Permits which resulted in a take of just over 1,700 deer (MDNR 1995b) (Table 1).

Table 1. Number of Shooting Permits issued and number of deer killed on Shooting Permits in Michigan since 1991 (MDNR 1995b).

	1991	1992	1993	1994
No. of Shooting Permits Issued	549	446	305	336
No. of Deer Killed	1,781	3,271	1,838	1,703

Block Permits

Following a 2-year experimental trial period, a second type of special permit was introduced statewide in 1990 (Wildlife Conservation Act Commission Order Section 3.12). These new permits were called "Bonus Deer Hunting Licenses" and were designed for use during the regular fall deer hunting season (archery, firearm, or muzzleloading seasons) on private land where deer depredation has been documented to be a chronic and significant problem. A goal of these permits was not only to control damage but also to promote the use of licensed hunters to do the control work. These tags are known as "Block Permits" because they are issued in groups, or blocks. As a general rule with rare exception in special cases as approved by MDNR administrative personnel, the minimum number of tags given to an eligible landowner is 10 (MDNR 1994d). The rationale behind the minimum block size is that the regular antlerless permit system is sufficient to take care of problems that would involve the removal of less than ten nuisance deer

(Langenau 1993).

To be eligible for Block Permits, the landowner must have incurred significant deer damage to agricultural or horticultural crops during 2 or more of the 5 years preceding the request ("historical" damage) (Langenau 1993). The permittee must pay a non-refundable $3.00 fee for each Block Permit, which is the same fee required of the general public applying for antlerless deer licenses (Langenau 1993). The permittee is mandated to report the number of deer taken on the Block Permits and the name, address, and passbook number of all authorized designees to the MDNR by the 15th of January following the deer hunting season. Noncompliance with Block Permit rules renders the landowner ineligible for Block Permits in the future.

Block Permits are valid only on the land where the damage occurred and adjoining private land with the permission of the respective landowner (Langenau 1993). All regular season deer hunting rules apply to Block Permits except that they are transferable. That is, unsuccessful hunters may return the permit to the landowner for reissuance to another licensed hunter during the hunting season. The permittee may not sell the Block Permits, nor are they to allow another landowner to use or attempt to use a Block Permit on non-designated lands; however, the landowner may charge the designee an access fee. There is no restriction on the number of Block Permits that may be filled by any one hunter, and deer taken on Block Permits do not count against the hunter's regular bag limit (Langenau 1993). In 1994, nearly 16,000 Block Permits were issued to 955 agricultural producers statewide (MDNR 1995a) (Table 2). About 12,000 deer were taken on Block Permit tags in 1994, which accounted for approximately 10% of the total antlerless harvest in that year (MDNR 1994b). The reduction in the number of farms and

orchards issued block permits since the statewide inception of the program has been cited as evidence of the success of the program (Langenau 1993).

Table 2. Number of farms receiving Block Permits, number of Block Permits issued, number of deer taken on Block Permits, and number of hunters using Block Permits in Michigan from 1988 to 1994 (Langenau 1993).

	1988[a]	1989[a]	1990	1991	1992	1993[b]	1994[c]
No. of Farms Receiving Block Permits	1	0	1,591	1,243	1,150	993	955
No. of Block Permits Issued	30	5,331	27,980	20,780	19,627	16,825	15,992
No. of Deer Killed	19	3,960	15,557	14,274	12,777	11,643	11,893
No. of Participating Hunters	39	0	11,498	10,263	9,400	8,422	8,164

[a] Block Permits were tested at Michigan State University's Lake City Experimental Farm in 1988 and in three MDNR Districts (9, 11, and 13) in 1989.
[b] From MDNR (1994a).
[c] From MDNR (1995a).

Similarities between the Shooting Permit and Block Permit Programs

Although numerous prescribed differences between the two damage control permit systems exist, they do have some similarities. For instance, MDNR field personnel are responsible for judging if there is a deer damage problem and — if judged as warranted — issuing permits to the farmer. The number of antlerless deer to be taken is jointly determined by the landowner and the MDNR representative (Langenau 1993). Also, both permit systems are valid only for taking antlerless deer on private land (i.e., deer without antlers and deer with antlers that extend less than 3 inches above the skull), except when authorization is provided by MDNR administrative personnel for special circumstances, such as antler-caused rubbing damage to orchard trees. Finally, because

these permits are targeted to precise areas, the impact on the overall deer herd in the State is said to be minimal (MDNR 1994b). The logic supporting Shooting and Block Permits is that, through removal of nuisance deer from designated private land, a larger deer herd can be maintained in surrounding areas than would be possible without these crop damage control permits, thereby providing relief to landowners with severe crop damage problems while not unduly detracting from recreational deer hunting opportunities (Langenau 1993).

Human Tolerance of Deer

The issue of crop damage revolves around damage and its control. However, resolution of deer damage conflicts goes beyond simply a diagnosis of the problem and prescription of a technological fix in the form of control measures. The bigger picture is one — like many deer management issues — of conflicting preferences for deer among multiple stakeholders. That is, the crop damage issue is a member of a larger family of resource management conflicts based on differences in human tolerance for wildlife, wildlife-caused problems, and the control of those problems. From the natural resource manager's perspective, the crop damage issue represents the age-old dilemma of managing a public resource to the benefit of all citizens. Finding an acceptable balance among constituency interests becomes the ultimate challenge. Thus, to supplement and guide the investigation into the crop damage issue, human tolerance for wildlife was conceptually modeled, and a theoretical framework to facilitate agency management of wildlife-related issues was proposed.

Statement of the Problem

At the core, the problem is finding an answer to the question of, "How many deer are enough?," within the constraints of biology, politics, economics, and the diversity of social values in deer management. One symptom of the problem is the disagreement among stakeholders, namely farmers and hunters, over whether killing deer to control crop damage is warranted and, if so, whether the Shooting and Block Permit programs are acceptable approaches to the lethal control of deer damage. At the institutional level, the problem is the disruption in agency management of deer due to the conflicts among stakeholders. Disruptive activity by stakeholders is an indication that the agency is not satisfactorily achieving its mission of managing the deer herd to serve the needs and wants of the citizens of Michigan.

Based on existing literature and experience of the MDNR personnel, the issue surrounding crop damage and its control in Michigan is fueled by at least four sources. First, there are many differing beliefs associated with crop damage management. These include differing beliefs about the extent and severity of deer crop damage; about how much loss a farmer should tolerate and how many deer a hunter should expect; and differing beliefs regarding whose interests should be served by the management agency. Second, misperceptions and misunderstandings regarding Shooting and Block Permits are in part responsible for the localized conflicts. The prescribed differences in Shooting and Block Permits, coupled with the regional variation in the implementation of the programs, has resulted in varied degrees of confusion and contention among farmers and hunters as well as among agency personnel. Third, low perceived credibility of the MDNR to implement any crop damage control permit program adds fuel to the controversy. For

instance, the MDNR's ability to assess crop damage and loss has been questione farming interests (Subcommittee on Deer Damage 1995) as well as hunting inte Zolnierek, Concerned Sportspersons and Business People of Northeastern Michigan, pers. commun. 1994). Finally, actual problems in the administration of the permit programs may be in part responsible. For instance, based on the internal investigation in 1990 into complaints about the Block Permit program, the MDNR Wildlife Division concluded that the "rules for inspecting crop damage and insuring that applicants are indeed eligible to participate in the program need to be tightened" (Langenau 1991:4).

However, a clear understanding of the issue over crop damage in Michigan was lacking. Therefore, given what was known and what remained to be answered, the focus of this research was on deer hunters' attitudes toward the lethal control of deer damage. In addition, the social-psychological factors involved in human tolerance for wildlife and the consideration of multiple constituencies in agency decision making were addressed.

Goal

This study was not meant to define the macro-level dynamics of the social movement around crop damage and its control. Rather, the study represents a snapshot in time to explore the micro-level psychological processes that influence individuals' attitudes and behaviors associated with crop damage issues. The dual goal was to offer practical insight into crop damage issues for consideration by the management agencies while contributing to the scholarly knowledge base on wildlife tolerance and resource management.

Justification

The social conflicts surrounding crop damage and the use of Shooting and Block Permits present a challenging management environment for the MDNR Wildlife Division MSU-E. This is particularly true for field personnel in localized areas of the state where crop damage controversies are especially acute. This study was justified as an attempt to help alleviate the tension between hunters and farmers and help the MDNR and MSU-E manage the issue of crop damage in Michigan. In addition, because most other states offer some form of special lethal control program for damage abatement (Conover and Decker 1991), the results of this study may help other state agencies address similar controversies.

Objectives

The primary objectives of this research were

1. to propose a conceptual framework for facilitating resource management agency consideration of multiple stakeholder preferences for deer populations;
2. to explore the utility of the conceptual framework for deer management by testing various measurement approaches for making the framework operational;
3. to propose a conceptual model for understanding attitudinal and behavioral responses to deer populations and deer management; and
4. to develop and test a causal model for understanding and predicting deer hunter approval of deer-crop-damage lethal control programs.

CHAPTER 2

LITERATURE REVIEW

Overview of this Chapter

This chapter begins with the development of a conceptual framework to facilitate state agencies' consideration of the preferences of multiple stakeholders in wildlife management. The framework was designed to serve as a wildlife population management decision-making tool applicable to a broad range of species in a broad range of landscapes. Then, an overview of the literature on human tolerance of wildlife and wildlife interactions is presented. Past measurement of tolerance of wildlife and wildlife interactions is explored, and a conceptual model of factors influencing individuals' behaviors to seek change in a wildlife population is proposed. The third section includes a review of the literature relevant to understanding deer hunters' attitudes toward state-directed special permit programs that involve killing deer to control crop damage. The chapter ends with a list of hypotheses that were tested.

A Framework for Agency Consideration of Preferences of Multiple Stakeholders

Evolution of the Framework

The history of how this framework came to be part of this dissertation warrants mention because it provides not only a rationale for the inclusion of this fairly lengthy section but also illustrates the fortuitous twists of fate that wind up with larger

implications. In early 1993, a wildlife professional in Minnesota approached my major professor, Dr. R. Ben Peyton, with a solicitation of a research presentation for a then upcoming symposium (Minnis and Peyton 1995). There were two topics to choose from. One involved, as I recall, a fairly straightforward, mundane topic; the other sounded far more intriguing. With what occasionally has seemed as little apparent forethought, we eagerly accepted the challenge of developing the latter topic. Through this twist of fate, we took on the task of evolving the concept that had come to be known as, "cultural carrying capacity." The initial model that emerged from the brainstorming sessions took the form of a broadly encompassing framework, which served as a stepping stone to a micro-level conceptual model of human behavior. The model of human behavior in turn served as a guide for our investigations into the deer-crop-damage issue in Michigan. Throughout this section, the pronoun "we" is used because the development of the cultural carrying capacity framework was made possible only through the collaborative team of Peyton and Minnis.

Need for a Decision-Making Framework

As was apparent from the outside solicitation of this effort, an organizational tool for facilitating consideration of multiple stakeholders' preferences regarding appropriate wildlife population objectives was of interest to resource managers. A comprehensive framework that facilitated methodical and objective consideration of preferences of multiple stakeholders would potentially provide a solid foundation for wildlife population planning and management. This foundation might better enable managers to formulate and reach management objectives that maximize wildlife resource values within both

orchards issued block permits since the statewide inception of the program has been cited as evidence of the success of the program (Langenau 1993).

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these permits are targeted to precise areas, the impact on the overall deer herd in the State is said to be minimal (MDNR 1994b). The logic supporting Shooting and Block Permits is that, through removal of nuisance deer from designated private land, a larger deer herd can be maintained in surrounding areas than would be possible without these crop damage control permits, thereby providing relief to landowners with severe crop damage problems while not unduly detracting from recreational deer hunting opportunities (Langenau 1993).

Human Tolerance of Deer

The issue of crop damage revolves around damage and its control. However, resolution of deer damage conflicts goes beyond simply a diagnosis of the problem and prescription of a technological fix in the form of control measures. The bigger picture is one — like many deer management issues — of conflicting preferences for deer among multiple stakeholders. That is, the crop damage issue is a member of a larger family of resource management conflicts based on differences in human tolerance for wildlife, wildlife-caused problems, and the control of those problems. From the natural resource manager's perspective, the crop damage issue represents the age-old dilemma of managing a public resource to the benefit of all citizens. Finding an acceptable balance among constituency interests becomes the ultimate challenge. Thus, to supplement and guide the investigation into the crop damage issue, human tolerance for wildlife was conceptually modeled, and a theoretical framework to facilitate agency management of wildlife-related issues was proposed.

Statement of the Problem

At the core, the problem is finding an answer to the question of, "How many deer are enough?," within the constraints of biology, politics, economics, and the diversity of social values in deer management. One symptom of the problem is the disagreement among stakeholders, namely farmers and hunters, over whether killing deer to control crop damage is warranted and, if so, whether the Shooting and Block Permit programs are acceptable approaches to the lethal control of deer damage. At the institutional level, the problem is the disruption in agency management of deer due to the conflicts among stakeholders. Disruptive activity by stakeholders is an indication that the agency is not satisfactorily achieving its mission of managing the deer herd to serve the needs and wants of the citizens of Michigan.

Based on existing literature and experience of the MDNR personnel, the issue surrounding crop damage and its control in Michigan is fueled by at least four sources. First, there are many differing beliefs associated with crop damage management. These include differing beliefs about the extent and severity of deer crop damage; about how much loss a farmer should tolerate and how many deer a hunter should expect; and differing beliefs regarding whose interests should be served by the management agency. Second, misperceptions and misunderstandings regarding Shooting and Block Permits are in part responsible for the localized conflicts. The prescribed differences in Shooting and Block Permits, coupled with the regional variation in the implementation of the programs, has resulted in varied degrees of confusion and contention among farmers and hunters as well as among agency personnel. Third, low perceived credibility of the MDNR to implement any crop damage control permit program adds fuel to the controversy. For

instance, the MDNR's ability to assess crop damage and loss has been questioned by farming interests (Subcommittee on Deer Damage 1995) as well as hunting interests (N. Zolnierek, Concerned Sportspersons and Business People of Northeastern Michigan, pers. commun. 1994). Finally, actual problems in the administration of the permit programs may be in part responsible. For instance, based on the internal investigation in 1990 into complaints about the Block Permit program, the MDNR Wildlife Division concluded that the "rules for inspecting crop damage and insuring that applicants are indeed eligible to participate in the program need to be tightened" (Langenau 1991:4).

However, a clear understanding of the issue over crop damage in Michigan was lacking. Therefore, given what was known and what remained to be answered, the focus of this research was on deer hunters' attitudes toward the lethal control of deer damage. In addition, the social-psychological factors involved in human tolerance for wildlife and the consideration of multiple constituencies in agency decision making were addressed.

Goal

This study was not meant to define the macro-level dynamics of the social movement around crop damage and its control. Rather, the study represents a snapshot in time to explore the micro-level psychological processes that influence individuals' attitudes and behaviors associated with crop damage issues. The dual goal was to offer practical insight into crop damage issues for consideration by the management agencies while contributing to the scholarly knowledge base on wildlife tolerance and resource management.

Justification

The social conflicts surrounding crop damage and the use of Shooting and Block Permits present a challenging management environment for the MDNR Wildlife Division MSU-E. This is particularly true for field personnel in localized areas of the state where crop damage controversies are especially acute. This study was justified as an attempt to help alleviate the tension between hunters and farmers and help the MDNR and MSU-E manage the issue of crop damage in Michigan. In addition, because most other states offer some form of special lethal control program for damage abatement (Conover and Decker 1991), the results of this study may help other state agencies address similar controversies.

Objectives

The primary objectives of this research were

1. to propose a conceptual framework for facilitating resource management agency consideration of multiple stakeholder preferences for deer populations;
2. to explore the utility of the conceptual framework for deer management by testing various measurement approaches for making the framework operational;
3. to propose a conceptual model for understanding attitudinal and behavioral responses to deer populations and deer management; and
4. to develop and test a causal model for understanding and predicting deer hunter approval of deer-crop-damage lethal control programs.

CHAPTER 2

LITERATURE REVIEW

Overview of this Chapter

This chapter begins with the development of a conceptual framework to facilitate state agencies' consideration of the preferences of multiple stakeholders in wildlife management. The framework was designed to serve as a wildlife population management decision-making tool applicable to a broad range of species in a broad range of landscapes. Then, an overview of the literature on human tolerance of wildlife and wildlife interactions is presented. Past measurement of tolerance of wildlife and wildlife interactions is explored, and a conceptual model of factors influencing individuals' behaviors to seek change in a wildlife population is proposed. The third section includes a review of the literature relevant to understanding deer hunters' attitudes toward state-directed special permit programs that involve killing deer to control crop damage. The chapter ends with a list of hypotheses that were tested.

A Framework for Agency Consideration of Preferences of Multiple Stakeholders

Evolution of the Framework

The history of how this framework came to be part of this dissertation warrants mention because it provides not only a rationale for the inclusion of this fairly lengthy section but also illustrates the fortuitous twists of fate that wind up with larger

implications. In early 1993, a wildlife professional in Minnesota approached my major professor, Dr. R. Ben Peyton, with a solicitation of a research presentation for a then upcoming symposium (Minnis and Peyton 1995). There were two topics to choose from. One involved, as I recall, a fairly straightforward, mundane topic; the other sounded far more intriguing. With what occasionally has seemed as little apparent forethought, we eagerly accepted the challenge of developing the latter topic. Through this twist of fate, we took on the task of evolving the concept that had come to be known as, "cultural carrying capacity." The initial model that emerged from the brainstorming sessions took the form of a broadly encompassing framework, which served as a stepping stone to a micro-level conceptual model of human behavior. The model of human behavior in turn served as a guide for our investigations into the deer-crop-damage issue in Michigan. Throughout this section, the pronoun "we" is used because the development of the cultural carrying capacity framework was made possible only through the collaborative team of Peyton and Minnis.

Need for a Decision-Making Framework

As was apparent from the outside solicitation of this effort, an organizational tool for facilitating consideration of multiple stakeholders' preferences regarding appropriate wildlife population objectives was of interest to resource managers. A comprehensive framework that facilitated methodical and objective consideration of preferences of multiple stakeholders would potentially provide a solid foundation for wildlife population planning and management. This foundation might better enable managers to formulate and reach management objectives that maximize wildlife resource values within both

biological and sociological constraints (Brown et al. 1978, Stoll and Mountz 1986).

Premise of the Framework

The premise of this framework was that the social environment places demands and constraints on defining and achieving objectives for wildlife management. The demands and constraints reflect the tolerance and preferences for wildlife of the affected stakeholders. The social environment not only serves as the context for wildlife management efforts, it also serves as one of the driving and controlling factors in the management process (Peyton 1987, Duda and Schaefer 1991, Schmidt et al. 1992).

The Notion of Cultural Carrying Capacity

Biological carrying capacity (BCC) is widely recognized as a cornerstone principle of wildlife management, but despite its predominance in the vocabulary of wildlife professionals, it remains a general concept rather than an operational reality (Edwards and Fowle 1954, Caughley 1979, Macnab 1985). Basically, BCC refers to an equilibrium between animals and vegetation that is indexed by its characteristic density of animals (Caughley 1979). The premise of BCC is that wildlife populations are constrained by the limited capacity of an ecosystem to support organisms, with the factor in shortest supply being the major control on the population (Edwards and Fowle 1954).

Over the past few decades, social conflicts over wildlife have motivated the wildlife management community to pay closer attention to the role of the human social system as a limiting force on wildlife populations (Brown and Decker 1979, Stoll and Mountz 1983, O'Donnell and VanDruff 1984). In 1986, Ellingwood and Spignesi coined the term "cultural carrying capacity" (CCC) to describe the general idea that humans have

a limited capacity to cohabit with—to "support"—wildlife, a concept loosely analogous to BCC. Ellingwood and Spignesi (1986) defined CCC as "the maximum number of deer that can compatibly co-exist with a local human population" (see also Ellingwood and Caturano 1988). This capacity is a product of human cognitive/affective (e.g., values, beliefs, attitudes) and conative responses to wildlife. Others have labeled this notion as "sociological carrying capacity" (Stoll and Mountz 1983, Decker et al. 1985, Purdy 1987) and later as "wildlife acceptance capacity" (Decker and Purdy 1988, Decker 1991).

Decker and Purdy (1988:53) defined WAC as the "maximum wildlife population level in an area that is acceptable to people." WAC is described as an individual stakeholder-level capacity (e.g., deer hunters' WAC; dairy farmers' WAC; fruit growers' WAC), and, as per its definition, WAC deals with the *maximum* level of wildlife that is acceptable to a stakeholder group. The application of WAC to wildlife management has been suggested to entail identifying the one stakeholder of greatest concern and managing for the WAC of that group (Decker and Purdy 1988).

Needed Refinements in the Notion of Cultural Limits on Wildlife

Although significant conceptual contributions had been made (e.g., Decker and Purdy 1988, Decker 1991, Craven et al. 1992), at least three refinements in the concept of cultural limits on wildlife populations were needed. The first area of needed improvement was a synthesis of existing literature on the mechanics of tolerance for wildlife, which is addressed in the next section of this chapter. Secondly, a method that facilitated systematic consideration of preferences of multiple stakeholders needed to be

developed. This need was based on the premise that a resource manager may decide to manage for one *or* for several stakeholders' preferences, but that decision should be made only after analysis of the preferences of all identified stakeholders. Although Decker and Purdy (1988) focused on the tolerance of individual stakeholders, they and others have recognized the utility of developing a broader conceptualization (Craven et al. 1992, Stout et al. 1993). Towards that end, we built upon earlier work to offer a conceptual framework for integrating the relevant stakeholder-level capacities. This highlights one of the key differences between the CCC and WAC conceptualizations: WAC is a narrower, individual stakeholder-level capacity, whereas CCC as we have proposed it is a broader, societal-level capacity incorporating multiple value systems.

Third, to answer the question, "How many wildlife are enough?," it was important to consider not only how many wildlife are too many but also how many wildlife are too few. As will be discussed in greater detail in the next section, most research in the arena of wildlife tolerance has been from the angle of "too many," and this is probably due to the fact that the notion of tolerance of wildlife is easily amenable to situations in which the wildlife species is viewed as a pest, such as in damage control situations. Formal treatment of the question of "too few" of a wildlife species was lacking in the literature. The proposed framework accommodated the fact that individuals occasionally become intolerant because a wildlife population is perceived as being too low.

Link to Wildlife Population Management

For a framework to be a useful guide for wildlife managers, it needed to accommodate a wide range of preferences for the wildlife resource of a reasonably large

number of constituencies and incorporate not only the human dimension but also the biological dimension of management (Decker et al. 1992). Human tolerance of wildlife needed to be linked to the actual management of the wildlife resource in a meaningful way. Thus, we chose to link it to the parameter of wildlife population size, which is one of the most common units of measure of a wildlife population in an agency's decision on the wildlife population objective.

The CCC framework is designed to aid managers in dealing with the social considerations involved in *identifying* a wildlife population objective, and it provides insights on how managers might manage the social system regarding a population objective. When analysis of the situation using the CCC framework indicates that it is the wildlife population size that should be changed to accommodate stakeholder preferences, the subsequent step of managing for that population objective is outside the purview of the framework. That is, the CCC framework is not designed to address the onerous issues associated with trying to reach a wildlife population objective once it is set, such as deciding on the population control mechanism. (However, attitudes toward agency management practices are discussed in the next two sections of this chapter.)

For clarity, two other applications of the carrying capacity concept that may be confused with CCC in the context of wildlife population management warrant mention. The term cultural carrying capacity is used in some circles to refer to the limits of human population growth (Hardin 1992), which we interpret as BCC revamped to consider quality of life and then applied to the human species. "Social carrying capacity" — or "recreational carrying capacity" — another concept derived from BCC, is used in the

field of recreation resource management to describe the effects of user density on visitor satisfaction in natural areas (Stankey 1973, Becker et al. 1984, Graefe et al. 1984, Shelby and Heberlein 1984, Stankey and McCool 1984). These usages are distinctly different from the application of CCC developed here.

Defining CCC in Terms of Issues

With the fluctuations in most wildlife populations (especially deer), it is inescapable that people will disagree on how many wildlife are enough and how best to achieve the wildlife management objective in any bio-socioenvironment. Therein lies the challenge. When resource managers work within the limits of ecological parameters, they must solve problems; but, when they work within the limits and forces of sociological parameters, they must also resolve issues.

Issues

A public issue occurs "when a problem becomes focused in a particular question that calls for dispute and some sort of resolution," and issues are created when publics or organizations attach significance to them (Crable and Vibbert 1986:62). Many issues, including the one over crop damage and its control, are the result of conflicts over values and policy. "Value issues" involve disputes over judgments or evaluations of something, and "policy issues" involve disputes over the sort of action that should be taken in a particular situation (Crable and Vibbert 1986). Finally, what may be an issue to some may not be an issue to another. As will be discussed later, we ultimately define an issue from the perspective of the management agency for the purposes of this research.

Issue Development

The level of importance of a perceived issue to the publics and to the management agency tends to change over time. The apparent temporal shifts in issues led to the concept of the issue "life cycle" (Crable and Vibbert 1986), and this progression of change over time is consistent with the concept of social *movements*. The periods in the life cycles of issues have been variously referred to as phases, stages, or statuses (Greiwe 1979, Peyton 1984, Crable and Vibbert 1985, 1986; Crable and Faulkner 1988). These stages are indexed by the associated communication patterns and purposes: who is talking to whom and for what reason? The communication behavior characteristic of each issue stage is termed, "issue activity." Benford (1993:677) described grievance interpretation and communication processes as the "essence" of social movement dynamics. The stages of issues are proposed here as key indicators of an agency's success in incorporating social considerations into wildlife management decisions.

When the particular question or point is not one the management agency feels it may need to dispute and settle, the issue is said to be nonexistent. Those issues that are existent are said to develop through four general stages. The following description of the issue life cycle is a synthesis of Crable and Vibbert's (1986) and Peyton's (1984) theoretical advances in the concept of issue development.

The first stage in the issue life cycle is said to involve "problems lying just beneath the surface, waiting to emerge" as issues to be faced by the management agency (Crable and Vibbert 1986:66). These questions that the management agency believes may be raised as issues to be disputed and settled may be viewed as "potential" issues.

Because the questions seem to need only the slightest stimulus to activate, this phase of the issue life cycle has been referred to as the "dormant" or "latent" stage.

Issues that are imminent and are beginning to be disputed may be seen as in the "emerging" stage (Moore 1979). The emerging stage is characterized by individuals beginning to perceive ideological linkages with others, which leads to a coalescence of individuals into identifiable stakeholder groups. In the emerging stage, communication occurs primarily within stakeholder groups, but policy change is not sought. In this stage, the question under dispute begins to be formed, framed, and justified.

Eventually, stakeholders may begin to express their issue positions to the wildlife management agency, demanding some action or policy change. The associated issue stage is referred to as being "active," "current," or "existing," and it is characterized by the purpose and target of the communication behavior, which is to seek change in the management policy by communicating directly to the management agency. Stakeholders may write letters, make phone calls, attend public meetings, or otherwise communicate their position on the issue not only to the management agency but also to other stakeholder groups and agencies. In the active stage, publics and arguments become polarized in support of or opposition to policy options. Each side attempts to confirm, legitimize, and justify its issue position while discrediting that of the opposing factions.

As suggested by the literature on social movements, perceived competition for resources and for consideration in agency planning may motivate publics to more frequently and more passionately communicate their position on the issue to the agency. Those publics who perceive that their interests are not adequately being addressed may

attempt to have their needs met by forcing the agency's hand through legislative, executive, or judicial authority. When an agency loses control of management, the issue is said to be in the "critical" or "disruptive" stage. When an issue reaches this stage, management approaches, policies, or goals may be prescribed by legislation rather than the purview of trained wildlife professionals (e.g., Cobb 1982, Lautenschlager and Bowyer 1985). Most often, disruptive issue activity is undesirable from the agency's perspective because the agency risks losing its authority and flexibility to establish and meet wildlife management goals and objectives.

Definition of Cultural Carrying Capacity

We define cultural carrying capacity as the wildlife population level in a defined area that produces the most manageable amount of issue activity at a particular time. This definition suggests that an indicator of the socially appropriate wildlife population range is the frequency and intensity of social issues resulting from the presence of the wildlife species. It is left to the management agency to define what is "manageable" issue activity. Of course, the most manageable amount of issue activity would be no issue activity. However, some type of issue activity is inevitable in most cases, and, consequently, the agency must act to achieve some manageable level.

A tenet of the CCC framework is that issue management to minimize stakeholder conflict is a legitimate and important practice of resource managers (Mangun 1992). Indeed, the CCC notion was born of the need by resource managers for better tools to help resolve wildlife-related issues (Ellingwood and Kilpatrick 1995). Based on its origin, it seems only fitting that we defined CCC in terms of issue management and

present CCC from the perspective of the resource agency in the form of a conceptual tool that directly addresses issues regarding wildlife population levels.

Conditional Nature of CCC

CCC, as with any capacity, must be expressed conditionally both temporally and spatially. That is, CCC is a dynamic entity that needs to be evaluated in terms of a particular time and space to be meaningful.

In terms of spatial considerations, cultural carrying capacity should be evaluated on the basis of individual management units of practical size to be feasible for use in wildlife management (Purdy 1987). Management units should have some degree of homogeneity in sociological parameters in order to facilitate consideration of stakeholder preferences (Decker et al. 1983). For instance, although not a point of elaboration here, others have developed systematic means of identifying "human resource units" by determining the boundaries of informal communication networks associated with unique issues (Kent et al. 1985).

Cultural Carrying Capacity: The Framework

Components of the CCC Framework

Conceptualization of a carrying capacity requires consideration of "descriptive" and "evaluative" dimensions (Shelby and Heberlein 1984). The descriptive component of a carrying capacity includes management parameters (any factors that can be directly manipulated by managers), impact parameters, and the relationship between the two (Shelby and Heberlein 1984). The evaluative component of a carrying capacity involves social judgments about levels of impact, and these judgments result in evaluative

standards (Shelby and Heberlein 1984).

In terms of the CCC framework, the primary descriptive component is the management parameter of wildlife population size, represented on the horizontal axis (Figure 2). This variable was intended to serve as the link between the framework and the actual management of the wildlife population. Because wildlife population size is a primary factor in the framework, successful application of the CCC framework may hinge on the availability of reliable wildlife population estimates. An attempt to relate measures of individuals' perceptions of deer densities, tolerance of those deer densities, and management agency estimates of the actual deer densities was made in this research. One of the most promising applications of the CCC framework may be as a monitoring tool to assess how stakeholders' tolerance for wildlife fluctuates with changes in the size of the wildlife population over time.

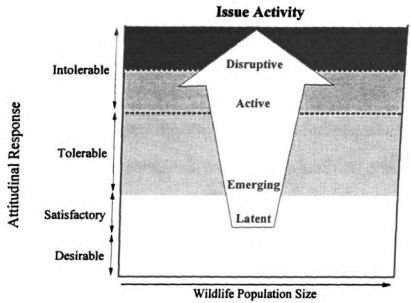

Figure 2. Cultural carrying capacity conceptual framework, showing attitudinal (tolerance) and behavioral (issue activity) response to a wildife population.

The impact parameters implicit in the framework are the wildlife-human interaction events that result from a certain density and distribution of wildlife. Wildlife-human interactions may involve contact between humans and wildlife or between property and wildlife. For example, a deer hunter may have direct contact with deer through the hunting experience. Or, as mentioned in the introduction of this thesis, another impact of deer populations is damage to agricultural crops, which involves deer in contact with the crop (i.e., property).

The evaluative component of the CCC framework, represented on the vertical axis, is the stakeholders' attitudinal response to the values gained and/or lost due to the interaction with wildlife. Crick (1973) defined tolerance as the degree to which individuals accept things of which they disapprove. Continuing with this logic, we proposed that the satisfactory-level response refers to the degree to which individuals accept things of which they approve but do not prefer. The desirable-level response then represents not only acceptance and approval but also preference. Finally, at the other end of the spectrum, intolerance is a rejection of that which is disapproved. This resulted in an attitudinal variable with four levels: desirable, satisfactory, tolerable, and intolerable. The term "acceptable" will be used herein to denote responses of desirable, satisfactory, and tolerable, collectively.

We proposed that the attitudinal response levels correspond to the stages of issue development described previously (represented by the arrow superimposed on the Cartesian graph in Figure 2). When stakeholders find the wildlife population size and corresponding impacts to be desirable or satisfactory, we posit that they will not engage

in any issue activity, and the issue will be latent. When stakeholders find the wildlife population size or impacts tolerable, they will begin to communicate about their wildlife concerns but not in an attempt to seek change, and the issue will emerge. Once stakeholders find the wildlife population size or impacts intolerable, they will begin to actively seek change in the situation from the management agency. At some threshold point, the intolerance motivates stakeholders to engage in disruptive issue activity, which may result in the agency losing control of management decisions.

We assumed some relationship between the wildlife population size (horizontal axis) and the attitudinal response (vertical axis) (Figure 2), but this relationship, which is discussed in the next section, may not necessarily be direct. Certain wildlife population densities may result in varying extents of interaction (or "impacts") with stakeholders and elicit varying levels of response. For example, the relationship between the wildlife population size and the stakeholder response is likely to be somewhat linear for row-crop producers in northeast Michigan, with increased deer numbers resulting in increased crop losses and increasingly less tolerant responses. However, for orchard growers in western Michigan, only a few deer can produce devastating crop losses and engender immediate producer intolerance. Decker et al. (1983) found that the relationships between deer population increases and perceived damage levels or between perceived damage levels and intolerance of deer (measured as an expressed preference for a decrease in deer numbers) were neither constant nor linear. The utility of the CCC framework is predicated on the assumption that—whatever their nature—there are quantifiable relationships among the evaluative parameter (i.e., attitudinal response), the management

parameter (i.e., wildlife numbers), and the impact parameters (i.e., intervening variables of actual and perceived wildlife-human interactions).

Identifying a Cultural Carrying Capacity

As the "public" is actually many publics, segmenting the citizenry into stakeholders is one of the first steps towards identifying a CCC (Fazio and Gilbert 1981, Thorne et al. 1992). For purposes of this research, a stakeholder is any individual or group identified by the resource agency as being affected by the achievement of the agency's wildlife management objectives (Freeman 1984, Stout et al. 1992). Different stakeholders reflect different values (what they define as important) and/or different beliefs (what they perceive as "truth" or reality) (e.g., Brown and Decker 1982). Responses to wildlife populations levels will differ based on the values and beliefs that are salient to each stakeholder. Proximity to the defined management area is not a factor in determining stakeholders in the CCC analysis. For instance, residents of the East Coast who express concern about what happens with wolf restoration in Wyoming would be stakeholders in wolf management, although thousands of miles from the management site.

The next step was to provide some theoretical structure that facilitates consideration of preferences of multiple stakeholders. Social judgment theory (SJT), which originated in the field of persuasive communication, provides some direction towards this end. SJT purports that attitudinal response is mediated by judgmental processes and effects (Sherif and Hovland 1961, Sherif et al. 1965, O'Keefe 1990). According to SJT, an individual may have a range of judgments regarding a position on a

given issue, and the range that is acceptable establishes the person's "latitude of acceptance" (LOA). Although several limitations to SJT have become evident through empirical studies (O'Keefe 1990), it nevertheless provided a useful structure and terminology for development of the wildlife tolerance framework.

Borrowing the basic concept and terminology, we can apply SJT to wildlife management, with responses now being to wildlife rather than to topical positions. Theoretically, each stakeholder in a wildlife management issue has a maximum and a minimum number of a wildlife population that is acceptable based on the evaluations of real or perceived interactions with that species (Queal 1968). The minimum wildlife population size that is acceptable to a stakeholder is labeled as the "minimum demand level" (Figure 3). For the maximum population size that is acceptable to a stakeholder, we adopt the label "wildlife acceptance capacity" proposed by Decker and Purdy (1988). These lower and upper population levels establish bounds on a range of wildlife population levels acceptable to a stakeholder (i.e., the LOA) (Figure 3). For some stakeholders, either a minimum demand or a WAC may theoretically be zero or infinity, respectively, due to the particularly strong values associated with the interactions with the wildlife species.

Each stakeholder has a "response curve" that identifies the particular attitudinal response at various wildlife population levels that may exist at different times (Figure 4). The slope of the curve is an indicator to the volatility of that stakeholder's response. A steeply sloping response curve suggests that the wildlife level may soon become intolerable, resulting in disruptive issue activity. That is, as long as a wildlife population

is within the LOA, a stakeholder's attitudinal response will be either at the desirable, satisfactory, or tolerable level, and we would expect them not to initiate active (or disruptive) issue activity. The critical wildlife population levels are outside the LOA at which disruptive issue activity is initiated (Figure 4). The points at which a stakeholder's response curve crosses the "critical response level" indicate that the stakeholder attempts to circumvent the management agency by seeking resolution from higher authority. Again, disruptive issue activity may result from wildlife populations that are either too low *or* too high (Figure 4).

The next step was to advance the concept from the individual stakeholder perspective to a broader, cultural perspective. This involved taking a composite view of individual LOAs to determine whether current social dispositions produced a consensus on a biologically feasible range of population levels. That is, overlapping latitudes of acceptance would indicate that there is some range of wildlife population levels that may be acceptable to all stakeholders (Figure 5), whereas mutually exclusive latitudes of acceptance would indicate that there is no wildlife population level that may be acceptable to all without some intervention (Figure 6). Ideally, latitudes of acceptance would overlap for all stakeholders and a socially optimal wildlife population goal would be readily identifiable (Figure 5). Often, though, at least one stakeholder will have an acceptable range of wildlife that is incompatible with preferences of other stakeholders (Figure 6).

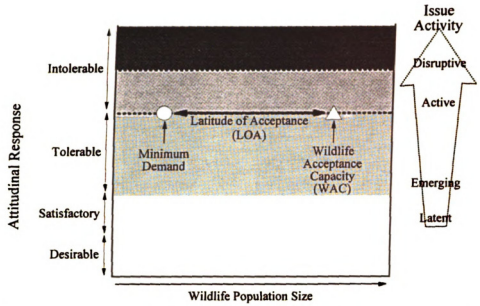

Figure 3. Parameters of the latitude of acceptance construct of the cultural carrying capacity framework.

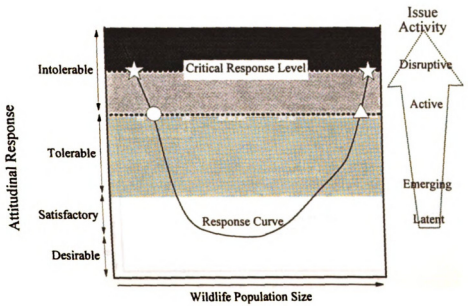

Figure 4. Example of a response curve and critical response points (depicted by the stars) of one stakeholder within the cultural carrying capacity conceptual framework.

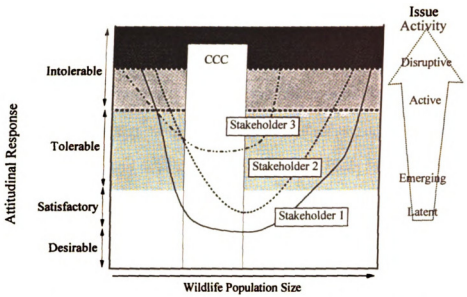

Figure 5. Example of a consensus on acceptable wildlife population size (i.e., a cultural carrying capacity is readily apparent), based on a simplified society of three stakeholders.

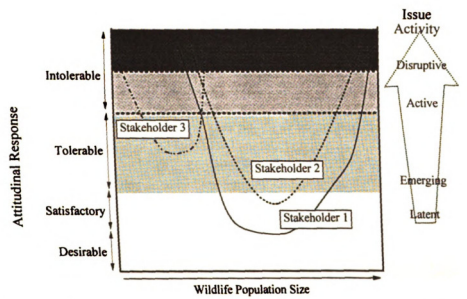

Figure 6. Example of a society in which there is no consensus on acceptable deer population size (i.e., cultural carrying capacity is not readily apparent) due to the mutually exclusive latitude of acceptance of one stakeholder (i.e., no. 3), based on a simplified society of three stakeholders.

A Hypothetical Example

To help illustrate the intended utility of the CCC framework, a more operational example — where the horizontal axis represents deer density and specific stakeholders are identified — is presented in Figure 7. For this example, we used the stakeholders of farmers and hunters because they have been studied rather extensively (e.g., Brown et al. 1977, 1978; Evans 1979, Wywialowski 1994, Fritzell 1996). *The hypothetical deer density preferences in Figure 7 are for illustration purposes only.* Although hypothetical, the relationships among preferences reflect results of empirical studies, including the one conducted as part of this Ph.D. project. That is, deer hunters have been found to be more accepting of deer than have farmers, and, of the rural stakeholders studied, orchardists have been the least accepting of deer (Decker et al. 1981, Decker and Brown 1982, Fritzell 1996). In this simplified society where orchardists, bean producers, and hunters are the only identified stakeholders, CCC might be defined as 30-40 deer per square mile for the particular area.

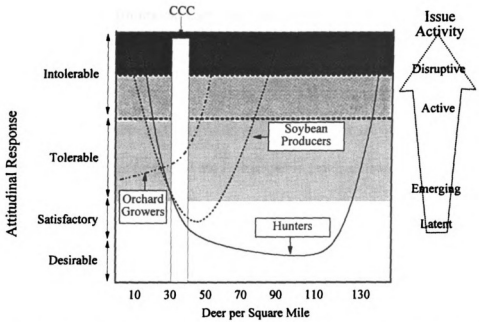

Figure 7. Hypothetical example of a cultural carrying capacity of 30-40 deer per square mile, in a simplified society of three stakeholders, where each stakeholder is given equal consideration by the management agency.

Application of the CCC Framework

As with the Biological Carrying Capacity concept, the primary utility of the CCC concept is not so much to predict acceptable wildlife population ranges as it is to suggest management targets for setting and achieving wildlife management objectives. And, the CCC framework illustrates that wildlife population levels are only one of several potential management targets. That is, a resource management agency will most likely be faced with the challenge of not only managing wildlife populations within defined cultural limits but also inducing change in the social system to shift or create a CCC. For instance, the agency might try to change attitudes of stakeholders or moderate the level of stakeholders' interaction with wildlife to increase tolerance. The conceptual model of tolerance of wildlife developed in the next section serves to suggest specific targets for agency response.

Agency Consideration of Stakeholders' Interests

In its simplest application, overlapping latitudes of acceptance of identified stakeholders would reveal a wide range of easily attainable population levels, and a CCC would be readily apparent (Figure 5). The task of management would be to maintain the populations within those ranges as long as the social system did not change and shift the CCC range.

Most likely, however, either there will not be a consensus on a socially acceptable population level (i.e., a CCC) (Figure 6), or the consensus that does exist will be infeasible to manage for because the identified population range is too narrow (Figure 7), too high (i.e., over BCC), or too low (e.g., not a viable population size). When this is the

case, the agency will need to evaluate the situation from its perspective and attempt to alter the situation as necessary. A central part of evaluating the management situation is to consider and weigh the interests of the stakeholders.

In principle, because managing for multiple interests by definition precludes the maximization of any one interest, the agency's mission directs it to attempt to balance the interests of its constituents. That is, in an apolitical world, the agency would seek to optimally meet the interests of all of the stakeholders. In practice, however, consideration of stakeholders' interests is mired in the context of political and economic constraints of the resource management agency. The task, then, of the agency in the situation in which one stakeholder's LOA is mutually exclusive from the rest (e.g., stakeholder 3 in Figure 6) is to decide whether the issue activity of this stakeholder group would be manageable if the wildlife population level were held outside this stakeholder's LOA, or whether some effort should be made to target one or more of the variables that affect tolerance to change the LOA of this or other stakeholders.

It is likely that defining manageable levels of issue activity is a process of the art, rather than the science, of wildlife management (Giles 1978). This process will require a clear vision of the agency's policies and mission, and the definition of "manageable" will vary depending on — among other things — the past experiences and resources of the agency in working with wildlife issues. As the wildlife population level changes over time, the agency will need to monitor stakeholder values and continually reevaluate the CCC (Schenborn 1985).

Summary of this Section

The notion that the social environment represents a complex system with its own carrying capacity for wildlife was explored, and a conceptual framework of Cultural Carrying Capacity was proposed. The cultural carrying capacity framework suggests that managers can achieve adjustments in the social system and/or the wildlife population that may not eliminate social conflicts but may enhance the agency's ability to manage them. The goal in this section was to present a theoretical framework for understanding and influencing human response to wildlife—a framework that facilitates integration of the notion of cultural limits on wildlife into population management decisions. A very rudimentary effort to test its utility was made in this research project.

Tolerance of Wildlife and Wildlife-Human Interactions

To supplement the CCC framework, a model that provided greater insight into the mechanics of human tolerance for wildlife (i.e., the vertical axis of the CCC framework) was developed. To prepare for the development of this model, a survey of the literature with emphasis on past measures of tolerance of wildlife was conducted.

Overview of Past Research

Most of the reported research on human tolerance for wildlife and wildlife-human interactions has focused on responses to unacceptably high populations of wildlife, with limited empirical attention given to intolerance of unacceptably low populations (Conover and Decker 1991). Around 1960, researchers began to formally investigate human tolerance of wildlife and the wildlife-human interaction in the domain of wildlife

damage (Craven et al. 1992). In fact, most of the research has been targeted toward the rural landowners' (typically agricultural producers) perceptions of wildlife and wildlife damage, usually with white-tailed deer as the species of interest (Queal 1968, Brown et al. 1977, 1978; Brown and Decker 1979, Decker and Brown 1982, Decker et al. 1982, 1983, 1984; Stoll and Mountz 1983, 1986; Tatro 1986, Jones 1984, Porath et al. 1984, Tanner and Dimmick 1984, Pruitt 1988, Sayre and Decker 1990, Stoll et al. 1991).

To a lesser extent, urban/suburban populations' responses to wildlife have been studied (Dawson et al. 1978, Brown et al. 1979, O'Donnell and VanDruff 1984, Decker and Gavin 1985, 1987) as well as have perceptions of other types of wildlife-human interactions, such as deer-related vehicle accidents (Stedman et al. 1992, Stout et al. 1993) and Lyme disease transmission (Siemer et al. 1992).

Pomerantz et al. (1986) and Siemer and Decker (1991) compiled summaries of work done on human tolerance of wildlife damage. They discussed not only research on tolerance of deer damage but also of other species such as black bear *(Ursus americana)* and beaver (*Castor canadensis*). The conclusions drawn by Siemer and Decker (1991) regarding factors that influence tolerance of wildlife damage that have implications for this research are summarized below:

1. Tolerance of damage decreases as perceived amounts of damage or severity of damage increases.

2. The amount of damage that is judged as intolerable varies among individuals.

3. Individuals who experience similar levels of economic loss due to wildlife damage may express dissimilar levels of damage tolerance.

4. An individual's tolerance of wildlife damage may change over time.

5. Increased financial dependency on the product being damaged reduces tolerance of damage.

6. Increased perceived risks of deer impacts reduces tolerance of deer.

7. Positive values for deer and wildlife increase tolerance of deer damage, as weighted against negative values for deer.

8. Individuals who suffer wildlife damage tend to prefer a decrease in the wildlife population.

9. Individuals who believe that a wildlife species has recently increased tend to prefer a decrease in the wildlife population.

Measurement of Tolerance of Wildlife and Wildlife Damage

Indices of tolerance of wildlife damage typically have involved measures of either damage rating or perceived severity of monetary loss due to damage (Craven et al. 1992). Response categories for items designed to measure tolerance of wildlife damage have generally involved options which, based on face validity, were problematic (e.g., such as Pomerantz and Decker's (1986:8) item on attitude toward deer damage with the response options of "not aware of deer damage," "negligible deer damage," "the amount of deer damage was tolerable," and "the amount of deer damage was unreasonable").

Indices of tolerance of wildlife (principally deer) have involved measures of preference for future wildlife population trends or some type of good-bad rating of the particular wildlife species. Similar to the problem in past measures of tolerance of damage, response categories for items designed to measure attitudes toward wildlife have generally involved options with weak face validity (e.g., such as Decker and Brown's (1982:152) item on attitude toward deer with the response options of "aesthetically valuable," "worry about crop damage," "deer are nuisance," and "no particular feelings").

Few efforts had been made at measuring the weighing of perceived costs and perceived benefits of wildlife. In what appeared to be one such attempt, Pomerantz and Decker (1986:9) proposed the following item:

> "Generally, how do you feel about having deer in your neighborhood? (Circle One.)
> 1. I enjoy having deer around AND their aesthetic value was worth my crop loss to deer damage within the past 12 months.
> 2. I enjoy having deer around BUT their aesthetic value was NOT worth my crop loss to deer damage within the past 12 months.
> 3. I generally regard deer as a nuisance regardless of the amount of crop damage they cause; I could get along without any deer.
> 4. No particular feelings about deer."

Siemer et al. (1992) replaced the above item with the following:

> "Generally, how do you feel about having deer in your county? (Check [√] one.)
> □ I enjoy having deer AND I do not worry about problems deer may cause.
> □ I enjoy having deer BUT I worry about problems deer may cause.
> □ I do not enjoy having deer in my area and regard them as a nuisance.
> □ I have no particular opinions about deer."

However, based on face validity, several problems, such as double-barrel response options, seemed to me as major threats to the validity of these items.

Siemer et al. (1992) also presented tradeoff scenarios in Likert format that asked respondents to consider the worth of certain benefits relative to the risk of contracting Lyme disease (e.g., "The benefits I get from having deer in my county are worth the risk of contracting Lyme disease.")

Later, Purdy and Decker (1989) proposed the Wildlife Attitudes and Values Scale (WAVS) with the expressed goal of providing a standardized values measure for the study of attitudes associated with wildlife management. It included the following 4-item scale of "problem-acceptance attitudes," with 5-point response options for each statement

(Strongly Agree-Neither-Strongly Disagree) (Purdy and Decker 1989:495):

> "*It is important to me personally:*
> That *I* tolerate most levels of property damage by wildlife.
> That *I* tolerate most wildlife nuisance problems.
> That *I* tolerate the ordinary personal safety hazards associated with some wildlife.
> That *I* tolerate the ordinary risk of wildlife transmitting disease to humans or domestic animals."

However, the measurement properties of WAVS—notably the validity of the scale—have not been established.

To be compatible with the CCC framework, we were interested in measuring tolerance as a combination of attitude and intention (e.g., an item with a response options such as, "The wildlife population size is unacceptable, and I intend to try to do something about it," with a continuum of other mutually exclusive response categories). However, no such measures were located in the literature.

Perceptions of Deer Population Trends and Tolerance

Studies out of the Cornell Human Dimensions Research Unit (e.g., primarily authored by Brown and Decker in the late 1970s), used farmers' perceptions of past deer population trends and preferences for future deer population trends as indicators of tolerance of deer (Table 3). In addition, these researchers attempted to connect perceptions of deer populations to actual trends in populations. Specifically, they compared the qualitative perceptions of the past population trend with changes in the estimated buck take per square mile of deer habitat (an index provided from the state wildlife management agency). Because a similar effort to link actual population estimates, perceived population estimates, and attitudinal response is part of this research,

the Cornell methods and findings regarding the "accuracy" of perceptions of deer populations are reviewed here.

Table 3. Survey items used in Cornell studies of tolerance of deer (Decker et al.1984).[a]

Perceived Past Trend in Deer Population	Preference for Future Trend in Deer Population
"Over the past 5 years, what trend have you seen in deer populations in the area of your farm? ____more deer now than 5 years ago ____fewer deer now than 5 years ago ____about the same number now as 5 years ago ____don't know"	"The Department of Environmental Conservation is updating its management plan for deer population levels in your town. Please indicate below whether you would like them to increase, decrease, or leave deer populations in your town at the current level: (check one). ____moderately increase deer population ____slightly increase deer population ____slightly decrease deer population ____moderately decrease deer population

[a] See Brown et al. (1980) or Decker et al. (1981) for a discussion of methods.

In a review of the aggregate results of the Cornell research on the subject, Decker et al. (1984) reported that, overall, 40% of the farmer respondents who had indicated a trend in deer numbers held a perception of the past trend that was consistent with the trend suggested by the agency's harvest indices (i.e., an "accurate" perception). Dependence on farming for income did not significantly affect "accuracy" of farmers' perceptions (where a full-time farmer was defined as one with more than 75% of the family income derived from farming). However, farmers living in areas where the deer population had previously been low (i.e., less than 2.0 bucks taken per square mile) were found to more often have "accurate" perceptions of the deer population trend as compared

to farmers living in areas where the deer population had previously been higher than (i.e., more than 2.0 bucks taken per square mile). Farmers who had reported suffering deer damage were more likely to judge the deer population as increasing as compared to farmers who had not reported suffering deer damage. Queal (1968) found that farmers who experienced crop damage had different preferences for deer trends than did farmers who did not experience crop damage, with the former group being less likely than the latter to want more deer around their farm.

The authors contended that "the general finding [was] that farmers who have experienced damage from deer are less likely to accurately perceive trends in deer abundance than those without such experience" (Decker et al. 1984:192). However, this statement is judged by me to be faulty in at least two regards. First, the experience of deer damage was based on a self-report by farmers, so at best the above statement would read that farmers who believed they had experienced deer damage are less likely to be accurate in their perceptions of deer trends than those who did not believe they had experienced deer damage. Second, no evidence of the "general finding" noted above was found in the article. That is, as far as I could tell, the article did not present a significance test comparing the accuracy of farmers' perceived trends between those with perceived damage and those without perceived damage. However, in a table comparing actual trends with perceptions of trends by farmers who did and did not believe they experienced damage, it appeared that the evidence that they used to support of their "general finding" was a test of the distribution of those with and without perceived damage for the nine categories of possible outcomes collectively (Table 5 in Decker et al.

1984:194; This table is replicated for the reader's inspection in Table 4). In my judgment, the particular chi-square test presented was not adequate to test differences in accuracy of perceptions between those who reported damage and those who did not.

Table 4. Replication of table of results found in Decker et al. (1984:194).[a]

Table 5. Comparative perception and reporting of trends in the deer population over the preceding 5 years by farmers who had not and by those who had experienced deer damage.

Actual population trend*	Validity of perception by respondent	Trend reported: Direction§	According to respondent's experience with deer damage† (% of respondents‡): No damage	Damage
Increase	*Correct*	*Increase (1)*	2.8	5.9
No change	*Correct*	*No change*	30.6	31.9
Decrease	*Correct*	*Decrease*	4.7	3.5
Increase	*Incorrect*	*No change*	9.5	9.7
		Decrease (2)	7.5	3.7
No change	*Incorrect*	*Increase (3)*	3.9	18.6
		Decrease (4)	28.6	14.9
Decrease	*Incorrect*	*No change*	5.6	6.7
		Increase (5)	1.8	5.1
Total			100.0	100.0
Number of respondents ‡			5736	2712

* According to population index. § Figures in parentheses denote alternative hypotheses as given under category "C" in text.
† Figures represent percentages of total respondents in each group. Distribution of those with vs. those without damage significantly different for the nine groups collectively (χ^2 = 455.05 with 8 d.f.; $P \leq 0.05$). ‡ Total less than in Tables 1 to 4 because respondents who reported "don't know" are excluded.

[a] Permission to duplicate obtained by D. Decker, Cornell University, 31 Mar. 1996.

For the analysis of farmer tolerance of deer populations in the original studies, areas with different deer population levels were lumped together. Upon reanalysis of the method, Decker et al. (1983:44) urged against such aggregation, stating

> "The earlier practice of determining deer population level objectives for a region by crossectional [sic] studies where farmers' preferences were plotted for various townships having different deer population levels, then applying some criteria for selecting the optimal level based on trends demonstrated across the region (Brown and Decker 1979), though intuitively straightforward and attractive, is now seen to be imprecise and may lead to 'mismanagement' of some units within the broader region."

They instead recommended that some type of sociological unit be used to help form the boundaries of management units.

Further, in what seemed to be a stretching interpretation, Craven et al. (1992:79) claimed that Decker et al. (1984) stated that the inaccuracy in farmers' perceptions of the deer population trends "should be disappointing to wildlife managers because straightforward relationships do not exist and, therefore, general predictions of responses to deer population changes cannot be made with confidence." An inspection of Decker et al. (1984:192) will reveal that the strongest concern raised about the "inaccuracy" of farmers' perceptions of deer trends was that wildlife managers "should not assume that most farmers will correctly assess management results, even when substantial changes in the deer population occur."

A Conceptual Model of Tolerance of Wildlife Populations

A comprehensive synthesis of factors influencing human response to wildlife populations, especially in terms of helping to explain why and how stakeholders try to change their interaction with the wildlife population, was missing in the literature. Yet, a

few efforts deserve noting. First, in a study of perceptions and behaviors associated with Lyme disease, Siemer et al. (1992) proposed a laudable conceptual framework of social-psychological processes influencing individuals' preferences and behaviors related to deer and public lands, which they based on the theory of planned behavior (Ajzen 1985). Second, a couple of models that addressed tolerance of wildlife damage had been offered (Pomerantz and Decker 1986, Siemer et al. 1991, Craven et al. 1992).

Based on previous research on human behavior in general and attitudes toward wildlife and wildlife damage specifically, a conceptual model of attitudinal and behavioral response to wildlife was proposed. For the purposes of this model, it is assumed that stakeholders in wildlife management approach decision-making from the viewpoint of *trying to achieve a desired outcome*, namely a change in the wildlife population. Because the primary purpose of this model in this thesis was as a guide for integrating the investigations into tolerance of deer with the research on attitudes toward special permit programs for the lethal control of deer damage, the specific components of the model receive only cursory treatment herein.

Dimensions of the Model

This model consisted of five major dimensions: actuality, beliefs, attitudinal response, intentions, and behavioral response (Figure 8). The top half of the first three dimensions dealt with the wildlife population and the bottom half dealt with the management agency and its management practices. The generality of the variables and paths was intentional because the model's purpose was not as a path diagram but rather as a conceptual map.

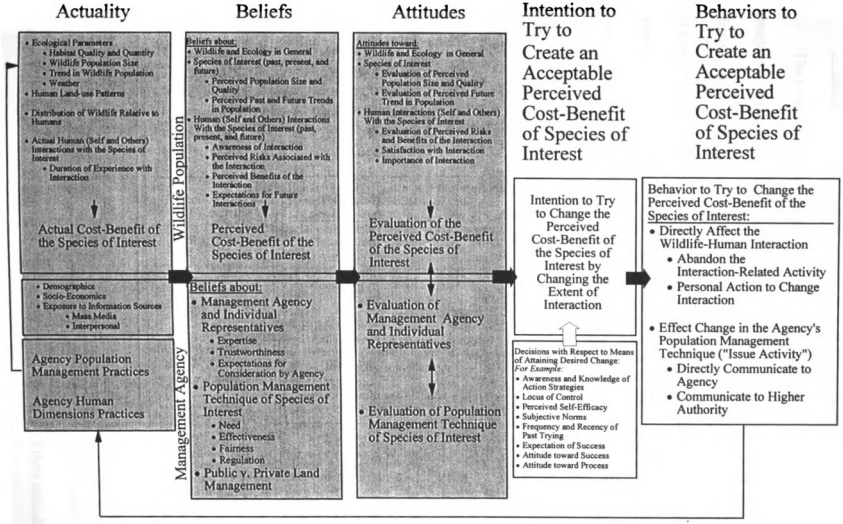

Figure 8. Conceptual model of attitudinal and behavioral response to wildlife.

Actuality

The external variables of ecological and human parameters, as well as agency management practices, are proposed as "setting the stage" for individuals' cognitive, affective, and conative responses. The actual occurrence of a wildlife-human interaction was hypothesized to result in an actual gain or potential gain of values and the actual loss or potential loss of values (herein, the potential to lose values is termed "risk"). This actual wildlife-human interaction is believed to result in an assessable cost-benefit ratio.

Beliefs

Based in part on past experiences with the wildlife species (the actual cost:benefit ratio), individuals form beliefs about the species of interest and their interactions with the species. In addition, related beliefs about wildlife and ecology in general, the management agency, and the management techniques used for the species of interest are formed. We proposed that an individual will mentally tabulate the values perceived to be gained or potentially gained and the values perceived to be lost or at risk. This weighing process may range from a deliberate, rational weighing of gains and losses to a rapid, emotional assessment (Fischer 1974). Others have noted that this perceived cost-benefit assessment may be at least as important of a consideration in management decisions as the actual cost-benefit ratio (Brown et al. 1978).

Attitudes

Individuals' perception of reality—or beliefs about what has, is, and will happen with regard to the wildlife population—, are thought, in the tradition of the Theory of Reasoned Action (Ajzen and Fishbein 1980), to form the foundation of their attitudes

toward the wildlife population. Evaluations of the agency (as a whole and of the individual representatives) and the management techniques are made based on beliefs about the wildlife, the agency, and its management of the species. The evaluation of the perceived costs and benefits of the wildlife population, the evaluations of the agency, and the evaluation of the management techniques are hypothesized to be interrelated.

As shown in the model, an assumption is that the relationship between wildlife population size (depicted at the top of the far left box in Figure 8) and stakeholders' affective response is not direct. Specifically, the actual wildlife population size is hypothesized to only indirectly influence a person's attitudinal response to the wildlife population via the extent of wildlife-human interactions and subsequent belief formation. Moreover, beliefs about the wildlife-human interaction may not reflect "truth." For instance, the perceived probability of harm from a wildlife-human interaction may exceed the actual probability of harm, thereby producing a nonlinear relationship between wildlife numbers and attitudinal response.

We hypothesized that an individual's conative response will be influenced by the evaluation of the perceived costs and benefits of the wildlife population. Essentially, the evaluation of the perceived costs and benefits represents the individual asking him/herself the question of whether or not the perceived cost-benefit assessment is acceptable or unacceptable (i.e., intolerable).

Intentions

A perceived cost-benefit judged to be intolerable is hypothesized to result in an intention to try to change the situation to create an acceptable perceived cost-benefit. The

intentions (and subsequent behaviors) of interest are those that are geared toward ultimately changing the individual's extent of interaction with the wildlife population. (The term "extent" is used here to connote not only the frequency but also the quality of the interaction.) The effort to try to effect change in the extent of interaction with the wildlife population is viewed as a result of the desire to increase the acceptability of the perceived cost-benefit ratio of the wildlife population. The desire to create an acceptable perceived cost-benefit ratio represents the motivation to intend to try to produce a certain outcome (i.e., an acceptable perceived cost-benefit ratio) (Bagozzi 1992).

The intention to try to produce an outcome is hypothesized as being directly influenced not only by one's evaluation of the perceived costs and benefits of the wildlife population but also by one's evaluation of the management agency and of the population management techniques used by the agency. Because the dependent variables in the model focused on an individual's striving to attain an outcome, the Theory of Trying was used to guide its development (Bagozzi and Warshaw 1990). To strengthen the relationship between intention to try to produce an outcome and the behavior of outcome attainment, the actor's volition, or decisions with respect to the means for attaining the outcomes, are said to influence intentions (Bagozzi 1992).

Behaviors

Behaviors aimed at increasing or decreasing the extent of interaction with the species may involve either personal efforts to directly effect the desired outcome or efforts to change the interaction by trying to modify the agency's management approach. The order of change-seeking behaviors may not be linear or sequential. That is, a person

may choose to take personal action to change the interaction and never try to change the interaction via the management agency. Or, a person may bypass direct personal efforts to create the change and try to change the interaction only by attempting to get the management agency to change its management approach.

Personal efforts to directly change the extent of wildlife-human interaction may take one of two forms. First, the individual may abandon the specific activity by which he/she interacts with or is impacted by the wildlife. For instance, an agricultural producer may decide to quit growing red kidney beans, perhaps switching to another crop type perceived to be less susceptible to deer. Another example would be a deer hunter who judges the perceived cost-benefit of deer to be unacceptable (e.g., based on unsatisfactory hunts) and seeks to change his/her interaction with deer by giving up deer hunting altogether.

Second, rather than abandoning the specific interaction-related activity, an individual may try to directly modify the extent of interaction. An example of an effort to decrease an interaction would be an agricultural producer constructing a fence around the perimeter of his/her red kidney bean fields in order to exclude deer from the fields and thereby reduce crop damage from deer. An example of efforts to increase the extent of interaction would be a deer hunter placing feed year-round in his/her hunting site in order to supplement the deer's natural foods and produce more robust and greater numbers of deer.

In addition to personally trying to create the change, an individual may seek change in the extent of wildlife interaction through issue activity, or those behaviors

aimed at seeking change in resource management through political action. As described in the previous section, in the active stage of an issue, change is sought directly from the management agency. That is, a person may try to achieve the desired outcome in the wildlife population size, distribution, or quality by getting the state agency to change its management of the wildlife population. The change may involve adding, modifying, or eliminating an agency's management practice. In the disruptive stage of an issue, change is sought from the management agency via adjudication or lobbying of legislators.

As a result of stakeholders' efforts to try to get the management agency to change its wildlife management approach, the agency may voluntarily or by mandate of higher authority respond by changing its management approach, thereby influencing the precursory components in this model. The supporting references for the variables hypothesized to be involved in influencing the process of human response to wildlife are presented in Table 5.

Table 5. Variables and sources of support for inclusion in the conceptual model of human responses to wildlife populations.

	Variable	Supporting Literature[a]
Actuality	Demographics Socio-Economics	O'Donnell and VanDruff 1984 Tanner and Dimmick 1984 Adkins and Irby 1992 Siemer et al. 1992 Wywialowski 1994
	Exposure to Information Sources	Stoll and Mountz 1986 Craven et al. 1992 Siemer et al. 1992 Stout et. al. 1993
	Ecological Parameters Land-Use Patterns Distribution of Wildlife Relative to Humans Agency Management Practices	Stoll and Mountz 1983, 1986 Matschke et al. 1984 O'Donnell and VanDruff 1984 Ellingwood and Caturano 1988
	Actual Risks	O'Donnell and VanDruff 1984
	Actual Experience with Wildlife-Human Interaction	Stout et al. 1993
Beliefs	Beliefs about Wildlife and Ecology in General	Kellert 1980
	Beliefs about Current Wildlife Population Size Perception of Trends in Wildlife Population Size	Tanner and Dimmick 1984 Decker et al. 1983, 1984
	Awareness and Beliefs about Past Interactions with Species of Interest	Siemer et al. 1992
	Beliefs about the Benefits of Human Interaction with Species of Interest	Stout et al. 1993
	Perceived Risks Associated with Human Interaction with Species of Interest	Decker et al. 1983, 1984 Merkhofer 1987 Slovic 1987 Knuth et al. 1992 Stout et al. 1993

Table 5 (cont'd).

	Expectations for Interaction	Siemer et al. 1991
Attitudes	Beliefs about Agency Credibility	Decker 1985 Smolka and Decker 1985
	Evaluation of Agency Credibility	
	Attitude toward Wildlife and Ecology in General	Kellert 1980
	Attitude toward the Species	O'Donnell and VanDruff 1984 Stout et al. 1993
	Satisfaction with Interaction with Species of Interest	Hendee 1974
	Importance of Interaction with Species of Interest	Stout et al. 1993
Intentions	Awareness and Knowledge of Action Strategies	Hines et al. 1986/87
	Locus of Control	Hines et al. 1986/87
	Perceived Self-Efficacy	Bandura 1977
	Subjective Norm	Azjen and Fishbein 1980 Siemer et al. 1991
	Frequency and Recency of Past Trying	Bagozzi and Warshaw 1990
	Expectations of Success Attitude toward Success Attitude toward Process	Bagozzi 1992 Zint 1996
Behaviors	Personal Behaviors to Try to Directly Change the Wildlife Population	Purdy et al. 1987 Pomerantz and Siemer 1988 Siemer et al. 1988, 1991
	Behaviors to Try to Create Change in the Wildlife Population Via the Management Agency ("Issue Activity")	Peyton 1984

[a] Support may have been based on empirical evidence or hypothesized importance of the variable. This is not an exhaustive list of the literature on the subject, and other literature may lend additional support.

The Model as a Conceptual Map for Agency Response

This model complements the CCC framework by providing specific targets for agency interventions. For instance, the hypothesized relationships between wildlife numbers and attitudinal response offer potential targets. Steps might be taken to change the relationship between wildlife population levels and actual interactions by targeting the biological environment. In some agricultural areas, the distribution and movement of deer might be shifted by habitat management to decrease risks of deer-crop damage. In some agricultural areas, characteristics such as field sizes or interspersion with deer habitat may be equally as important as deer population sizes in determining crop damage impacts and thus offer another set of management targets.

Managers may target not only actual conditions but also beliefs and attitudes via educational or public involvement programs (e.g., Decker et al. 1985, Knuth et al. 1992). There are several examples of agency efforts to change the behavior of stakeholders by changing their beliefs and attitudes, and two are mentioned here: the first deals with altering risk perceptions and perceived self-efficacy and the second deals with altering evaluations of management techniques. (1) Providing agricultural producers with information, skills, and assistance on crop damage abatement techniques may place the producer in perceived control regarding the probability of deer-crop damage as well as reduce the actual probability of crop damage. (2) Public participation in selecting management solutions may increase the sense of voluntary compliance or acceptance of outcomes of the decision. For instance, citizen task forces or advisory groups have met with some success in creating approval for adoption of new management policies and

techniques (McAninch and Parker 1991, Stout et al. 1992, Curtis et al. 1993, 1995; Stout and Knuth 1995).

Attitudes toward Special Permit Programs for the Lethal Control of Deer Damage

The CCC framework ties into the top half of the tolerance model discussed in the last section (i.e., the variables related to wildlife populations) (Figure 8). The bottom half of the tolerance model dealt with the state agency and its management practices, which includes practices such as special permit programs for controlling wildlife damage.

As of 1987, 44 state agencies designed hunting seasons and bag limits to reduce wildlife damage to crops, and 42 state agencies issued some form of special shooting permit to agricultural producers for the control of wildlife damage (Conover and Decker 1991). Although many studies have been conducted to assess farmer and landowner attitudes toward deer populations, crop damage, and recreational hunting as a control measure, comparatively few studies have been done on attitudes toward the control of deer damage through special permit programs. The few such studies that were found in the literature are discussed here.

Attitudes toward Block Permits in Michigan

In the year after the statewide inception of the Block Permit program, the MDNR Wildlife Division sponsored a study to provide a baseline assessment of attitudes and behaviors associated with the program (Nelson and Yuan 1991). However, this study provided little insight into the psychological bases for deer hunters' opinions about the Block Permit system. The descriptive information about respondents that may provide clues to their opinions of Block Permits is summarized here.

Mail questionnaires were sent in March 1991 to five segments: (1) farmers who had participated in the Block Permit program in 1990 (n=286), (2) farmers eligible for Block Permits but who had not participated in the program in 1990 (n=97), (3) neighbors of participating farmers (n=177), (4) deer hunters who had participated in the Block Permit program in 1990, stratified by their success at harvesting one or more deer with a Block Permit (n=289), and (5) deer hunters who had not participated in the Block Permit program in 1990 and had not applied for an antlerless deer license in that year (n=117). Response rates were above 75% for each segment except non-participating hunters (67%), and no test for nonresponse bias was conducted.

The majority of each respondent segment, except hunters who had not participated in the program, were found to have favorable attitudes about the program. Deer hunters who had not hunted with Block Permits were evenly divided on their favorableness toward the program. This seems to suggest that participation in the permit program may influence attitudes toward the program.

Despite the newness of the program, most hunters reported that they were aware of the Block Permit Program prior to the 1990 deer season, with participating hunters significantly more likely than non-participating hunters to be aware of the program. Participating hunters were most likely to be a friend or immediate family member of the permittee, with only 4% having no previous relationship with the permittee. About one in five participating hunters reported that the Block Permit program gave them access to land they would not have otherwise had permission to hunt.

Over 90% of the hunters who participated in the Block Permit program and 80% of the non-participating hunters believed that deer damage to agricultural crops in Michigan was a moderate to serious problem. The remaining 8% of the participating hunters and 20% of the non-participating hunters believed that deer crop damage was not a problem. In open-ended responses to a question asking for the respondents' single most important recommendation for the Block Permit program, many non-participating hunters recommended that there should be better justification and verification of the need for Block Permits on a farm-by-farm basis and that farmers who used Block Permits should be required to open their farms to public access. This suggests that perceptions regarding how closely the program is regulated and monitored by the resource manage agency may influence attitudes toward the program. This also suggests that perceptions about access to land may influence attitudes toward the program.

Most farmers rated the Block Permit program as highly or moderately effective in controlling deer crop damage, and participating landowners were significantly more likely than non-participating landowners to rate the Block Permit program as effective. Perceptions of the effectiveness of the program may be an influence on attitudes toward the program.

The number of hunters and harvest of deer on eligible lands, as reported by the landowner, was greater on participating than on non-participating farms. From the MDNR's perspective, this research confirmed that the Block Permit program had a minor impact on the statewide deer population but may have had major local impacts on affected farms (Langenau 1993).

Attitudes toward Special Shooting Permits in Wisconsin

Horton (1995) investigated farmer and hunter attitudes toward the use of special permits for crop damage abatement in Wisconsin. The Wisconsin crop damage, or "Hot Spot," shooting permit program resembles a hybrid of Michigan's Shooting and Block Permit systems and has been in place since 1989 to assist landowners with deer damage that exceeds $1,000 and where other abatement strategies are judged to be impractical. Tags may be used by the farmer or issued to licensed hunters. These tags are intended for use outside the regular deer hunting season but use during the archery and firearms seasons is not prohibited. One deer may be kept by the shooter, but the rest must be relinquished to the Wisconsin Department of Natural Resources for distribution to the public. Similar to Michigan Shooting Permits, the permits are primarily for the taking of antlerless deer but may be used for taking bucks to control rubbing damage.

There are two major differences between the Wisconsin and Michigan crop damage programs. First, permittees are required to open the lands that they own or lease to public hunting. Second, this "Hot Spot" program supplements a crop loss compensation program (there is no compensation program in Michigan).

Hunters were randomly selected from the 1991 Wisconsin Hunter's Choice deer permit applications (a Hunter's Choice license permits the taking of either sex of deer). The response rate was 92% (n=315) for participating farmers, 69% (n=336) for non-participating farmers, and 80% (n=394) for hunters. Based on a phone survey of non-respondents, non-response bias was judged not to be a problem.

Experience with farming was found to affect hunters' perceptions of permit effectiveness. Unfortunately, this finding was not described clearly by Horton, except to say that most of those who did not know what the statewide crop damage level was had no farming experience. Thus, experience with farming may or may not influence attitudes toward the program, but intuitively it seems that familiarity with farming would affect approval of the permits due to increased understanding of losses and increased empathy for farmers who incur the losses.

Horton (1995) noted three common misperceptions associated with the Hot Spot permits: (1) permittees used all the permits themselves, (2) permittees kept all the deer, and that (2) hunters had no access to these permits. Three concerns about the shooting permits were indicated by more than one in five of the hunter respondents: farmers were killing hunters' deer (36%); the permit system was unfair in that it gave farmers the chance to take more deer than anyone else (27%); and that fawns were left to die when does are shot (23%). Thus, perceptions of fairness of the permits, concern for the impact of the permits on deer available for recreational hunting, and perceptions of humaneness and waste may influence attitudes toward the permits. In addition, attitudes toward doe harvest in general may influence approval of the permits.

Other Relevant Studies

Erickson and Giessman (1989) reported on Missouri's experience with special permits similar to Michigan's Block Permit program. They noted that there was an initial burgeoning of interest in the in-season permits but that after 5 seasons of the program, landowners became less favorable regarding the permits. After a decade of use of the in-

season crop damage control permits, the Missouri Department of Conservation terminated the program because it was judged to have limited effectiveness, require substantial labor demands of agency staff, and had the potential to be a source of public controversy (Erickson and Giessman 1989). However, Nelson and Reis (1992) contended that the Michigan Block Permit program was different from the Missouri crop damage permit program in four important ways: (1) more farms received the special permits in Michigan as compared to Missouri, (2) the average allotment of permits to each landowner was greater in Michigan, (3) unlike the either-sex permits of Missouri, only antlerless deer could be taken on the special permits in Michigan, and (4) Michigan had an established structure for regular season antlerless deer licenses for private landowners.

Landowners in Oklahoma were found to have generally favorable attitudes towards newly introduced special in-season antlerless permits based on their expressed desire to continue using the permits; However, they were less enthusiastic about out-of-season damage control permits in part because of perceived lack of effectiveness and complexity of the permitting process (Shaw 1995). This again suggests that perceptions of the effectiveness of the permits may influence attitudes toward the permits.

In a study of stakeholders attitudes towards deer management in the Hudson Valley region of New York, Purdy et al. (1989) found that most big game hunters believed that fruit growers should be willing to tolerate some risks of crop damage but not those that were considered "severe" (presumably as judged by the grower). One in 5 hunters believed "that growers must be willing to assume the risk for any level of crop

damage associated with deer regardless of the severity of that risk" (Purdy et al. 1989:21).

Membership in Organizations

From a marketing analysis perspective, deer hunters are not a homogeneous group but rather may be meaningfully segmented based on a number of characteristics depending on the intended application by resource managers. One useful segmentation basis for targeting purposes is the behavior of belonging to a hunting-related organization. Membership in organizations is a useful basis for segmentation because members are generally more accessible to marketers than are nonmembers as a result of the identifiable communication channels associated with the interactions of the organization. For instance, Rustem (1991) found that individuals who sought membership in Michigan United Conservation Clubs tended to be motivated in part by desiring to receive and read the periodical published by the organization.

Because of the higher degree of mediated interactions, members of hunting-related or conservation organizations tend to have greater opportunities to be exposed to information about deer management. Members of hunting- and fishing-related organizations tend to participate in the consumptive recreational activity more frequently than do non-members (Gigliotti and Peyton 1993), and outdoor recreationalists who participate more frequently in their recreational activity tend to use mass media and agency sources for information more than do those who participate less frequently (Ditton et al. 1992). In addition, age of members has been found to influence exposure to and interest in resource-management-related information sources. Younger recreationalists tend to use television, magazines, and recreation-related retailers more than do older

recreationalists (Loomis and Warnick 1992). In addition, younger members may have greater interest in media that provide information on increasing hunting skills, whereas older members may be more interested in media concerning current resource management issues (Rustem 1991).

Study Design Hypotheses

Two hypotheses were tested to confirm assumptions made in the design of the study. The first assumption was that deer hunters' opinions about antlerless deer hunting were reflected in their behavior of applying for an antlerless deer license. The second assumption was that Menominee and Presque Isle counties were sites of higher crop damage issue intensity than were the other study counties.

Hypothesis$_a$ 1: Deer hunters who did not apply for an antlerless permit in 1993 are more likely to be opposed to antlerless deer harvest and unwilling to harvest antlerless deer compared to those who did apply for an antlerless permit in 1993.

Rationale for H$_a$1:
Assuming that behaviors are consistent with attitudes, deer hunters who applied for an antlerless permit should support antlerless deer harvest, and those who did not apply should be opposed to antlerless deer harvest. Similarly, deer hunters who applied for an antlerless permit should be willing to harvest antlerless deer, whereas those who did not apply should be unwilling to harvest antlerless deer.

Hypothesis$_a$ 2: Farmer and deer hunter respondents who lived and/or hunted in Menominee or Presque Isle county were more likely to report engaging in issue activity in or around 1994 than were those who lived and/or hunted in Benzie, Calhoun, Leelanau, Montcalm, or Oceana county.

Rationale for H$_a$2:
This hypothesis was based on the opinions of MDNR and MSU-E professionals regarding the intensity of deer-management-related issues in each study county (refer to Table 7 in the Study Area section of the Methodology Chapter).

Research Hypotheses

The hypotheses that were tested in this research and their supporting rationale based on the review of the literature and on the results of the exploratory phase of this research are presented in this section. They are presented in the form of alternate hypotheses and are divided into two categories. The first category of hypotheses addresses the second objective of this research, which was to explore potential measurements associated with the Cultural Carrying Capacity framework. Hypotheses in this category deal with stakeholder perceptions of the trend in deer numbers, estimation of deer densities, and tolerance of deer. The second category of hypotheses addresses the third objective of this research, which was to develop and test a model for understanding and predicting deer hunter approval of deer-crop-damage lethal control programs. Hypotheses in this category deal with attitudes toward Shooting and Block Permits and perceptions of agency credibility in managing deer.

Exploring Potential Measurements Associated with the CCC Framework

Perceptions of the Trend in the Deer Population

Hypothesis$_a$ 3: Non-farming deer hunters believe that deer have been decreasing, whereas non-hunting farmers believe that deer have been increasing.

Hypothesis$_a$ 4: Most deer hunters and farmers have perceptions of the deer population trend that are incongruent with the trend judged by MDNR field personnel (i.e., most stakeholders have "inaccurate" perceptions).

Rationale for H_a3 and 4:

A series of studies by the Human Dimensions Research Unit at Cornell suggest that most farmers do not accurately perceive the trend in deer numbers (Decker et al. 1984).

Hypothesis$_a$ 5: Deer hunters who are residents of a study county are more likely to have perceptions of the deer population trend that are congruent with the trend judged by MDNR field personnel than are those who are not residents of the study county.

Rationale for H_a5:
Longer term exposure to a deer population in a particular area is assumed to result in a more accurate perception of changes in the deer population size over time.

Hypothesis$_a$ 6: Farmers who judge their losses to deer as intolerable are less likely to have perceptions of the deer population trend that are congruent with the trend judged by MDNR field personnel than are farmers who judge their losses to be tolerable or not a problem.

Rationale for H_a6:
Decker et al. (1984) reported finding support for this hypothesis. Queal (1968) found that the incidence of farmer reports of crop damage was directly correlated with the number of deer seen and that desired trends in deer numbers differed between those who had reported experiencing deer damage and those who had not.

Estimates of Deer Densities

Hypothesis$_a$ 7: Stakeholder deer density estimates are positively correlated with MDNR deer density estimates, with those who are full-time farmers who also deer hunt having the strongest positive correlation with the MDNR's deer density estimates.

Rationale for H_a7:
Deer density indices are assumed to reflect of the relative abundance of deer across Deer Management Units (DMUs). Assuming stakeholders will experience interactions with deer proportional to the abundance of deer in the area, and, assuming that their personal estimates are based on interactions with deer, the deer density estimates by stakeholders for each of the DMUs should be consistent with the MDNR estimates for the respective DMUs.

Those respondents who spend the most time out-of-doors where they may experience interactions with deer first hand (e.g., directly observe deer abundances) will be more likely to provide estimates that are congruent with MDNR estimates. Of all of the respondents to the surveys, full-time farmers who also deer hunt are assumed to spend the most time out-of-doors in the county due to more time spent farming as well as time spent afield during deer hunting season.

Hypothesis$_a$ 8: Deer hunters who live in the county where they deer hunt are more likely than deer hunters who live outside the county where they deer hunt to provide deer density estimates for the county that are positively correlated with MDNR deer density estimates for the county.

Rationale for H_a8:
Deer hunters who reside in the county are assumed to have had longer term exposure to the relative abundance of deer across the county and in the area in which they hunt most often in the county as compared to deer hunters who live outside the county but deer hunt in the county.

Hypothesis$_a$ 9: Farmers who judge their crop losses to deer as intolerable will estimate higher deer densities than will farmers who do not judge their crop losses to deer as intolerable.

Rationale for H_a9:
It is assumed that farmers who judge their crop losses as intolerable believe more deer damage is occurring than those who do not judge their crop losses as intolerable. The perception of deer damage is assumed to be positively related to the perception of the number of deer in the area.

CCC Framework Parameters

Hypothesis$_a$ 10: There is greater overlap in preferences for deer ("latitudes of acceptance") for the four segments of respondents (based on hunting and farming participation) in counties with relatively low deer-management-related issue activity than in counties with relatively high deer-management-related issue activity.

Rationale for H_a10:
Deer hunters have been found to be more likely than farmers to desire a higher deer population (Brown et al. 1980, Tanner and Dimmick 1984, Purdy et al. 1989). Deer hunters have been found to be more likely than farmers to desire a higher deer population (Brown et al. 1980, Tanner and Dimmick 1984, Purdy et al. 1989). Focus group results suggested that deer hunters tend to disbelieve the deer population estimates published by the MDNR, and generally they believe that there are fewer deer than the MDNR estimate. Personal interviews with farmers indicated that farmers tend to believe there are more deer in the county than what the MDNR report.

Confidence in Deer Density Estimates

Hypothesis$_a$ 11: Deer hunters who live in a study county as compared to deer hunters who do not live in a study county are more confident in their estimate of the deer density in the county.

Rationale for H$_a$11:
Focus group results indicated that deer hunters who live in the county where they deer hunt tend to assert themselves more confidently about information related to deer and deer management in the county than do deer hunters who live outside of the county where they deer hunt.

Hypothesis$_a$ 12: Deer hunters who are members of an organization are more likely to offer an estimate of the deer density in the county than are nonmembers.

Hypothesis$_a$ 13: Deer hunters who are members of an organization are more confident in their estimate of the average deer density than are nonmembers.

Rationale for H$_a$12 and 13:
Research suggests that individuals who are exposed to more information tend to be more confident in their knowledge (Oskamp 1965), and members are assumed to have greater access and exposure to deer-management-related information than do nonmembers.

Tolerance of Deer

Hypothesis$_a$ 14: Given the same MDNR deer density index, non-farming deer hunters believe there are too few deer, whereas non-hunting farmers believe that there are too many deer.

Rationale for H$_a$14:
Perceptions and preferences for deer abundance reflect the values perceived to be at risk to the individual. Those who farm but do not hunt are primarily concerned about the negative impacts of too many deer, and those who hunt but do not farm are primarily concerned about the negative impacts of too few deer.

Hypothesis$_a$ 15: Deer hunters rank their personal benefits from deer as a more important consideration in their opinion of the deer density in the county than others' benefits from deer, the number of deer-related vehicle accidents, and farmers' crop losses due to deer.

Rationale for H_a15:
It is assumed that deer hunters chose to participate in deer hunting because they value that activity and place more importance on the benefits they get from deer via hunting than the benefits or costs of deer to others.

Hypothesis$_a$ 16: Deer hunters who live in a study county are more likely than those who live outside the county to rate the number of deer-related vehicle accidents as an important consideration in their opinion of the deer density in the county.

Rationale for H_a16:
Although, as hypothesized in hypothesis 15, deer hunters will primarily be concerned about the benefits they personally get from deer, they will also be concerned about the risks to themselves associated with deer. Because the reference area in the opinion on the importance of DRVA is the study county, those deer hunters who live in a study county will place greater importance on DRVA than will those who live outside the study counties because they run a greater risk of experiencing the accidents.

Opinions Associated with Deer-Crop-Damage Lethal Control Programs and MDNR Deer-Management Credibility

Hypothesis$_a$ 17: Deer hunters have more favorable attitudes toward Block Permits than toward Shooting Permits.

Rationale for H_a17:
The Block Permit system is different from the Shooting Permit system in several ways, all of which would tend to be viewed as more favorable to hunters' interests. Among potentially other things, these include the fact that Block Permits are used during the regular deer season by licensed hunters, which holds many advantages such as a greater sense of fairness to hunters and less likelihood that deer would go to waste or that pregnant does would be shot.

Hypothesis$_a$ 18: Deer hunters who have not been a designated shooter are more disapproving of Shooting Permits than are those who have been a designated shooter.

Hypothesis$_a$ 19: Deer hunters who have not used a Block Permit are more disapproving of Block Permits than are those who have used a Block Permit.

Rationale for H$_a$18 and 19:
Personally participating in the permit system would serve to negate any beliefs related to the unfairness of the system. It is assumed that if a deer hunter thinks the systems are fair, he/she will approve of them. However, it may turn out that participation in the permit systems increases the salience of MDNR mismanagement or farmer abuses of the systems, and the direction of the alternate hypothesis could be reversed (i.e., participants would be more disapproving than nonparticipants).

Hypothesis$_a$ 20: Approval of Shooting and Block Permits is highest among deer hunters who depend on farming for a living. That is, deer hunters whose primary occupation is farming are more likely to approve of Shooting and Block Permits than are deer hunters who have farmed to an extent but not as a primary occupation (i.e., "part-time farmers"), and both of these farming segments are more likely to approve of Shooting and Block Permits than are deer hunters who are not farmers.

Rationale for H$_a$20:
Farmers are assumed to have greater understanding of and appreciation for the impact that deer can have on crops and farmers' livelihoods than nonfarmers, especially those farmers who depend on farming for their living. As such, farmers will be more likely to approve of permits designed to help control deer crop losses, and those farmers who depend the most on farming and also value deer hunting will be most approving of the permits. Assuming that, as compared to those who are farmers, individuals who do not farm are less aware and appreciative of the impact that deer crop damage can have on a farmer, deer hunters who do not farm will be most likely to disapprove of the permit systems.

Hypothesis$_a$ 21: Deer hunters who have friends or family who are farmers are more likely to approve of Shooting and Block Permits than are those who do not have friends or family who are farmers.

Rationale for H$_a$21:
It is assumed that individuals who know someone who farms will be more empathetic for deer crop losses than those who do not know someone who farms. This is assumed to be especially true when the farmer that the individual knows is a friend or family member.

Hypothesis$_a$ 22: Deer hunters who were raised in a rural farming area are more likely to approve of Shooting and Block Permits than are those who weren't

Rationale for H$_a$22:
It is assumed that, as compared to those who were not raised in a rural farming areas, those who were raised in a rural farming area will have more familiarity with agriculture and greater appreciation for the significant impact that deer damage can have on a farmer. Therefore, those who were raised in a rural farming area would be more likely to empathize with farmers' crop losses and approve of permits used to control the losses.

Hypothesis$_a$ 23: Deer hunters whose families depended on farming during their youth are more likely to approve of Shooting and Block Permits than are those whose families did not depend on farming during their youth.

Rationale for H$_a$23:
It is assumed that those whose families depended on farming during their youth would have greater empathy for farmers' losses due to deer damage and thus would be more likely to approve of permits to help control deer damage than those whose families did not depend on farming.

Hypothesis$_a$ 24: Deer hunters who oppose the harvest of antlerless deer or are unwilling to personally harvest antlerless deer are more likely to disapprove of Shooting and Block Permits than are deer hunters who support the harvest of antlerless deer or are personally willing to harvest antlerless deer.

Rationale for H$_a$24:
The policy guidelines for Shooting and Block Permits stipulate that these permits are for the taking of antlerless deer. A negative attitude toward the harvest of antlerless deer should logically result in disapproval of these permits which authorize such harvest. Similarly, personal unwillingness to harvest antlerless deer would by default exclude participation in the program, which may result in disapproval of these permit systems.

Hypothesis$_a$ 25: Deer hunters who hunt on public land are more likely to disapprove of Shooting and Block Permits than are deer hunters who hunt on private land.

Rationale for H$_a$25:
Assuming that deer hunters who hunt on public land compete with other deer hunters for hunting sites and deer to a greater extent than do deer hunters who hunt on private land, deer hunters who hunt on public land will feel that the crop damage permits are an unfair advantage to farmers and those who use the farmers' permits, who already have ready access to private land.

Hypothesis$_a$ 26: Deer hunters who own or lease land where they can deer hunt are more likely to approve of Shooting and Block Permits than are those who do not own or lease land where they can deer hunt.

Rationale for H$_a$26:
Given that the area has an open antlerless season, deer hunters who own land where they can deer hunt can apply for a private lands antlerless permit as well as a regular (lottery) antlerless permit, whereas those who do not own land where they can deer hunt can apply only for a regular (lottery) antlerless permit. In addition, deer hunters who own/lease land where they can deer hunt have ready access to land for hunting, whereas those who do not own/lease land for deer hunting may have a more difficult time finding a place to hunt. Based on less opportunity to get an antlerless permit and the relative difficulty of finding a place to hunt, those who do not own/lease land where they can deer hunt will be more disapproving of "special" permits for farmers than will those who do own/lease land where they can deer hunt.

Hypothesis$_a$ 27: Deer hunters who are members of a hunting-related organization are more likely to disapprove of Shooting and Block Permits than are non-members.

Rationale for H$_a$27:
Members of hunting-related organizations tend to have greater exposure to deer-management-related information than do nonmembers (Rustem 1991). Assuming that communications from a deer-hunting perspective about the crop damage control program tend to be unfavorable, members of hunting-related organizations will be more disapproving of Shooting and Block Permits than will nonmembers due to their greater exposure to negative information about the permit systems.

MDNR Perceived Credibility

Hypothesis$_a$ 28: Deer hunters who live in a study county have a more unfavorable rating of MDNR deer-management credibility than do deer hunters who live outside of a study county, with the ratings by both groups being unfavorable.

Rationale for H$_a$28:
It is assumed that residents of a study county have had greater exposure to agriculture and use of crop damage control permits as compared to residents of Metropolitan Areas. It is also assumed that deer hunters who live in a study county will perceive more frequent abuse of crop damage control permits because of greater familiarity (first- or second-hand information) with the nature of farmers' participation in the permit systems. Assuming abuse of permits is judged as at least in part the fault of the agency, deer hunters who perceive more abuse will have a more unfavorable rating of MDNR deer-management credibility than

deer hunters who perceive less abuse. However, based on the assumption that there is general discontent among hunters with deer and deer management in Michigan, it is likely that even those who live in Metropolitan Areas will have an unfavorable opinion of the MDNR as a deer management agency.

Hypothesis$_a$ 29: Deer hunters who hunt in counties with relatively higher deer-management-related issue intensity are more likely to judge the MDNR credibility to manage deer as low than are those who hunt in counties with relatively lower deer-management-related issue intensity.

Rationale for H$_a$29:

The greater prominence of social conflict over special crop damage control permits in the county will be associated with a stronger unfavorable attitude toward the MDNR due to beliefs that the MDNR is not satisfactorily managing deer or the permit programs. As discussed in hypothesis 33, it is hypothesized that perceived agency credibility will be a direct influence on the approval of the permits.

Hypothesis$_a$ 30: Farmers who do not deer hunt and full-time farmers who do deer hunt are more likely than deer hunters whose primary occupation is not farming to feel that significantly more consideration should be given to farmers' interests than to hunters' interests by the MDNR when it sets deer population goals for the county.

Rationale for H$_a$30:

Dependence on farming as the primary source of income will be more important to the individual than values derived from their participation in deer hunting. In order to protect their farming interests, deer hunters who are farmers will think that the MDNR should place more importance on farmers' interests than on hunters' interests. For those hunters who are not farmers, farming interests will be less important than hunting interests because they have no personal stake in farming in terms of an income source.

"Causal" Influences

Hypothesis$_a$ 31: Deer hunters' tolerance of deer is directly influenced by their satisfaction with their deer hunting experience.

Hypothesis$_a$ 32: Deer hunters' perceptions of the agency's deer management credibility are directly influenced by their satisfaction with their deer hunting experience.

Rationale for H$_a$31 and 32:
Satisfaction with deer hunting experience is likely to be an important variable in deer hunters' opinions in general based on the importance of the activity to them. A satisfactory hunting experience will likely directly lead to the belief that the agency is doing a good job managing deer and that the size of the deer herd is satisfactory.

Hypothesis$_a$ 33:
Deer hunters' attitudes toward the special deer damage control permit program are directly influenced by the following: (The hypothesized causal relationships associated with approval of Michigan's deer damage control special permit program are presented in Figure 13.)

a. approval of antlerless harvest (increased approval of antlerless harvest, increased approval of permits)
b. the perceived effectiveness of the permits at controlling deer damage (increased perceived effectiveness, increased approval of permits)
c. the perceived extent to which the permits are overseen by the MDNR (increased perceived oversight, increased approval of permits)
d. satisfaction with hunting access (increased satisfaction with access, increased approval of permits)
e. the perceived credibility of the state agency to manage deer (increased perceived credibility of agency to manage deer, increased approval of permits)
f. their tolerance of deer (increased tolerance for deer population, increased approval of permits)

Rationale for H$_a$33:
The first four hypothesized paths (a-d) are based on the review of the literature on attitudes toward special permit programs for the lethal control of deer damage (especially Nelson and Yuan 1991, Horton 1995). The last two hypothesized paths could plausibly go in either direction, but it seems most intuitively plausible to me that both perceived credibility and tolerance for deer would directly affect approval of crop damage control permit programs rather than vice versa.

Reader Advisement

It is very important that the reader bear in mind that MDNR data on deer densities are validly used only as comparative indices. The deer density indices presented herein were generously provided to the author by MDNR field personnel contingent on careful and cautious use of them because they do not necessarily represent the absolute number of deer in the Deer Management Units. In other words, although they are believed to be precise estimates, they may not necessarily be accurate. Thus, any direct comparison of stakeholder estimates of deer density to MDNR estimates of deer density should be evaluated prudently. Due to the nature of the indices, comparisons between stakeholders and MDNR figures will be framed in terms of "congruence" rather than "accuracy." The congruence of stakeholder perceptions with MDNR judgments will be explored for deer population trends over time and for estimates of deer densities across geographic areas.

CHAPTER 3

METHODOLOGY

Overview of Chapter

This chapter has three main sections. The first section describes the research design and study area. The second deals with the phases in the research project. The third section addresses measurement and analysis.

RESEARCH DESIGN AND STUDY AREA

Study Site Selection

The intensity of controversies surrounding crop damage and its control were assumed to vary across Michigan due to unique local social and ecological conditions. Based on this assumption, we hypothesized that deer hunters' and farmers' attitudes and behaviors associated with the crop damage issue would vary depending on the unique characteristics of localized situations. Seven agricultural counties in Michigan were selected in an attempt to help control for moderating influences on the incidence and extent of crop depredation by deer and perceptions and responses associated with crop damage and its control (i.e., Benzie, Calhoun, Leelanau, Menominee, Montcalm, Oceana, Presque Isle) (Figure 9).

To select the study sites, we first identified those counties in which deer had caused noticeable crop damage during 1994. We then selected counties that represented

relatively high intensity conflict areas and areas where there was less debate between farmers and hunters over the killing of deer to control crop damage during 1994. The assessment of the existence of deer damage and of the intensity of the issue was based on expert opinion of MSU-Extension and MDNR professionals.

Several parameters of the counties that represented potential moderating influences were considered during the study site selection process. These included the proportion of farmland and forested land in each county; mixture of agricultural products grown in the county; rate of deer-related vehicle accidents as an indicator to the relative abundance of deer across the counties (McCaffery 1973); availability of general antlerless deer permits in 1993 and 1994; and the relative latitude in the State for climatic considerations (Tables 6 and 7; Figure 9). One other characteristic of the counties that was considered during study site selection and that may be an important moderator on hunter attitudes toward the crop damage issue in the county is the availability of access to land for hunting in the counties (Table 8).

Benzie and Leelanau counties, which are adjoining counties in northwest lower Michigan with high fruit acreage, were treated as one unit in the analysis. Each county is part of a different Agricultural Statistics District (ASD) in Michigan (except for Benzie and Leelanau, which are in the same ASD); an ASD is defined as a contiguous group of counties having relatively similar agricultural characteristics (Michigan Agricultural Statistics Service 1995a). Several of the study counties were ranked in the top 10 agricultural counties in Michigan for 1994. Calhoun ranked tenth in Michigan for corn grain production; Montcalm ranked first for potato production and sixth for dry bean production; and Presque Isle ranked third for potato production (Michigan Agricultural

Statistics Service 1995a). In terms of fruit production, Oceana was the third and Leelanau the fourth top county in Michigan in 1994 based on fruit acreage (Michigan Agricultural Statistics Service 1995b).

A practical consideration in the study site selection process was the location of the field sites used in Michigan studies of actual deer damage and deer population dynamics in agricultural landscapes. Specifically, Benzie, Leelanau, and Presque Isle were selected because of the concurrent Michigan State University research projects aimed at assessing actual deer depredation on red kidney beans and alfalfa in those counties (Braun in press) and deer movements in those counties (Sitar 1996). Inclusion of Benzie, Leelanau, and Presque Isle would allow for an integration of the relevant biological findings with the findings from this sociological research to provide a fuller explanation of the relationship between actual deer crop damage and perceptions of damage.

Sample Stratification

We stratified deer hunters by whether they had applied for and were successful at receiving a permit to harvest an antlerless deer in 1993 because of the potential influence of attitudes toward doe harvest on attitudes associated with the crop damage issue. Because we suspected that there might be variation in hunter opinions based on their familiarity with farmers and agriculture, we also stratified hunters based on where they lived and where they hunted. We chose one sample of hunters who lived and hunted in one of the study counties ("Live Ins"). We also chose a sample of hunters who lived in a Metropolitan Area (MA) (Bureau of Census 1990) but then deer hunted in one of the 7 study counties ("Live Outs") (Figure 9). By definition, an MA "must contain either a city with a population of at least 50,000 or an urbanized area delineated by the Census

Bureau; in the latter case the MA must consist of one or more counties containing a population of at least 100,000 (75,000 in cities and towns in New England)" (Bureau of Census 1994:2).

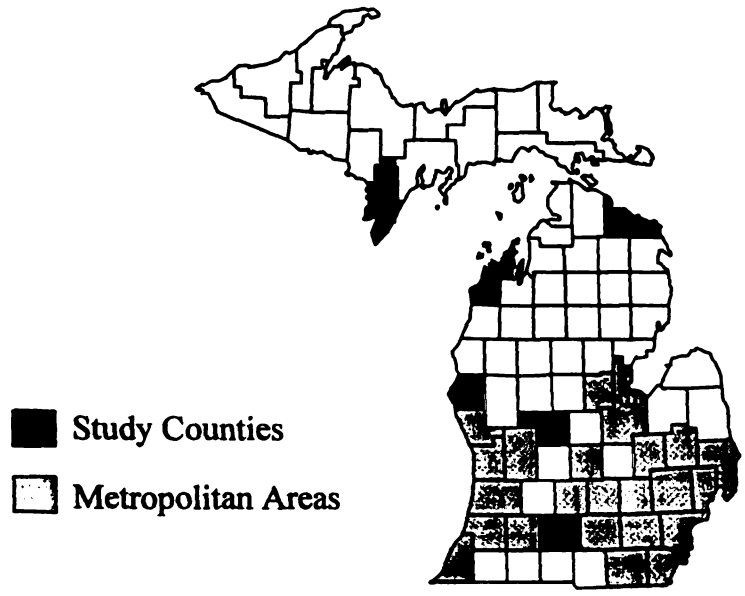

Figure 9. Seven study counties and Metropolitan Areas in Michigan (Bureau of Census 1990). Study counties from north to south are Menominee (in Upper Peninsula), Presque Isle, Leelanau, Benzie, Oceana, Montcalm, and Calhoun. Leelanau and Benzie are located immediately adjacent to one another in the northwest lower peninsula and were treated as one unit in the analysis. Calhoun, a study county, is also a Metropolitan Area.

Table 6. Forest and agricultural acreage for each of the seven study counties in Michigan, 1994.

Study County	County Acreage in Forest (%)[a]	County Acreage in Farms (%)[b]	Farm Acreage in Crop Type, 1994 (%)[c]						
			Corn (Grain and Silage)	Dry Beans	Hay	Soybeans	Potatoes	Wheat	Fruit[d]
Benzie	71.3	9.7	6.6	—	10.1	—	—	—	14.7
Calhoun	24.5	54.0	33.5	0.1	8.3	17.1	—	6.4	NA
Leelanau	56.9	29.1	6.2	—	9.7	—	—	0.4	21.7
Menominee	78.5	16.5	13.6	0.2	28.6	0.1	—	0.3	NA
Montcalm	29.3	51.6	22.3	8.2	14.7	5.9	6.3	7.3	<0.4[e]
Oceana	54.0	37.3	7.0	—	11.2	0.3	—	1.0	11.4
Presque Isle	73.7	18.9	5.8	3.6	23.8	—	4.0	1.6	NA

[a] Leatherberry and Spencer, Jr. (1996); land area excludes acres defined by Bureau of Census (1990) as land but by Forest Inventory and Analysis standards of area classification as water.

[b] Calculated as acres of land in the county in farms (Bureau of Census 1992) divided by the total acres of land area in the county (Bureau of Census 1990).

[c] For row crops and truck crops, this is calculated as acres of the crop type harvested in the county in 1994 (Michigan Agricultural Statistics Service 1995a) divided by the total acres of land in the county in farms (Bureau of Census 1992). A "—" indicates that there are less than 100 acres in this crop type in the county, and the Michigan Agricultural Statistics Service does not report acreages under 100 (S. Pscodna, Deputy State Statistician, pers. commun. 5 March 1996).

[d] Calculated as acres of all fruit grown in the county (Michigan Agricultural Statistics Service 1995b) divided by the total acres of land in the county in farms (Bureau of Census 1992). "NA" indicates that data were not available for the individual county but rather only in terms of the Fruit District to which the county belongs.

[e] Because data for Montcalm were available only as combined with Mecosta county, this percent was calculated as acres of all fruit grown in Montcalm and Mecosta counties (Michigan Agricultural Statistics Service 1995b) divided by the total acres of land in both Montcalm and Mecosta in farms (Bureau of Census 1992).

Table 7. Profile of study counties in terms of crop-damage-related issue activity, deer-vehicle accident rates, and availability of regular antlerless deer licenses.

Study County	Past Issue Activity[a]		1994 Issue Activity[a]		Deer-Vehicle Accident Rate[b]				Regular Antlerless Deer License Availability	
	Farmers	Deer Hunters	Farmers	Deer Hunters	1990	1991	1993	1994	1993	1994[c]
Benzie	Low/ Moderate	Low	Moderate/ High	Moderate	1.53	1.35	1.52	1.95	western 1/3 open	western 1/3 open
Calhoun	Moderate	Low/ Moderate	Low/ Moderate	Low/ Moderate	0.96	0.97	1.02	1.10	all open	all open
Leelanau	Low/ Moderate	Low/ Moderate	Moderate/ High	Moderate	1.09	0.98	0.82	1.19	all open	all open
Menominee	Very High	High	High	High/ Very High	3.36	4.26	4.10	4.58	south central 1/3 open	*all open*
Montcalm	Low/ Moderate	Low	Low/ Moderate	Low/ Moderate	2.50	2.42	2.07	2.32	all open	all open
Oceana	Low	Low	Low/ Moderate	Low/ Moderate	2.04	1.61	2.00	1.24	all closed	all closed
Presque Isle	High	High	High	Very High	2.13	2.45	2.11	2.66	all open	*1/4 open*

[a] Pers. commun. 1994: G. Dudderar, MSU-Extension Wildlife Specialist, Dep. of Fisheries and Wildlife, Michigan State University; E. Langenau, Big Game Specialist, MDNR Wildlife Division; MSU-Extension and MDNR Field Personnel who worked in the study county in 1994. Rating scale from "Very Low" to "Very High" intensity of communication by stakeholder groups, such as complaints to the management agencies, organized meetings, and media coverage. Intensity is provided on the county-level with the recognition that there is within county variation in intensity. "Past" refers to 1983 (initiation of Shooting Permits in Michigan) to 1993 calendar years.

[b] Calculated as the number of deer-vehicle accidents in the county in that year (Michigan State Police 1990-1994) divided by the total number of miles traveled in the county in that year (All Roads Annual Vehicle Miles of Travel in Millions of Miles) (D. R. Schade, Michigan Dep. of Transportation, pers. commun. 1996). Rate not reported for 1992 because of concerns over reliability of data collected on deer-car collisions due to a change in the Michigan State Police reporting process.

[c] *Italics* indicate a change in the availability of regular antlerless deer licenses in the county from the previous year.

Table 8. Land base and availability of public hunting access in each of the seven study counties in Michigan.

Table 8. Land base and availability of public hunting access in each of the seven study counties in Michigan.

Study County	Total Land Area (Thousand Acres)[a]	Hunting Access Program Involvement, 1994[b]	State Lands (Acres)[c]			Federal Lands (Acres)[c]		Acres Enrolled as Commercial Forest Lands as of Date[e]		
			Parks and Recreational Areas	Game/ Wildlife Areas	State Forests	National Parks and Lakeshores[d]	National Forests	1 Jan. 1993	1 Jan. 1994	1 Jan. 1995
Benzie	205.7	No	0	697	59,049	10,991	0	3,733	3,542	2,136
Calhoun	453.7	Yes	0	0	0	0	0	225	225	185
Leelanau	223.0	No	1,262	1,230	4,993	44,327	0	2,343	2,343	1,553
Menominee	667.9	No	650	0	91,765	0	0	131,449	131,264	127,684
Montcalm	453.2	Yes	0	19,997	0	0	1,760	185	185	125
Oceana	345.9	Yes	2,871	370	1,989	0	52,697	2,845	2,845	2,601
Presque Isle	422.4	No	793	0	80,767	0	0	0	0	0

[a] Bureau of Census (1990)
[b] MDNR Wildlife Division Hunting Access Program leases private lands for public hunting.
[c] T. Nederveld, Private Lands Wildlife Specialist, MDNR Wildlife Division, pers. commun. March 1996.
[d] The National Lakeshore lands in Benzie and Leelanau (Sleeping Bear National Lakeshore) is open to public hunting.
[e] **Commercial Forest lands are open to the public without written permission for hunting and fishing (V. Burcham, CFA Assistant, MDNR Forest Management Division, pers. commun. 1996).**

RESEARCH PROCESS

The research on deer hunters and agricultural producers involved a four-phase process: exploratory methods, pilot survey and review, mail survey, and non-response telephone follow-up. Methodology used in the research on agricultural producers is not described here but is presented in detail in Fritzell (1996). The research on the managing agencies involved a focus group and mail survey. The Michigan State University Committee on Research Involving Human Subjects approved all methodology (Appendix B).

Exploratory Phase

Focus groups were used during the formative stage of this research to gain insights into the needs and attitudes of the deer hunter population and MDNR personnel. The purposes of the exploratory phase were to facilitate development of conceptual frameworks and hypotheses for the subsequent mail surveys and to guide the development of the survey instruments (Percy 1981, O'Brien 1993, Schechter et al. 1993, Wolff et al. 1993). A focus group is a method of gathering qualitative data which involves moderated group discussion with generally 6 to 12 individuals from a population of interest. It is the interpersonal interaction among participants that distinguishes this method from other data collection techniques (Morgan 1988). Focus groups are also known as "group depth interviews" because the supportive environment of group discussions tends to evoke feelings and reactions indicative of motivations that are not usually accessible at the level of interpersonal relationships (Goldman 1962).

Focus Group with MDNR Wildlife Division

A 2-hour group discussion with seven MDNR field personnel who had been involved in some capacity for several years with the crop damage issue in their respective counties (e.g., issuing Shooting and Block Permits; dealing with deer hunter and farmer complaints regarding crop damage and its control) was held on 13 October 1994 at the Saginaw Field and Stream Club in Saginaw, Michigan. Five Wildlife Habitat Biologists and two District Wildlife Supervisors represented five of the seven study counties (a Biologist from Calhoun; a Biologist and a Supervisor representing both Leelanau and Benzie; a Biologist from Oceana; and a Biologist and a Supervisor from Presque Isle). Montcalm and Menominee counties were not represented because the relevant field personnel from those two counties had scheduling conflicts which prevented them from attending the meeting. One participant was a Wildlife Habitat Biologist from Ogemaw county which was not a study county. He was included because he had extensive experience with the crop damage issue and was available at the meeting time.

The objectives of this group discussion were to gain insight into the local crop damage management situations in the study counties and to learn about the MDNR Crop Damage Control Program and its implementation. Participants were updated on the status of the MSU crop-damage-issue study and provided input as to the types of information they would like to learn from the research. The strengths and weaknesses of the crop damage control program were discussed. Recommendations for improving the program, the feasibility of alternative or supplemental crop damage management options, and the working relationship between the MDNR and MSU-Extension were also discussed. Participants from the study counties were asked to forward any information

(e.g., media coverage) relevant to the crop damage issue that they might encounter or disseminate in their counties during 1994 and 1995 to the MSU researchers. The agenda of the discussion is presented in Appendix C.

Focus Groups with Deer Hunters

Four focus groups were conducted with deer hunters in September, 1994 (Table 9). Two focus groups were held in southern Michigan (i.e., Flint and Marshall), and two were held in northern Michigan (i.e., Traverse City and Escanaba). One hundred names for each of the four focus group sites were selected from a list of deer hunters who returned the 1993 MDNR Wildlife Division Firearm Deer Survey based on the respondent's county of residence and county of hunt. Mailing labels with the names and addresses of potential focus group participants were provided by the MDNR Biometrics Section. For the two southern Michigan focus group sites, individuals were selected if they reported that (1) they resided in the county where the focus group was to be held or in one of the counties immediately adjacent to that county and (2) reported to have firearm deer hunted outside of their resident county (Table 10). For the two northern Michigan focus group sites, individuals were selected if they reported that they resided in *and* deer hunted in one of several counties including and immediately adjacent to the respective county where the focus group was to be held (Table 10).

The objectives of the focus groups with deer hunters were to assess the salience of beliefs associated with crop damage and its control; assess opinions regarding crop damage and its control; uncover relevant belief schema that were not as yet hypothesized; and explore the words and phrasing deer hunters use to describe and discuss the crop damage issue.

It is difficult to recruit participants for focus groups for a number of reasons, ranging from suspicion on the part of the prospective participant to narrowly defined selection criteria on the part of the researcher (Stewart and Shamdasani 1990, Krueger 1994). One of the more common recruitment approaches is to phone prospective participants and invite them to attend. However, the success rate for the telephone recruitment approach tends to be fairly low, and telephoning can be extremely time consuming (Krueger 1994). In an attempt to increase recruitment rate and reduce the time required in phone recruitment, an alternative recruitment method was tried in this study. Specifically, a postcard was mailed to each individual inviting him/her to participate in a discussion with a group of other deer hunters on deer hunting issues (Appendix D). The postcard encouraged individuals to call a toll-free number if they were interested in participating in a group discussion as part of a Michigan State University study of deer hunting issues.

Research indicates that personalization of correspondences associated with surveys helps to increase response rates (Dillman 1978). To investigate this assumption, a portion of the postcards sent to prospective focus group participants within each of the four locales were handwritten, and the remainder were typed in one of two fonts: a Times Roman and a cursive script font (Table 11) (Appendix D).

Individuals who called the toll-free number were asked several questions to assess their suitability for inclusion in a focus group, and each caller's schedule for the subsequent month was noted so that a date and time when all were available could be identified (Appendix D). During the screening interview, they were informed that they would be paid $25.00 for their participation in the group discussion. When at least 10

willing and available participants were identified, each of them was called back and confirmed (Appendix D). The other callers who either were not available at the appropriate time or date or who did not meet the screening criteria were also called and sent a letter to thank them for their interest but inform them that the discussion group was full or conflicted with their schedule (Appendix D).

The willing participants were sent a confirmation letter two weeks prior to their respective focus group which reminded them about the time, date, and location of the group discussion (Appendix D). A map with directions to the focus group site was included. Written confirmations not only provided a means for delivering maps and directions, they also serve to increase the commitment of the individual to participate due to their more formal tone as compared to telephone calls (Stewart and Shamdasani 1990). Two days prior to each meeting, confirmed participants were called and reminded of the discussion time, as well as given the opportunity to ask any last minute questions, such as about the directions to the focus group site. To allow salience of beliefs associated with crop damage to be accurately assessed during the focus group discussions, participants were never informed that the primary focus of this research was the crop damage issue.

Prior to the discussion, each participant completed a 1-page survey (Appendix D). This survey was designed to gather data on the participant's deer hunting avidity and deer hunting participation behaviors. Data were used to provide a general profile of focus group participants for consideration during data analysis.

The discussion guide consisted of six sections (Appendix D). The discussion began with a general orientation to the purpose of the discussion and introductions of participants, assistants, and moderator. Participants then discussed their deer hunting

experiences, including season of deer hunting, ownership of land hunted, number of deer seen, harvest success, and expectations for seeing and harvesting deer. The third section was designed to explore participants' perceptions of trends and current deer densities and opinions regarding the deer population and deer management in Michigan. To provide insights into the model of cultural carrying capacity, several questions in the third section revolved around the concept of deer hunters' tolerance for deer. Specifically, participants discussed the minimum and maximum deer densities that they would judge to be tolerable and their beliefs regarding the implications of having too few or too many deer. Participants also were asked about their participation in activities to change deer management in Michigan, such as attending local meetings or communicating to the MDNR Wildlife Division.

The fourth section of the discussion guide was designed to assess the salience and importance of the crop damage issue relative to other state resource management issues. The fifth section explored the crop damage issue more fully. Attitudes about farmers and farmers' deer crop-depredation losses and the MDNR program to control crop damage were probed. Other associated beliefs such as hunter access to private land were discussed. The final section dealt with the MDNR Wildlife Division. Participants shared their perceptions regarding MDNR credibility and the implementation and regulation of the crop damage control program.

Each discussion was moderated by the author, and the guide was used to facilitate coverage of the important research topics rather than as a strict script. That is, the discussions did not necessarily adhere to the logical sequence of the guide, nor was every question on the script addressed in each group. In addition, the level of moderator

involvement in the discussion was intentionally varied during the discussion (Morgan 1988). The moderator first employed a fairly nondirective approach in order to tap the salience of the crop damage issue (Stewart and Shamdasani 1990). General questions related to deer hunting and deer management were asked, and the moderator allowed the discussion to flow naturally as long as it remained on the topic. Then, once the crop damage issue was spontaneously mentioned by a participant, the moderator employed a directive approach to thoroughly probe beliefs and attitudes regarding the crop damage issue. In each of the four deer hunter focus groups, a participant brought up a topic directly related to the crop damage issue within the first 30 minutes of the discussion. A letter of appreciation was sent to each participant in the week following his/her respective focus group (Appendix D).

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Table 9. Dates and participant profile from focus groups with deer hunters.

Focus Group Location (MI)		Escanaba	Flint	Marshall	Traverse City
Date		16 Sept. 1994	6 Sept. 1994	12 Sept. 1994	14 Sept. 1994
Total No. of Participants		8	12	12	12
Male		8	11	11	10
Female		0	1	1	2
1993 Deer Hunting Season of Participation	Gun only	4	5	11	7
	Both Bow and Gun	4	7	1	5
Participant Ages		22,28,30,31, 31,45,48,49	30,32,33, 33,38,44, 47,50,54, 60,65,79	16,17,18,37, 37,40,41,44, 49,59,61,66	34,34,35,35, 38,40,40,45, 59,62,65,78
Members of Deer Hunting Club or Organization		1	3	3	4
Ownership of Land where Deer Hunted in 1993	All Private	4	6	6	4
	All Public	1	2	3	6
	Both Private and Public	3	4	3	2

Table 10. Selection of the sample pool of potential deer hunter focus group participants.

Focus Group City/ County (MI)	Escanaba/ Menominee	Flint/ Genesee	Marshall/ Calhoun	Traverse City/ Grand Traverse
No. of Names Selected from the MDNR 1993 Firearm Deer Survey	100	100	97	100
County of Residence, 1993	Delta, Dickinson, or Menominee	Genesee, Lapeer, Tuscola, Saginaw, Shiawassee, Livingston, or Oakland	Calhoun, Eaton, Jackson, Kalamazoo, or Barry	Grand Traverse, Leelanau, Benzie, Kalkaska, or Antrim
County of Deer Hunt, 1993	In Delta, Dickinson, or Menominee	Outside of Genesee, Lapeer, Tuscola, Saginaw, Shiawassee, Livingston, or Oakland	Outside of Calhoun, Eaton, Jackson, Kalamazoo, or Barry	In Grand Traverse, Leelanau, Benzie, Kalkaska, or Antrim

Table 11. Deer hunter focus group recruitment postcards sent and number of telephone calls returned.

Table 11. Deer hunter focus group recruitment postcards sent and number of telephone calls returned.

	No. Sent				No. Undeliverable			No. Deliverable			No. Telephone Calls Returned (% of Deliverables)		
Location	T[a]	S[b]	H[c]	Total	T	S	H	T	S	H	T	S	H
Escanaba	30	58	12	100	0	1	0	30	57	12	5 (16.7)	7 (12.3)	3 (25.0)
Flint	74	13	13	100	1	2	0	73	11	13	15 (20.5)	4 (36.4)	3 (23.1)
Marshall	69	14	14	97	2	2	0	67	12	14	14 (20.9)	2 (16.7)	5 (35.7)
Traverse City	71	15	14	100	0	0	0	71	15	14	12 (16.9)	4 (26.7)	5 (35.7)
TOTALS	244	100	53	397	3	5	0	241	95	53	46 (19.1)	17 (17.9)	16 (30.2)

[a] T = the postcard was typed in Times Roman font
[b] S = the postcard was typed in a Script font
[c] H = the postcard was handwritten in ink

Pilot Testing

Pilot Survey

To provide data to improve the quality of the deer hunter survey instrument, draft versions of the 1995 Deer Hunter Opinion Survey were sent to 35 deer hunters in February, 1995 (Appendix E). The draft versions were tailored to three of the seven study counties (i.e., Calhoun, Leelanau, Presque Isle) selected to represent geographic location (southern Michigan and northern lower Michigan) and differences in crop type (row crops; orchards; higher value row crops, such as red kidney beans, respectively). Due to the specific tailoring of the pilot surveys, it was difficult to obtain a sample of the appropriate populations (i.e., deer hunters who met the research design criteria of living in a certain county and deer hunting in a certain county). Also, due to the complexity of the instrument, a thorough review would require that pilot respondents invest a fair amount of time and energy to answer the questions. Consequently, we wanted to pilot test the survey with deer hunters who had some level of interest in this research project who would be willing to invest the required effort. Specifically, we chose to pilot test the deer hunter survey using the sample of deer hunters who called the toll-free number inquiring about the focus groups but who were unable or unwilling to participate in a group discussion. This group was selected because they would likely provide some assessment of the survey items and because of sampling convenience.

Because these individuals were selected from the sample frame of respondents to the 1993 MDNR Firearm Deer Survey, their county of residence and county where they firearm deer hunted in 1993 was identifiable. However, some of these hunters did not hunt in one of the three counties to which the pilot instrument was tailored.

To help these individuals respond to the pilot instrument, they were sent a cover letter as well as a brief description of the research design and instructions on responding to the survey (Appendix E). They were instructed to answer the questions for the county in which they had deer hunted in the most recent year and were told to skip over questions that involved the county maps. They were also encouraged to provide written comments aimed at improving the instrument. A toll-free number was provided to facilitate and encourage respondents to contact the researcher if he/she had any questions or encountered any problems in responding to survey items. Eighteen of the 35 individuals in the pilot sample returned a completed questionnaire (51.4%).

Review of Surveys

In February of 1995, draft versions of the deer hunter survey instrument were sent for review to approximately 80 individuals with familiarity with the crop damage issue and/or survey design. Reviewers included MDNR field staff associated with the seven agricultural study counties as well as select administrative staff at the MDNR headquarters in Lansing, Michigan. Other reviewers included select MSU-E and Michigan Agricultural Experiment Station personnel, presidents of two Michigan-based deer-hunting related organizations, select faculty and graduate students at Michigan State University, and the 44 deer hunters who participated in the four focus groups. A cover letter and instruction guidelines were sent to each reviewer, and a toll-free number to contact the researcher was provided (Appendix E).

Revisions Based on Piloting

The survey instruments were revised based on the results of the pilot mailing and the written comments of both the pilot respondents and reviewers. No statistical analysis of the measurement properties of the survey items was possible due to the low number or pilot surveys completed. Therefore, validity and reliability assessments were made only after the full mailing.

Deer Hunter Mail Survey

Sample Space and Sample Selection

The sample for the mail survey to deer hunters was selected from the same source as for the focus groups, the 1993 MDNR Wildlife Division Firearm Deer Survey, which is a survey that was used by the agency to assess firearm deer harvest in the 1993 season. This sample space was used because it was the only available source that provided not only names and addresses of Michigan deer hunters but also information on where they lived and where they hunted. Because the sample space for this study was derived from a pool of respondents to a previous survey, a brief description of the sampling involved in the MDNR Firearm Deer Survey is provided here.

The sample space for the 1993 Firearm Deer Survey was those individuals who purchased a 1993 deer hunting license that allowed the person to pursue a deer with a firearm. This included four license types: Resident Deer; Non-Resident Deer; Senior; and Sportspersons licenses. The sampling method for the 1993 Firearm Deer Survey involved a systematic sampling of Passbook purchasers with a random start (a Passbook is the card to which hunting licenses and stamps are affixed). The sample was stratified to represent deer hunters who received an antlerless deer license in 1993 and those who did not. For

the survey stratification, General and Private Land Antlerless Deer Licenses were grouped together, and they are hereafter referred to collectively as "antlerless deer licenses."

To represent unsuccessful antlerless deer license applicants and those who had not applied for an antlerless deer license, a random sample of eligible licenses within those who had applied for an antlerless permit in 1993 but did not receive one and within those who had not applied for an antlerless permit in 1993 was selected. To represent antlerless deer license recipients, a sample was randomly selected from responses to the 1993 MDNR Hunters' Choice (a license that allows the taking of either sex) Survey, which was a survey that involved a stratified random sample of antlerless tag recipients with the goal of characterizing antlerless harvest by DMU. In total, 35,846 Firearm Deer Surveys were sent in January to March of 1994 (20,846 to firearm deer hunters who had applied and received an antlerless deer license; 4,450 to firearm deer hunters who had applied for an antlerless deer license but had not received one; and 10,550 to firearm deer hunters who had not applied for an antlerless deer license). The response rates for the 1993 Firearm Deer Survey were 87.5% for antlerless tag recipients; 72.2% for unsuccessful applicants; and 76.0% for nonapplicants. No test of non-response bias was conducted.

To select the sample for the deer hunter crop damage survey research, a sample proportional to the true population in each of the antlerless deer license categories was first created from the responses to the 1993 Firearm Deer Survey. That is, because the distribution of antlerless deer license categories among respondents to the 1993 Firearm Deer Survey was not proportional to the distribution of the antlerless deer license categories in the firearm hunting population, a sample reflecting the appropriate ratio of deer license categories had to be created. Then, names were selected from this balanced

sample based on the study design criteria of county of residence and county of hunt. All individuals who lived in any 1 of the Metropolitan Area counties and hunted in any 1 of the 7 study counties were selected, and, due to the limited number who met the criteria, no attempt was made to achieve an equal number of nonresidents for each study county. The MDNR Wildlife Division Biometrics staff created the sample space, conducted the sample selection, and provided names, addresses, and identification codes for county of residence, county of hunt, and antlerless deer license category to Michigan State University.

Mailings

The first mailing of the survey instrument was sent bulk rate during April and May, 1995, to 1,257 deer hunters, 734 of whom lived in a study county and 523 of whom lived outside of a study county (Table 14 in Results Chapter) (Appendix F). The exact dates of the mailings are presented in Appendix F. A cover letter describing the study and a postage-paid return envelope accompanied the survey instrument (Appendix F). To reduce any biases toward the Michigan Department of Natural Resources that might affect responses to the questionnaire, Michigan State University Department of Fisheries and Wildlife letterhead was used for all cover letters, and surveys were mailed from and returned to the University. In addition, the front cover of the survey prominently displayed a statement that the research was conducted by Michigan State University. In an attempt to increase response rate, a flyer was included in the first mailing that notified the recipient of the opportunity to win a pair of binoculars from a drawing of completed and returned surveys (Appendix F).

Fifteen to 20 days after the initial mailing, a postcard was sent to those who had

yet to respond to remind them about the binocular drawing and to encourage them to return a completed survey (Appendix F). A second complete survey mailing was sent during May and June, 1995, and was sent certified mail for study counties with small sample sizes (i.e., n<20) and first class for counties with larger samples (Appendix F).

Data Check

To check the quality of the data entry, 5% of the cases (i.e., 39 respondents or 5,109 cells) in the data set were randomly selected, and the inputted data were checked for accuracy. Six errors were found, which resulted in an input error rate of 0.12%.

Non-Response Telephone Follow-Up

Four hundred and twenty three deer hunters who received a survey failed to complete and return the survey. To test for systematic variation between nonrespondents and respondents, we attempted to reach 149 randomly selected nonrespondents (35% of nonrespondents) via telephone and ask them particular questions from the mail survey (Appendix H). Questions were chosen based on the importance of the variables to the answering of key research questions. A sample of nonrespondents from each study county which was proportional to the nonrespondent rate in each county was chosen (i.e., more nonrespondents were called for counties with a higher percentage of nonrespondents compared to counties with a lower percentage of nonrespondents) (Table 15 in Results Chapter). A maximum of six attempts was made to reach each nonrespondent. The first attempt was made during evening hours of a weekday, and if the phone was not answered, the subsequent calls to that individual were made at various times on various days in order to increase the likelihood that the phone would be answered. Fifteen percent of the cases (10 individuals or 140 cells) in the nonresponse

data set were checked for accuracy, and no input errors were found.

MEASUREMENT AND ANALYSIS

Assumptions

Measurement Scale

The majority of the items on the survey instruments used in this research employed Likert-type response scales (Likert 1932). Use of Likert scales required an assumption about the underlying measurement properties of the resulting scale scores because, despite their prominent usage in psychometrics, the measurement properties are essentially unknown (Eagly and Chaiken 1993). Specifically, the exact level of measurement is unclear, and Likert scales may yield ordinal or interval level measurement. Eagly and Chaiken (1993:57) stated that, "recent developments in item response theory may provide a measurement metric for scales that...are based on the psychometric tradition." In the analyses presented here, Likert scales are treated as interval-level data with the assumption that the interval between measurements is meaningful. Biddle and Marlin (1987:10) concluded that, *regarding regression analyses*, "As a rule, it does not seem to matter much when data meet only ordinal assumptions."

Normality Assumption

Most univariate distributions were found to be non-normal based on an evaluation of histograms and results of Kolmogorov-Smirnov statistics with a Lilliefors significance level for testing normality. However, most statistics, especially estimates (as opposed to significance tests), are relatively unaffected by departures from normality (F. Boster, Dept. of Communication, Mich. State Univ., pers. commun. April 1996).

Statistics

For regression analyses in causal modeling, both ordinary least squares and maximum likelihood estimation approaches were used in order to compare the results of the two approaches given the likelihood for multivariate non-normality. For significance tests, non-parametric statistics were used. The software program, SPSS® for Windows™, Release 6.0 (SPSS Inc. 1993), was used for most statistical computations, and significant differences were tested at a significance level (α) of 0.05.

Reference Year

Deer Hunting Experience

Because the sampling frame for the deer hunter survey identified the hunters' county of hunt for 1993 but not 1994, it was not known *a priori* if respondents (who were asked to fill out the survey in mid-1995) deer hunted in the study county in only 1993, or in both 1993 and 1994. This posed a dilemma for referencing questions that dealt with satisfaction with deer hunting experience and perceptions of deer populations. After a careful consideration of the alternatives, it was decided to use a filter to identify whether the respondents hunted in the county in 1993 and/or 1994 and then to reference the respondent to the "most recent year" that they hunted during the November firearm deer season in the study county (See Appendix F, Questions #7-27).

Crop Damage Issue

All questions regarding the crop damage issue in the study county referenced 1994.

Tolerance of Deer

Estimation of the Deer Population

Deer Hunters

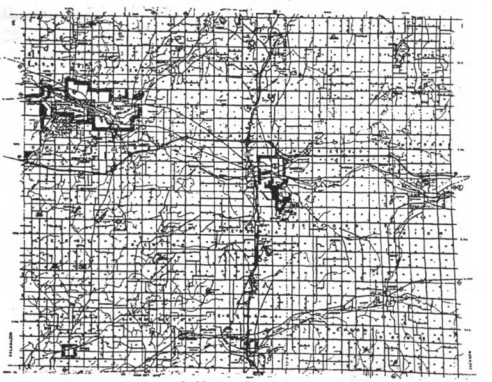
Each deer hunter survey contained a map of the study county which identified major highways (Appendix F, Question #20) (Figure 10). To provide adequate detail and clarity to facilitate hunters' identification of their hunting spot, most maps were generated from a Geographic Information System using map information from Michigan Resource Information System (Michigan Land Use Classification and Referencing Committee 1979). Because of pressing time constraints for mailing surveys, two of the maps (i.e., Benzie and Calhoun counties) were photocopied from a compilation of Michigan County Maps (MUCC 1988) (Figure 10). This resulted in a set of maps with differential quality.

Deer hunter survey respondents were asked to identify on the county map the approximate location(s) in which they deer hunted during the November firearm season in the most recent year that they deer hunted in the county. Those who had deer hunted in more than one location were asked to indicate the area where they spent most of their deer hunting time. A code for the DMU of the primary hunting spot was input into the data set.

Farmers

Each farmer survey contained a map of the county with township borders delineated (Appendix G, Question #5) (Figure 11). Farmer survey respondents were asked to identity on the map the approximate location of their primary farming operation. The gross level of map detail was suggested by farmers during piloting of the survey instrument as being adequate for identifying their farming location. A code for the DMU in which a majority of the farm-operation land base fell was input into the data set.

Benzie County



Calhoun County

Figure 10. Maps of study counties included in 1995 Deer Hunter Opinion Survey, shown the size that they appeared in the survey.

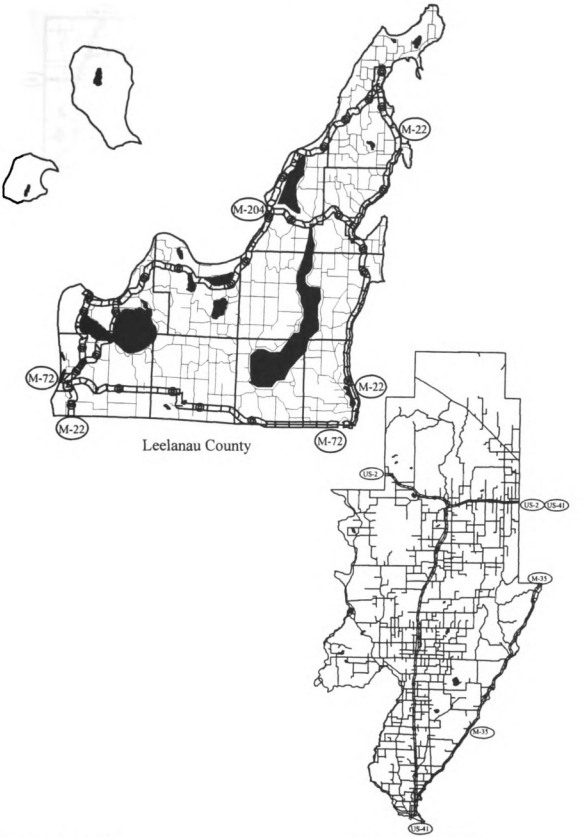
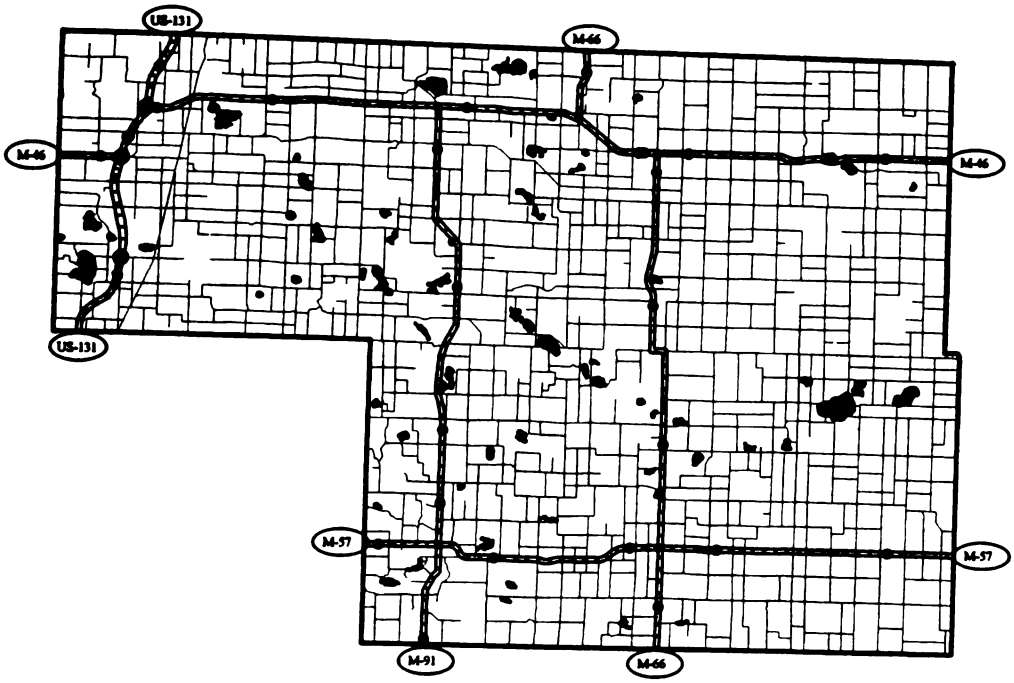
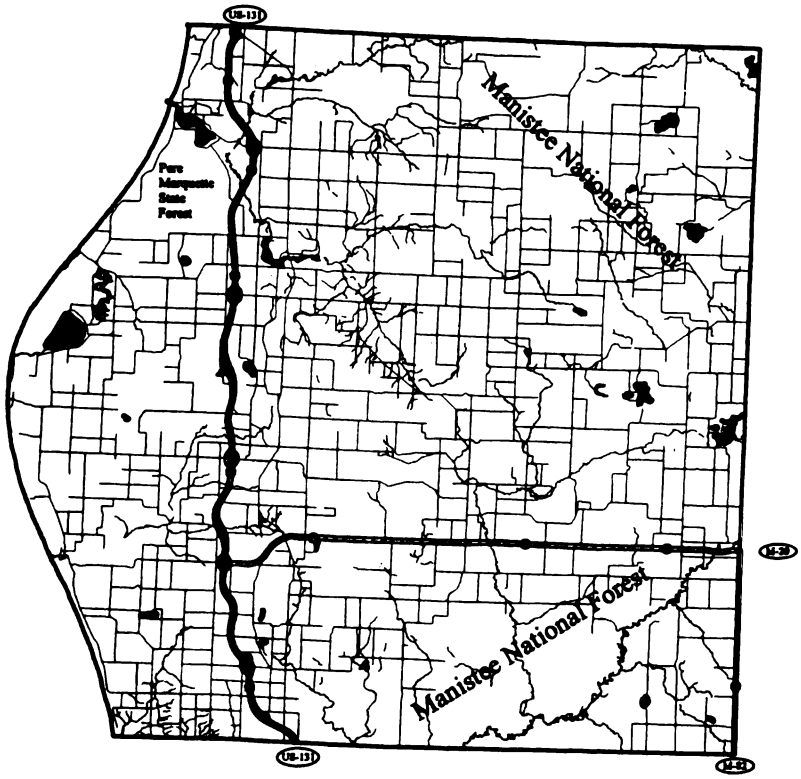


Figure 10 (cont'd).

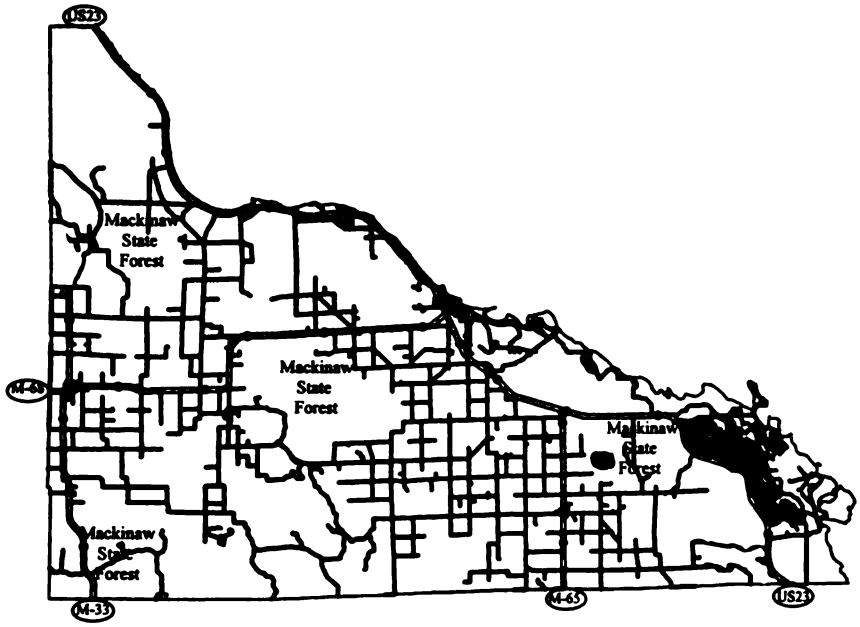


Montcalm County



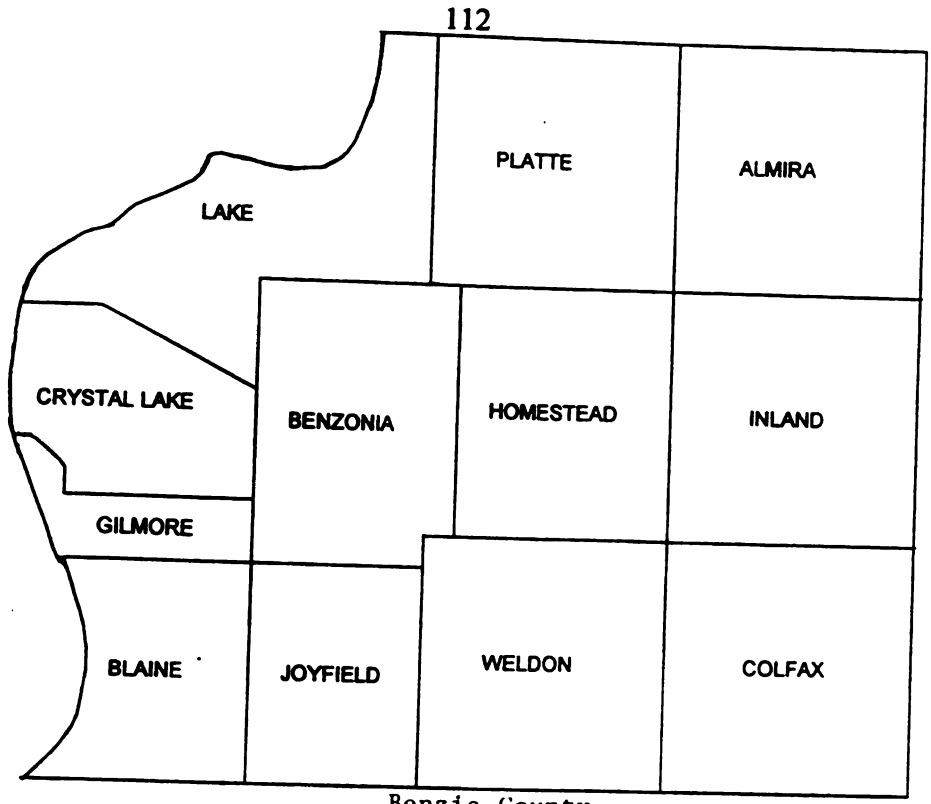
Oceana County

Figure 10 (cont'd).

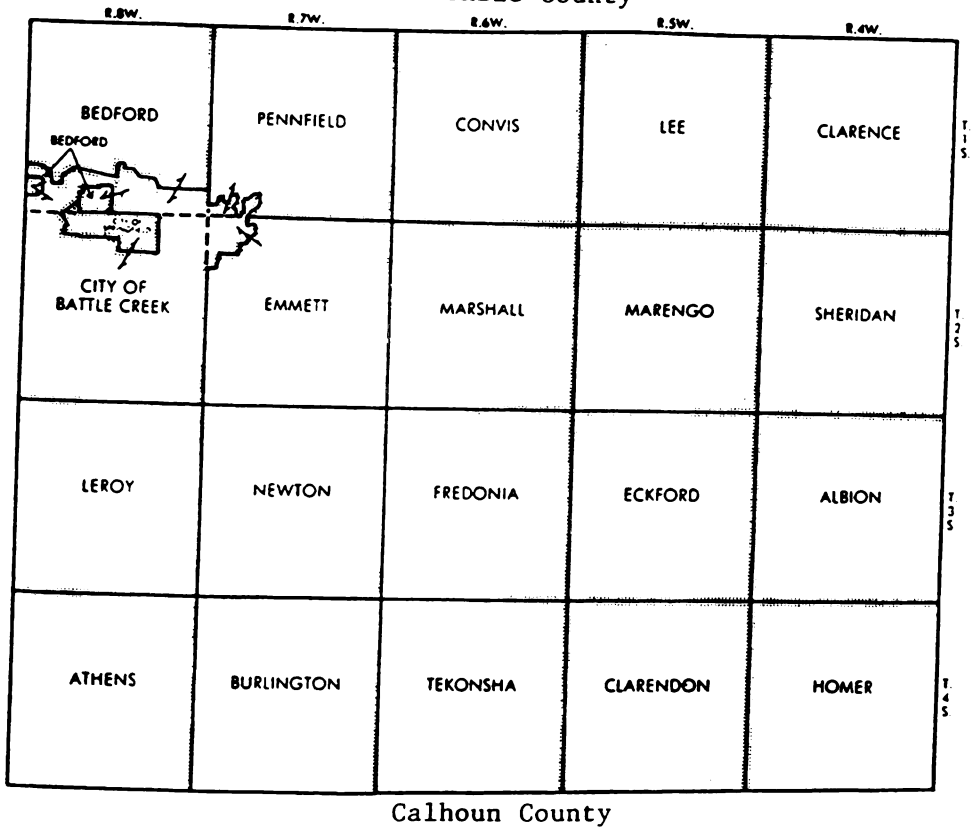


Presque Isle County

Figure 10 (cont'd).



Benzie County



Calhoun County

Figure 11. Maps of study counties included in the 1995 Opinion Survey of Michigan Producers about Deer and Deer Management, shown the size that they appeared in the survey.

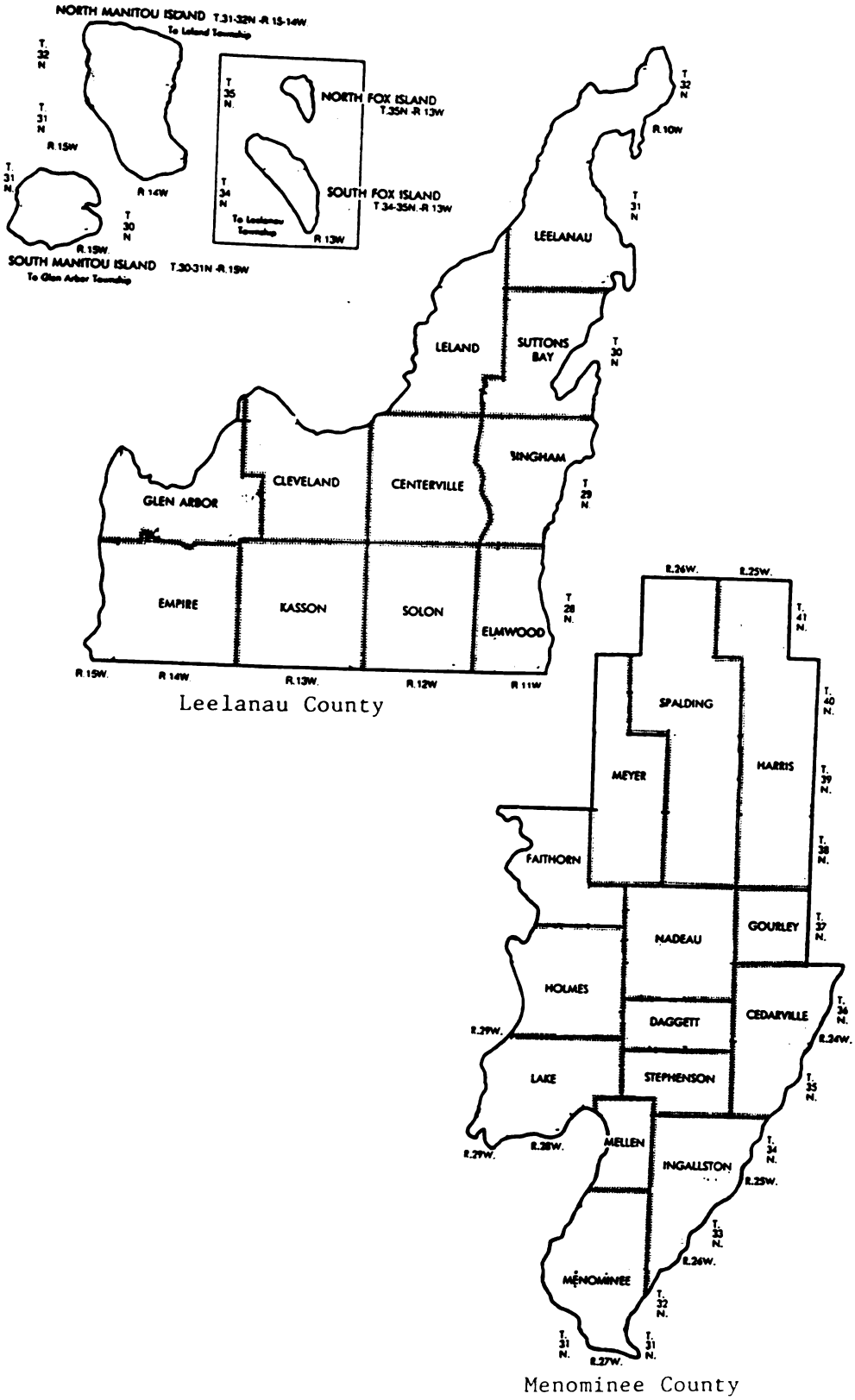
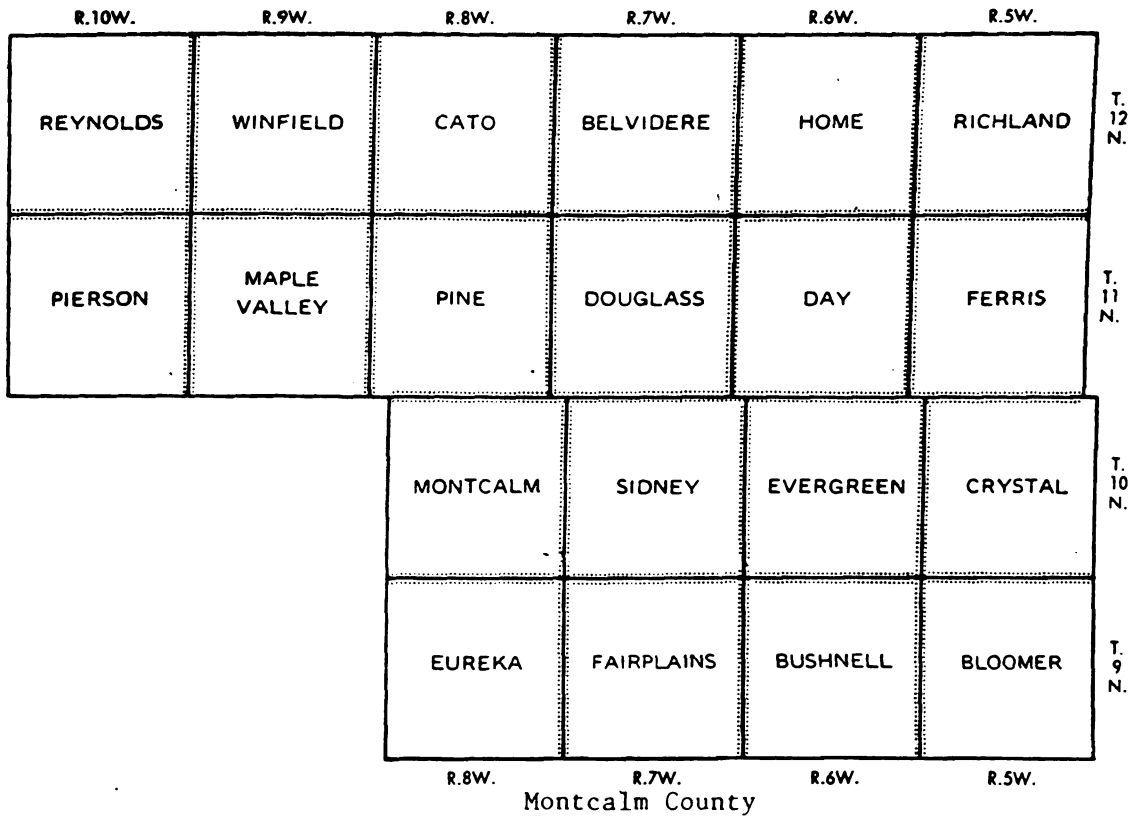
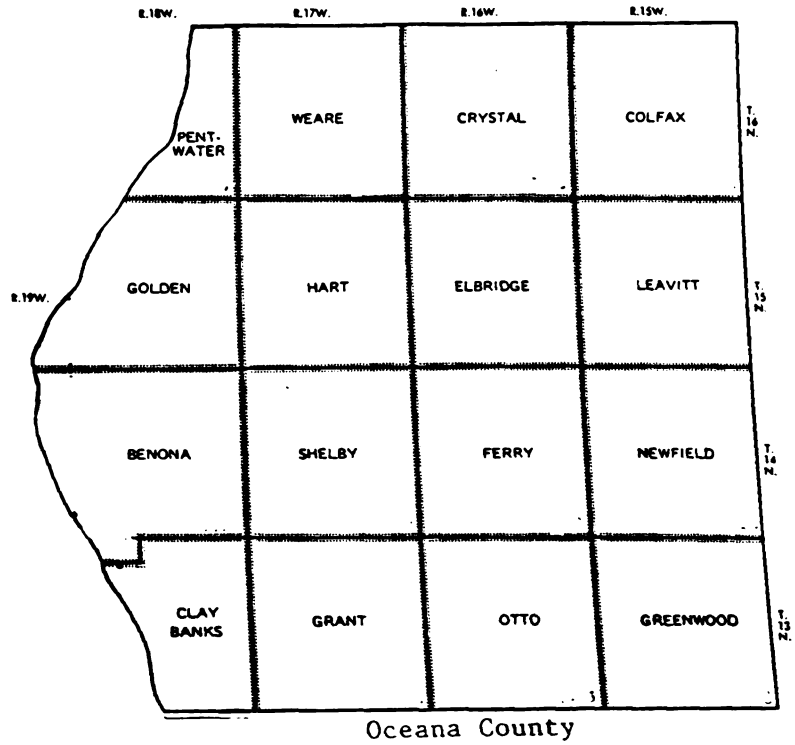


Figure 11 (cont'd).

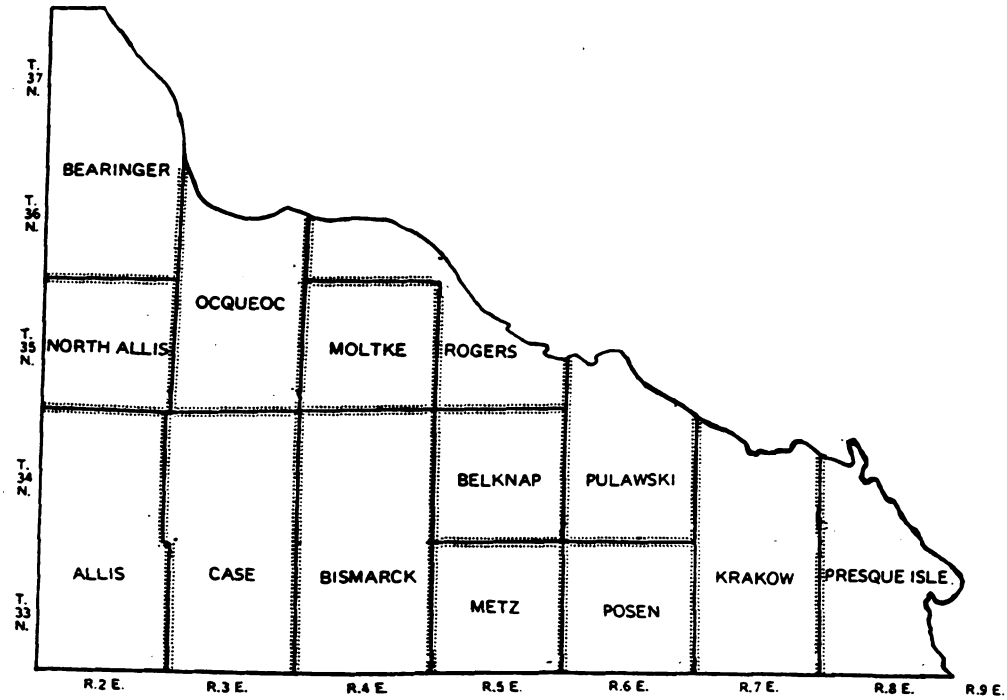


Montcalm County



Oceana County

Figure 11 (cont'd).



Presque Isle County

Figure 11 (cont'd).

Estimation

Subsequently, respondents were asked to provide their best estimate of the average number of deer per square mile in October 1994 for the area in which they had hunted or farmed most often, respectively. To allow for a range of estimates, a lower and upper end of deer density estimation was allowed (Appendix F, Question #22; Appendix G, #55).

In addition, it was assumed that the difference between the lower and upper ends of the deer density estimation would provide an indicator to the respondents' confidence in his/her estimate (Russo and Schoemaker 1989). Respondents who provided a smaller range in their estimate of the average deer density were assumed to be more confident in their estimate. Based on this assumption, a confidence index was calculated by subtracting the lower end of the estimated deer density range from the upper end of the estimated deer density range (Appendix F, Question #22, second blank minus first blank). These confidence indices were then compared for different respondent segments.

Because estimating deer density is a guessing process at best, we believed that respondents might react negatively to being asked to provide figures for deer density estimates. To minimize item non-response, respondents were given the opportunity to indicate that they did not know the deer density estimate. However, we suspected that a straightforward "I Don't Know" or "Not Sure" response option would have provided too easy of an out for the respondents and would have discouraged an estimate from those who might otherwise have made a guess. Consequently, a response option that was designed to be more restrictive was provided (i.e., "I have no idea whatsoever).

Tolerance Measurement

Linking Tolerance to Actual Deer Densities

Respondents were then asked to rate the deer density that they had estimated (Appendix F, Question #23; Appendix G, Question #56). No filter was used, so all respondents, including those who did not provide an estimate of deer density, were allowed to answer the tolerance item. To be consistent with the cultural carrying capacity model described earlier, this single-item indicator of tolerance was designed to reflect the various dimensions of the vertical axis of the CCC framework: satisfaction; tolerance for too few or for too many deer; and intolerance for too few or for too many deer. To measure this proposed tolerance construct, the response scale involved both an attitudinal component and an intention component regarding the perceived deer density. In addition, in an attempt to encourage a weighing of perceived costs and benefits associated with deer, respondents were cued to consider both the positive and negative impacts of deer to themselves and to the local community in the county.

This approach to tolerance measurement for use in the CCC framework involved two steps. The first was to connect the respondents' tolerance of deer with corresponding perceived deer densities, with full recognition that stakeholder perceptions of deer densities are likely to be tenuous at best. The second was to link perceived deer densities with actual deer densities (i.e., MDNR Wildlife Division estimates of deer densities) to try to chart the relationship between tolerance and actual deer densities as proposed in the CCC framework. However, this approach was fraught with complications. One constraint was the use of actual deer densities as the independent variable in the CCC

framework. The problem was that MDNR deer density estimates are strictly indices to the relative abundance of deer and should not be evaluated as absolute quantities. That is, the only legitimate and justifiable usage of MDNR deer density estimates involves either temporal comparisons or comparisons across geographic ranges at one time of the relative abundance of deer, assuming that MDNR data collection and estimation techniques are consistent (Leopold et al. 1984). Thus, the tentative conclusion was that the most appropriate application of the CCC framework may likely be to monitor concomitant changes in tolerance and deer densities over time and not to evaluate tolerance at any one point in time.

However, two types of static analyses were undertaken. First, stakeholder estimates of deer densities were compared across the study counties with regard to the actual relative abundance of deer and the associated tolerance levels. Secondly, deer hunter and farmer deer density estimates were compared with MDNR deer density estimates to evaluate their congruence (i.e., "accuracy"). Because MDNR estimates are indices (i.e., they are precise but are not necessarily accurate), the term "congruence" will be used instead of "accuracy" in the comparisons between stakeholders' estimates and MDNR indices. Due caution is advised in the evaluation and interpretation of the congruence of stakeholders' deer density estimates.

Measuring the Parameters of the CCC Framework

In total, respondents were asked to provide four different estimates related to the size of the deer herd in the area of the county where they hunted or farmed most often (Appendix F, Questions #24-26; Appendix G, Questions #57 and 58, parts A and B):

(1) the average number of deer per square mile as of October 1994, as discussed previously,

(2) the number of deer per square mile that would be most desirable to them,

(3) the minimum number of deer per square mile that they would be willing to tolerate (i.e., the "minimum demand"), and

(4) the maximum number of deer per square mile that they would be willing to tolerate (i.e., the "wildlife acceptance capacity").

These four estimates were used to specify the response curves in the CCC framework through a two-step computation. First, each of the latter three estimates was divided by the first estimate for each respondent. This standardized their preferred deer densities to what they believed was the actual deer density in the area. Then, each of the resultant quotients was multiplied by the MDNR deer density index for the respective DMU, and the mean value for each point served as the horizontal axis measure. DMUs in the same county with the same MDNR deer density index were combined.

Response "curves" were charted by plotting the three means for each respondent segment: the minimum demand (the far left point in the curve which was the lower bound to the latitude of acceptance), the most desirable deer density (the inverse apex of the curve), and the wildlife acceptance capacity (the far right point in the curve which was the upper bound to the latitude of acceptance). Each of the deer density preference questions was phrased in a way to elicit the vertical axis (tolerance) of the CCC framework as well as the deer density value. Points were connected with a straight line.

Because we wanted the threshold values for these points, only one blank was provided for each of the latter three estimates rather than a range as in the deer density estimate item. Following the same logic behind the deer density estimation item, the "I

have no idea whatsoever" response option was provided for each of these three items. Also, similar to the logic used in the development of the tolerance item, respondents were explicitly asked to consider the positive and negative impacts of deer before offering their estimates of the minimum and maximum number of deer they would find intolerable.

The range which contains the central 50% of the scores was plotted for each of the three points (i.e., the distance between the first and third quartile points; the interquartile range) (Minium 1970). This measure of variability was chosen because it provided meaningful information for policy makers (i.e., information about "the majority").

Causal Modeling

Structural Equation Modeling

Structural equation modeling (SEM) is a statistical procedure that allows for analysis of causal and interactional relations among unobservable theoretical constructs (i.e., latent variables) which are approximated by a set of directly observable variables (i.e., indicator variables) (Fassinger 1987). A complete SEM includes a structural component of hypothesized causal relations among latent variables and a measurement component that defines relations between latent variables and their indicators (Fassinger 1987). The former component is essentially a path model, and the latter component is essentially a factor analytic model similar to that commonly found in psychometrics (Hunter and Gerbing 1982, Long 1983). The complete SEM, then, is said to represent a merger of psychometrics and econometrics (Long 1983).

SEM is also called "covariance structure analysis" because the relationships among the indicator variables are characterized by the covariances among them (Long

1983). The covariance matrix derived from the indicator variables is decomposed by a model that assumes that latent variables are generating the pattern or structure among the observed variables (Long 1983).

In a full SEM, structural and measurement relations or parameters can be represented as algebraic formulations, or a series of regression equations, which are equivalent to the path diagram representation of the model (Jöreskog and Sörbom 1993). Factor loadings and structural relationships appear as standardized coefficients of the paths (Jöreskog and Sörbom 1993). Several computer software programs have been developed to generate estimates of model parameters and goodness-of-fit indices. Depending upon the computer program available, the regression equations may be used directly or may be transformed into parameter matrices in order to specify the model to be analyzed (Fassinger 1987). Analysis of this information for different models enables the researcher to modify and retest the theoretical model, so, along with confirmation, some degree of exploration of the theoretical model is possible.

Error

Both the structural and measurement components are assumed to include some error. For the structural component, the error terms result from the prediction of latent variables from other latent variables and are essentially residuals that may be random or may be the result of systematic influences not explicitly modeled (Fassinger 1987). For the measurement component, error terms result from the imperfect approximation of the latent variables by their indicators and are similar to errors in measurement in classical test theory (Fassinger 1987).

"Simultaneous" Testing of Measurement and Path Models

The covariance structure model (e.g., in the form used by LISREL®) consists of the simultaneous specification of a measurement model and a structural model (Long 1983). However, it is generally recommended that the factor analytic model be examined separately from the path model to aid in item evaluation and construct development *prior* to testing the path model (Gerbing and Hunter 1980, Fassinger 1987). In fact, although a full SEM theoretically involves the "simultaneous" testing of the structural and measurement models, in practice the path model and the factor analytic model are usually examined separately. The developers of LISREL® themselves recommend this two-step model testing approach when they assert that the testing of structural relationships among latent variables may be meaningless unless it is *first* established that the measurement model holds (Jöreskog and Sörbom 1993). Once it is established that the measurement model holds, the value of including the measurement component in the testing of the path model is judged by some to be tenuous and may serve only to render diagnosis of error more difficult (F. Boster, Mich. State Univ., pers. commun. 1996). For this research, measurement properties were investigated first, and then the path model was tested both with and without the measurement component included.

Software Packages

Two different software packages were used to test the measurement and structural components of the model: (1) Linear Structural Relations program (LISREL®8) software, which uses maximum likelihood by default to estimate parameters (it can also be programmed to use a number of other estimation approaches, including least squares) (Jöreskog and Sörbom 1993), and (2) the program PACKAGE, which uses ordinary least squares estimation of parameters (Hunter and Cohen 1969, Hunter 1987, Hunter and Hamilton 1992a,b). Indices formed by summing the respective measurement items were used as the latent variable measures in the analysis of the path model.

Measurement Properties

To make sure that the measurement model was viable, the two essential measurement properties of reliability and validity were carefully evaluated.

Reliability

The path diagram of the measurement component of the full SEM defines the relations between latent variables and their indicators (Figure 12). Each latent variable has directional arrows leading to its indicators, and each arrow represents the factor loading for the respective indicator (weights used to represent the proportion of variance in those measures accounted for by their underlying latent constructs) (Fassinger 1987). The factor loading, the squared multiple correlation (R^2), is a measure of the strength of the linear relationship. In the measurement model, R^2 is interpreted as the reliability of the observed measure and should be as close to 1.0 as possible (Fassinger 1987). The reliabilities were estimated by coefficient alpha using SPSS® (SPSS Inc. 1993) (Table

12). Reliabilities for single-item constructs were assumed to be 1.0.

Validity

To evaluate the measurement model's validity, deer hunter survey data were transformed into a covariance matrix for use by LISREL® and into a correlation matrix for use by PACKAGE (via the CFA module). These matrices were used in confirmatory factor analysis (CFA) to test the dimensionality of the measures. Basically, CFA is a data analytic procedure for testing whether theoretical relationships appear in observed data (Jöreskog and Sörbom 1993). Unlike exploratory factor analysis which aims to discover data structure, CFA tests a model that was based on *a priori* information about the data structure. If the factor analytic model fits the data well, the factor loadings, some contend, may be interpreted as validity coefficients (Bollen 1989, Jöreskog and Sörbom 1993).

Based on assessments of internal consistency (for those factors that were over identified) and parallelism, the CFA resulted in the retention of 20 measurement items. A schematic of the measurement model is presented in Figure 12, and the indicators used are listed in Table 12.

Perceived Oversight Scale

Six items were included in the scale designed to represent deer hunters' perceptions of how well the resource management agency administers, regulates, and monitors the crop damage control permit program. For lack of a better term, this construct was called "perceived oversight." The second and third items addressed perceptions associated with the equitable allocation of deer and deer hunting

opportunities related to the permit systems. The first and fourth items dealt with the issuance of the permits, and the last two items dealt with perceived abuses associated with the implementation and monitoring of the permits.

Perceived MDNR Credibility Scale

One clarification regarding construct development warrants mention so that readers might avoid misinterpretation. The construct dealing with the perceived credibility of the Michigan Department of Natural Resources was restricted to perceptions of deer management credibility. It was not intended to serve as an overall agency credibility variable and should not be interpreted to be stakeholders' perceptions of the MDNR as a whole.

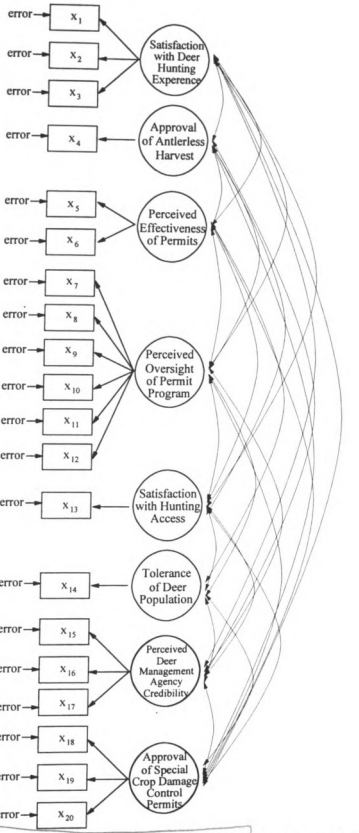


Figure 12. Eight-factor confirmatory factor analysis model. Measurement items are presented in Table 12.

Table 12. Measurement items depicted in Figure 12.

Construct	Scale Reliability[a]	Notation in Figure 12.	Item in Deer Hunter Survey Instrument (Question No.)[b]
Deer Hunting Satisfaction in Study County	0.87	x_1	"How would you describe your level of satisfaction with your overall deer hunting experience in [county name] county in the most recent year that you deer hunted there?" (11)
		x_2	"How would you describe your level of satisfaction with your deer harvest in [county name] county in the most recent year that you deer hunted there?" (16)
		x_3	"How would your describe your level of satisfaction with the number of bucks you saw while actually deer hunting in [county name] county (most recent year)?" (17)
Approval of Antlerless Harvest	1.0	x_4	"Please check the one statement that best describes your opinion about the legal recreational harvest of antlerless deer." (6)[c]
Perceived Effectiveness of Crop Damage Control Permits	0.93	x_5	"How would you describe the effectiveness of [Shooting Permits] at significantly reducing corn crop loss caused by deer in [county name] county during 1994?" (61, part 2)[d]
		x_6	"How would you describe the effectiveness of [Block Permits] at significantly reducing corn crop loss caused by deer in [county name] county during 1994?" (61, part 3)[d]
Perceived Oversight of the Crop Damage Control Permit Program by the MDNR	0.81	x_7	"In general, farmers should not receive permits to kill deer unless they have made reasonable attempts to control loss in other ways (such as fencing, using repellents, etc...)." (34)
		x_8	"Killing deer on farms to protect crops noticeably decreases the deer available in the areas where I hunt." (39)
		x_9	"If regular antlerless permits (lottery) are not available in the area, then permits to kill deer to control crop losses due to deer should not be available in that area either." (38)
		x_{10}	"Too many people who do not farm as their primary occupation receive permits to kill deer to control crop loss." (41)
		x_{11}	"Too many farmers try to get Block Permits for reasons other than controlling crop losses." (56a)
		x_{12}	"Too many of the deer killed on Shooting Permits are not utilized." (51d)
Satisfaction with Hunting Access	1.0	x_{13}	"In general, I am satisfied with the number of farmers who allow access to their land to hunters other than their relatives or friends." (35)

Table 12 (cont'd).

Tolerance of Deer	1.0	x_{14}	"Considering both the positive and negative impacts of deer to yourself and the local community in [county name] county, how would you describe your reaction to the number of deer per square mile that you indicated in the above question (#22)?"[e] (23) (Question #22 asks respondents for their best estimate of the average number of deer per square mile in October of 1994 in the area of the study county where they hunted most often during the November firearm season.)
Perceived MDNR Deer Management Credibility	0.84	x_{15}	"The DNR has the expertise to manage the state's deer herd." (28a)
		x_{16}	"I trust the DNR to fairly consider the interests of deer hunters when making decisions about how to manage the state's deer herd." (28b)
		x_{17}	"The DNR has enough information on the deer population to adequately decide how many deer to harvest in Michigan each year." (28c)
Approval of Crop Damage Control Permits	0.73	x_{18}	"To what extent do you approve or disapprove of the DNR's policy of intentionally reducing deer numbers in certain areas in order to decrease the extent of deer damage to agricultural crops?" (31)
		x_{19}	"To what extent do you approve or disapprove of the current Shooting Permit system?" (50)
		x_{20}	"To what extent do you approve or disapprove of the current Block Permit system?" (55)

[a] Coefficient Alpha.

[b] Appendix F. Most items, except those noted, employed a 5-point Likert-type scale, with a 1 coding the favorable response.

[c] Three-point Scale: 1 (Supportive and Willing); 2 (Supportive but Unwilling); 3 (Oppose). "Not Sure" responses excluded.

[d] Scale from 1 (Very Effective) to 4 (Not Effective). "Unsure" responses excluded.

[e] Three-point Scale: 1 (Satisfactory Number of Deer, response option 3); 2 (Tolerable Number of Deer, response options 2 and 4 combined); 3 (Intolerable Number of Deer, response options 1 and 5 combined).

Criteria for Judging a Causal Model

Several different criteria have been used to judge the acceptability of a path model. Three of those—explained variance, path significance, and measures of fit—are discussed here.

Explained Variance

One of the traditional criteria for judging the success of a regression analysis is R^2 (Biddle and Marlin 1987). For the structural component of a full SEM, the R^2 is an indication of the proportion of variance in each variable accounted for by the other latent variables (Fassinger 1987). A small R^2 indicates a weak relationship, suggesting that the model is not effective (Jöreskog and Sörbom 1993).

Significance of Paths

A *t*-value can be computed for each estimated parameter in the model. The *t*-value is the ratio between the estimate and its standard error, and if a *t*-value exceeds a certain level, the corresponding parameter is said to be significant (Jöreskog and Sörbom 1993). Significance indicates that the researcher can be fairly confident that the corresponding variable directly influences the dependent variable (Jöreskog and Sörbom 1993). For this path analysis, the significance level was set at 0.05, and *t*-values greater than 2.0 in magnitude were considered significant (Fassinger 1987). A path that produces a *t*-value less than 2.0 may not be necessary in the model and could be eliminated to obtain a more parsimonious solution without sacrificing important explanatory information (Fassinger 1987).

Measures of Fit

To test the plausibility of the model in the population, a chi-square (χ^2) value can be employed as a global measure of fit. Chi-square is a measure of overall fit of the model to the data and measures the discrepancy between the sample covariance matrix and the fitted covariance matrix (Jöreskog and Sörbom 1993). For SEM analysis, χ^2 goodness-of-fit tests test the null hypothesis that the observed covariance matrix was generated by the hypothesized model against the alternative hypothesis that the covariance matrix of the observed variables is unconstrained (Long 1983). "Chi-square is calculated as N-1 times the minimum value of the fit function, where N is the sample size" (Jöreskog and Sörbom 1993:122). The null hypothesis is rejected if the likelihood ratio test statistic exceeds the (1-α) percentile of the χ^2 distribution with specified degrees of freedom (t minus the number of parameters) (Jöreskog and Sörbom 1993). Rejecting the null hypothesis indicates that the hypothesized model does not adequately reproduce the observed covariance matrix and suggests that the model is not plausible in the population (Long 1983, Fassinger 1987). Alternatively, a nonsignificant χ^2 suggests that the hypothesized model fits the data. In this usage, χ^2 could be considered a badness-of-fit measure, as a small χ^2 corresponds to a good fit, and a large χ^2 corresponds to a bad fit (Jöreskog and Sörbom 1993).

Because χ^2 is calculated as a multiplicative of sample size, it tends to be large in large samples if the model does not hold exactly in the population (Jöreskog and Sörbom 1993). Consequently, models that hold approximately in the population will tend to be rejected in large samples (Jöreskog and Sörbom 1993). Thus, as is the problem with

many other significance tests, the χ^2 test will indicate that almost any relation is significant given a large enough sample size. In an attempt to reduce the dependence on sample size, several other goodness-of-fit measures, all of which are variates of χ^2, have been proposed (Bollen 1989, Jöreskog and Sörbom 1993). For instance, Hoelter (1983) proposed the index, "critical N," to supplement other fit measures by providing an estimate of the sample size necessary for statistical acceptance of a given model.

Another assessment of model fit involves an evaluation of the residuals. That is, because it is highly unlikely that a perfect fit will exist between the observed data and the hypothesized model, there will be a differential, or residual, between the two (Byrne 1989). The size and direction of these residuals can be judged to determine if the predicted values fall within sampling error of those obtained.

Assumptions in SEM

Three assumptions were made for the structural equation model analysis and are similar to those required for any regression analysis technique for examination of data. First, it was assumed that the empirical data used were a random sample that met the assumptions of parametric tests. For instance, the assumption of multivariate normality was required for the analysis of covariance structure models (Long 1983). Second, it was assumed that the relationships between variables are linear. In support of this assumption, an inspection of the scatterplots produced no evidence of nonlinearity. Third, a fundamental assumption in structural equation modeling is that the error term in each relationship is uncorrelated with all the independent constructs (Jöreskog and Sörbom 1993).

Hypothesized Path Model

For this research, a tentative model was specified *a priori* (Figure 13). The relations among the latent variables are shown by directional arrows which represent regression weights in the structural equations.

In this model, I hypothesized that one latent independent variable (satisfaction with deer hunting experience) directly affected deer hunters' evaluation of the deer population and the state agency's ability to manage deer. Four latent independent variables were hypothesized to directly affect deer hunters' evaluation of special crop damage control permit programs. These independent variables were

(1) approval of the harvest of female deer,

(2) perception of the effectiveness of the permits at controlling deer crop damage,

(3) perception of the degree to which the permit program is overseen by the resource management agency, and

(4) satisfaction with hunting access provided by farmers.

The independent latent variables were presumed to be the result of influences outside the current model that are either unknown or of no interest in this study (Fassinger 1987). The dependent latent variables were presumed to be the result of other variables in the model.

Two latent dependent variables (deer hunters' evaluation of the deer population and their evaluation of the state agency's ability to manage deer) were hypothesized to directly affect evaluation of special crop damage control permit programs.

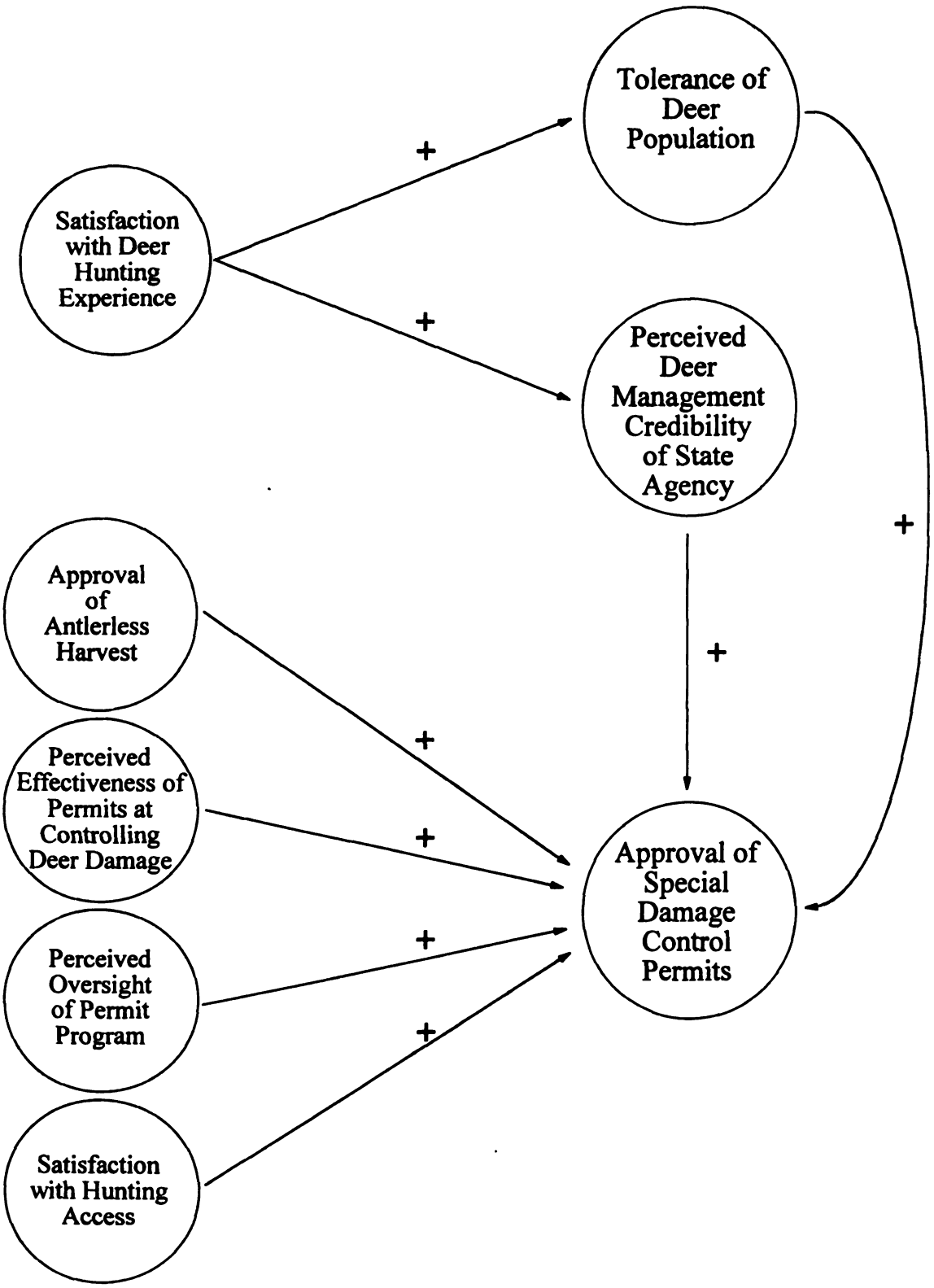


Figure 13. Hypothesized causal paths associated with deer hunters' approval of special deer damage control permits.

Model Generation

LISREL8® and PACKAGE (via the PATH module) were used to examine the model's fit in the population from which the sample was drawn. A sample covariance structure matrix was computed from the survey data and used to fit the model to the data and to test the model. The correlation matrix was corrected for attenuation due to error of measurement, and both the uncorrected and corrected matrices were tested.

Because the original model did not fit the data adequately, the model was modified and retested using the same data. Although a model was tested in each iteration, the whole approach might be more aptly referred to as model generating rather than model testing (Jöreskog and Sörbom 1993). Biddle and Marlin (1987:13) emphasized the importance of distinguishing between model testing and model generation by declaring that, "when [any path analysis software] is used to assess several different models and the user reports only that model which produced the best fit to the data, the research process is inductive, not deductive. No hypothesis is being tested, no theory is assessed, no causal model is 'confirmed.'" These authors stressed, however, that this does not invalidate the potential usefulness of the model generation process.

Estimations of the parameters and error terms in the model and several measures of goodness-of-fit of the model to the sample data were examined through an iterative process until a plausible model satisfactorily approximated the observed data. Evaluation of the model and assessment of fit were done not only on statistical but also substantive grounds. That is, there was substantive justification for including or excluding effects. Because each model adjustment was carefully guided by logical reasoning and was

theoretically defensible, the model generation process was not "ex-post-facto mucking around with the data," as Biddle and Marlin (1987:15) warned against.

Ideally, the final step in testing this model would have been to use a new sample from the same population (or a randomly assigned half of the original sample not used during the first testing period) to evaluate its fit (Fassinger 1987). However, due to the restricted sample size available, this step was not done.

Cautions in Model Testing

A model that fits the data based on interpretation of the goodness-of-fit statistics is not necessarily the correct model or even the best model (Jöreskog and Sörbom 1993). To conclude that the fitted model is the best one, *all* models equivalent to it must be able to be excluded on logical or substantive grounds (Jöreskog and Sörbom 1993). In addition, SEM is subject to the fundamental principle of scientific inference that data do not positively confirm a model but only fail to disconfirm it (Popper 1959, Fassinger 1987). Moreover, even if an SEM is not disconfirmed, the presumption of the presence of causal relations remains tenuous. That is, the evidence with which path models are tested is merely associational, and the strongest conclusion that can be drawn is that the pattern of observed associational relations has been correctly predicted (Biddle and Marlin 1987).

CHAPTER 4

RESULTS

Overview of this Chapter

This chapter begins with a comprehensive profiling of the deer hunter respondents and a brief profiling of farmer respondents. Additional details on farmer respondents can be found in Fritzell (1996). Three sections on hypotheses are also presented (Table 13). The first addresses the two hypotheses regarding the study design. The next addresses the hypotheses regarding measurements associated with the CCC Framework. The final section addresses the hypotheses regarding deer hunter attitudes toward special deer-crop-damage lethal control programs. Overall means or frequencies of responses for each item in the deer hunter survey and the farmer survey are provided in Appendix F and Appendix G, respectively.

Respondent Profile

Deer Hunters

Response

A total of 792 surveys were returned, with 56% (n= 444) of the deer hunter respondents living in and hunting in a study county and 44% (n=348) living outside of the study counties but traveling to one of them to deer hunt (Table 14). Forty-two of the surveys were not deliverable (18 from the live-in segment and 24 from the live-out

segment). After accounting for the undeliverable surveys, the overall response rate was 65.2%, with those who lived outside the study counties having a slightly higher response rate than those who lived in a study county (Table 14). Most surveys were returned within the first 2 weeks following mailing (Figure 14).

Nonresponse

Of the 149 targeted nonrespondents, 67 individuals agreed to answer the questions; 19 were unwilling or unable to talk with us; 32 were never at home; 17 of the phone numbers were disconnected or the wrong number; 10 individuals had moved or were deceased; and two claimed not to be a hunter (Table 15). The incorrect numbers and individuals who had moved, died, or were not hunters were treated as non-reachables (n=29) and subtracted from the total calls, and this resulted in a success rate of 55.8%. Of the 67 deer hunters who talked with us over the phone, 43 lived in a study county, and 24 lived outside of a study county.

The small sample size of non-respondents limited the statistical comparisons that could be done. However, based on chi-square tests, no substantively important significant ($p<0.05$) differences were detected between mail survey respondents and nonrespondents. In addition, frequency distributions of the responses were similar to those of the mail survey responses, which may suggest non-response bias was inconsequential. A wide range of reasons for not responding were given, with the most common reasons being having no time to complete it (31%) and claiming to have never received one (28%) (Table 16).

Table 13. Summary of research questions and hypotheses in the order in which they are addressed in this chapter (See Chapter 2 for supporting rationale).

Research Questions	Hypotheses
Were the assumptions made during the design of the study valid?	Hypothesis$_a$ 1: Deer hunters who did not apply for an antlerless permit in 1993 are more likely to be opposed to antlerless deer harvest and unwilling to harvest antlerless deer compared to those who did apply for an antlerless permit in 1993. Hypothesis$_a$ 2: Farmer and deer hunter respondents who lived and/or hunted in Menominee or Presque Isle county were more likely to report engaging in issue activity in or around 1994 than were those who lived and/or hunted in Benzie, Calhoun, Leelanau, Montcalm, or Oceana county.
What measurements can be used to make the Cultural Carrying Capacity framework operational? Are some stakeholders more "accurate" in their perceptions of the deer population? How do the estimates of deer density by different segments of stakeholders differ?	Hypothesis$_a$ 3: Non-farming deer hunters believe that deer have been decreasing, whereas non-hunting farmers believe that deer have been increasing. Hypothesis$_a$ 4: Most deer hunters and farmers have perceptions of the deer population trend that are incongruent with the trend judged by MDNR field personnel (i.e., most stakeholders have "inaccurate" perceptions). Hypothesis$_a$ 5: Deer hunters who are residents of a study county are more likely to have perceptions of the deer population trend that are congruent with the trend judged by MDNR field personnel than are those who are not residents of the study county. Hypothesis$_a$ 6: Farmers who judge their losses to deer as intolerable are less likely to have perceptions of the deer population trend that are congruent with the trend judged by MDNR field personnel than are farmers who judge their losses to be tolerable or not a problem. Hypothesis$_a$ 7: Stakeholder deer density estimates are positively correlated with MDNR deer density estimates, with those who are full-time farmers who also deer hunt having the strongest positive correlation with the MDNR's deer density estimates. Hypothesis$_a$ 8: Deer hunters who live in the county where they deer hunt are more likely than deer hunters who live outside the county where they deer hunt to provide deer density estimates for the county that are positively correlated with MDNR deer density estimates for the county. Hypothesis$_a$ 9: Farmers who judge their crop losses to deer as intolerable will estimate higher deer densities than will farmers who do not judge their crop losses to deer as intolerable. Hypothesis$_a$ 10: There is greater overlap in preferences for deer ("latitudes of acceptance") for the four segments of respondents (based on hunting and farming participation) in counties with relatively low deer-management-related issue activity than in counties with relatively high deer-management-related issue activity. Hypothesis$_a$ 11: Deer hunters who live in a study county as compared to deer hunters who do not live in a study county are more confident in their estimate of the deer density in the county. Hypothesis$_a$ 12: Deer hunters who are members of an organization are more likely to offer an estimate of the deer density in the county than are nonmembers. Hypothesis$_a$ 13: Deer hunters who are members of an organization are more confident in their estimate of the average deer density than are nonmembers. Hypothesis$_a$ 14: Given the same MDNR deer density index, non-farming deer hunters believe there are too few deer, whereas non-hunting farmers believe that there are too many deer.
What factors are important considerations in deer hunters' tolerance of deer?	Hypothesis$_a$ 15: Deer hunters rank their personal benefits from deer as a more important consideration in their opinion of the deer density in the county than others' benefits from deer, the number of deer-related vehicle accidents, and farmers' crop losses due to deer. Hypothesis$_a$ 16: Deer hunters who live in a study county are more likely than those who live outside the county to rate the number of deer-related vehicle accidents as an important consideration in their opinion of the deer density in the county.

Table 13 (cont'd).

What factors are related to deer hunters' approval of Shooting and Block Permits?	Hypothesis$_a$ 17: Deer hunters have more favorable attitudes toward Block Permits than toward Shooting Permits. Hypothesis$_a$ 18: Deer hunters who have not been a designated shooter are more disapproving of Shooting Permits than are those who have been a designated shooter. Hypothesis$_a$ 19: Deer hunters who have not used a Block Permit are more disapproving of Block Permits than are those who have used a Block Permit. Hypothesis$_a$ 20: Approval of Shooting and Block Permits is highest among deer hunters who depend on farming for a living. That is, deer hunters whose primary occupation is farming are more likely to approve of Shooting and Block Permits than are deer hunters who have farmed to an extent but not as a primary occupation (i.e., "part-time farmers"), and both of these farming segments are more likely to approve of Shooting and Block Permits than are deer hunters who are not farmers. Hypothesis$_a$ 21: Deer hunters who have friends or family who are farmers are more likely to approve of Shooting and Block Permits than are those who do not have friends or family who are farmers. Hypothesis$_a$ 22: Deer hunters who were raised in a rural farming area are more likely to approve of Shooting and Block Permits than are those who were not raised in a rural farming area. Hypothesis$_a$ 23: Deer hunters whose families depended on farming during their youth are more likely to approve of Shooting and Block Permits than are those whose families did not depend on farming during their youth. Hypothesis$_a$ 24: Deer hunters who oppose the harvest of antlerless deer or are unwilling to personally harvest antlerless deer are more likely to disapprove of Shooting and Block Permits than are deer hunters who support the harvest of antlerless deer or are personally willing to harvest antlerless deer. Hypothesis$_a$ 25: Deer hunters who hunt on public land are more likely to disapprove of Shooting and Block Permits than are deer hunters who hunt on private land. Hypothesis$_a$ 26: Deer hunters who own or lease land where they can deer hunt are more likely to approve of Shooting and Block Permits than are those who do not own or lease land where they can deer hunt. Hypothesis$_a$ 27: Deer hunters who are members of a hunting-related organization are more likely to disapprove of Shooting and Block Permits than are non-members.
What factors are related to deer hunters' perceived deer-management credibility of the MDNR? How are tolerance of deer, agency credibility, and approval of crop damage control permits interrelated? What are the direct influences on approval of crop damage control permits?	Hypothesis$_a$ 28: Deer hunters who live in a study county have a more unfavorable rating of MDNR deer-management credibility than do deer hunters who live outside of a study county, with the ratings by both groups being unfavorable. Hypothesis$_a$ 29: Deer hunters who hunt in counties with relatively higher deer-management-related issue intensity are more likely to judge the MDNR credibility to manage deer as low than are those who hunt in counties with relatively lower deer-management-related issue intensity. Hypothesis$_a$ 30: Farmers who do not deer hunt and full-time farmers who do deer hunt are more likely than deer hunters whose primary occupation is not farming to feel that significantly more consideration should be given to farmers' interests than to hunters' interests by the MDNR when it sets deer population goals for the county. Hypothesis$_a$ 31: Deer hunters' tolerance of deer is directly influenced by their satisfaction with their deer hunting experience. Hypothesis$_a$ 32: Deer hunters' perceptions of the agency's deer management credibility are directly influenced by their satisfaction with their deer hunting experience. Hypothesis$_a$ 33: Deer hunters' attitudes toward the special deer damage control permit program are directly influenced by the following: a. approval of antlerless harvest b. the perceived effectiveness of the permits at controlling deer damage c. the perceived extent to which the permits are overseen by the MDNR d. satisfaction with hunting access e. the perceived credibility of the state agency to manage deer f. their tolerance of deer

Table 14. Deer hunter surveys sent and returned by study county, resident stratum, and antlerless application stratum.

Study County	County Resident Stratum	1993 Antlerless Deer License Stratum						TOTAL			
		Applied and Received One		Applied but Did Not Receive One		Did Not Apply					
		Sent	Ret.	Sent	Ret.	Sent	Ret.	Sent	Usable Returns	Non-deliverables	Adjusted Response Rate[c] (%)
Benzie	Live In	7	4	8	5	17	12	32	21	2	70.00
	Live Out	4	3	12	9	21	13	37	25	3	73.53
Calhoun	Live In	122	83	6	5	58	27	186	115	7	64.25
	Live Out	56	35	6	0	24	15	86	50	3	60.24
Leelanau	Live In	6	6	15	10	11	8	32	24	0	75.00
	Live Out	4	4	10	10	14	11	28	25	1	92.59
Menominee	Live In	8	5	7	4	65	35	80	46[b]	2	58.97
	Live Out	15	13	9	9	17	14	41	36	3	94.74
Montcalm	Live In	110	62	42	26	73	29	225	118[b]	2	52.91
	Live Out	67	45	21	15	30	18	118	78	3	67.83
Oceana	Live In	6	6	6	6	82	53	94	66[b]	4	73.33
	Live Out	12	7	32	20	69	36	113	63	9	60.58

Table 14 (cont'd).

Presque Isle	Live In	44	24	11	9	30	21	85	54	1	64.29
	Live Out	54	43	27	19	19	8	100	71[b]	2	72.45
TOTAL		515	340	212	147	530	300	1257	792	42	65.19
							Live In	734	444	18	62.01
							Live Out	523	348	24	69.74

[a] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").

[b] Five respondents (2 Menominee Live Ins; 1 Montcalm Live In; 1 Oceana Live In; and 1 Presque Isle Live Out) had removed the identification code from the survey which made it impossible to identify their antlerless application stratum. Thus, the value in this column for these rows does not equal the sum of the returns across antlerless deer license application strata.

[c] Response Rate = [No. Returned/(No. in Sample-No. of Nondeliverables)] x 100.

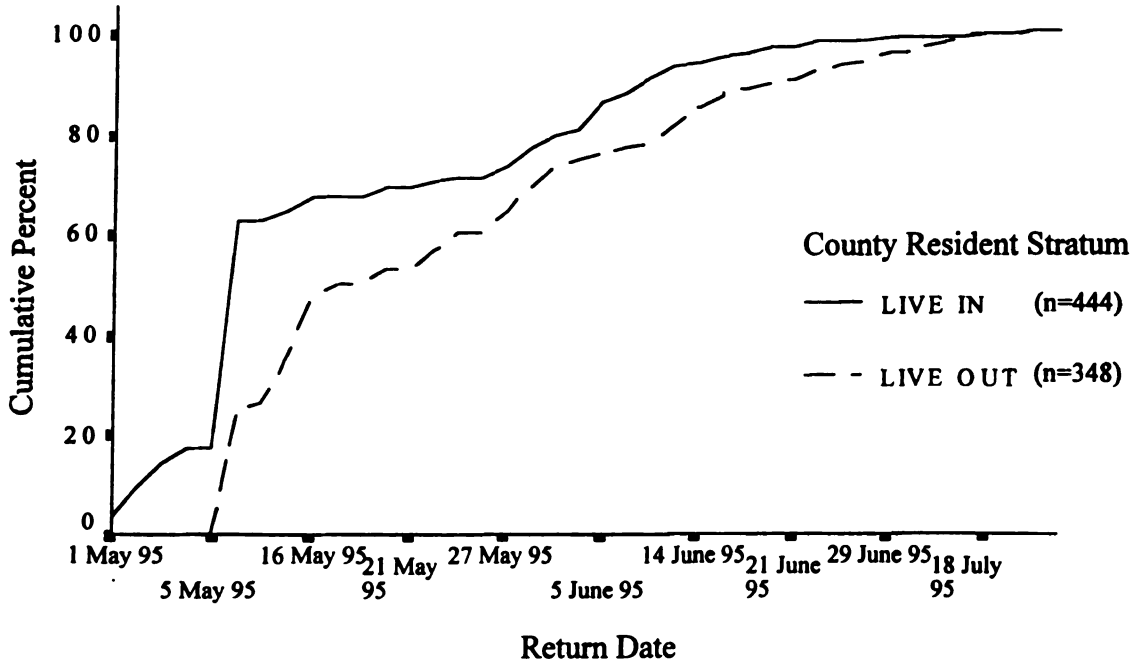


Figure 14. Cumulative response over time of deer hunters who responded to the 1995 Deer Hunter Opinion Survey, by resident stratum (n=792) (See Appendix F for the Mailing Schedule).

Table 15. Deer hunter nonrespondent survey information for each study county and resident stratum.

Study County	County Resident Stratum	No. of Nonrespondents Called	No. Surveys Completed	Non-Reachables[a]	Adjusted Success Rate(%)[b]
Benzie	Live In	9	7	1	87.5%
	Live Out	6	4	1	80.0%
Calhoun	Live In	19	7	1	38.9%
	Live Out	7	3	3	75.0%
Leelanau	Live In	5	3	1	75.0%
	Live Out	0	0	0	0.0%
Menominee	Live In	16	6	4	50.0%
	Live Out	0	0	0	0.0%
Montcalm	Live In	23	10	3	50.0%
	Live Out	6	4	1	80.0%
Oceana	Live In	13	6	1	50.0%
	Live Out	18	11	5	84.6%
Presque Isle	Live In	15	4	3	33.3%
	Live Out	12	2	5	28.6%
TOTALS		149	67	29	55.8%

[a] Incorrect or disconnected phone numbers and non-respondents who were deceased, had moved, or were not hunters.

[b] No. of nonresponse surveys completed/ (No. of Nonrespondents Called - Non-Reachables).

Table 16. Reasons provided by deer hunter survey non-respondents for not returning the survey.

Reason	Percent of Non-Respondents Providing this Reason (n=67)[a]
No Time to Complete It	31.3
Claimed Not to Have Received the Survey	28.4
Started to Answer Survey but Forgot to Finish	9.0
Lost the Survey	6.0
Thought they had Returned It	6.0
No Reason in Particular	6.0

[a] Each of the following reasons was provided only once:
Did not hunt in the study county.
Did not hunt in 1994.
Completing the survey "won't do any good."
The survey was "not important enough."
Completed it but simply did not mail it back.
Received too many other surveys.
Not Interested.
Could not read survey.
And, the classic, "my dog ate it."

Demographic Profile

As discussed in the study design section, those deer hunter respondents who did not live in a study county were residents of a county classified as a Metropolitan Area by the Bureau of Census (1990) (Table 17). As all of the metropolitan areas in Michigan are in the southern half of lower Michigan, it was not surprising that most of the deer hunter respondents lived in the southern half of lower Michigan (i.e., 79.4%, n=618, lived in the region of the state formerly classified as MDNR Administrative Region III) (Figure 15). Because there can be both urban and rural territory within a Metropolitan Area, respondents were asked to characterize the area in which they lived as either rural farmland, rural nonfarmland, small town, or an urbanized area (Appendix F, Question #73). About 47% (n=363) characterized the area in which they lived as rural farmland, and 11.2% (n=87) said they lived in a rural non-farm area. Just over 1 in 5 (21.6%, n=167) described the area where they lived as a small town (2,500 to 50,000 people), and another 1 in 5 (20.3%, n=157) described the area where they lived as urbanized (>50,000 people).

The age of respondents ranged from 16 years to 91 years, with the average age of respondents being 46.2 years (SD15.4, median=44, n=783) (Figure 16). The vast majority of respondents were males (94.0%, n=738). Most (62.8%, n=489) were high school graduates without a college degree, and 22.8% (n=178) had received a college degree (Figure 17). Of those who were willing to disclose the information, 62.8% (n=424) had a total gross household income in 1994 (before deductions) of between $25,000 and $74,999 (Figure 18).

Four percent of the deer hunter survey respondents (n=31) reported that farming was their primary occupation, about 6% (n=48) were retired farmers, and a fourth (n=195) reported that they farmed but not as a primary occupation (Table 18). Over half (57.5%, n=448) reported growing up in a rural farming area, and 29.3% (n=228) reported being raised in a family whose income was dependent on farming. Most (61.2%, n=477) reported having friends or family members who were farmers.

Table 17. County of residence during most of 1993 for those deer hunter survey respondents who did not live in a study county.

County in Michigan	Number of Individuals	Percent of Live Out Respondents from the County
Allegan	9	2.6%
Bay	1	0.3%
Berrien	6	1.7%
Clinton	8	2.3%
Eaton	17	4.9%
Genessee	22	6.3%
Ingham	24	6.9%
Jackson	9	2.6%
Kalamazoo	13	3.7%
Kent	53	15.2%
Lapeer	4	1.1%
Lenawee	2	0.6%
Livingston	4	1.1%
Macomb	22	6.3%
Midland	2	0.6%
Monroe	11	3.2%
Muskegon	36	10.3%
Oakland	11	3.2%
Ottawa	21	6.0%
Saginaw	14	4.0%
St. Clair	5	1.4%
Van Buren	2	0.6%
Washtenaw	4	1.1%
Wayne	47	13.5%
TOTAL	348	100.0%

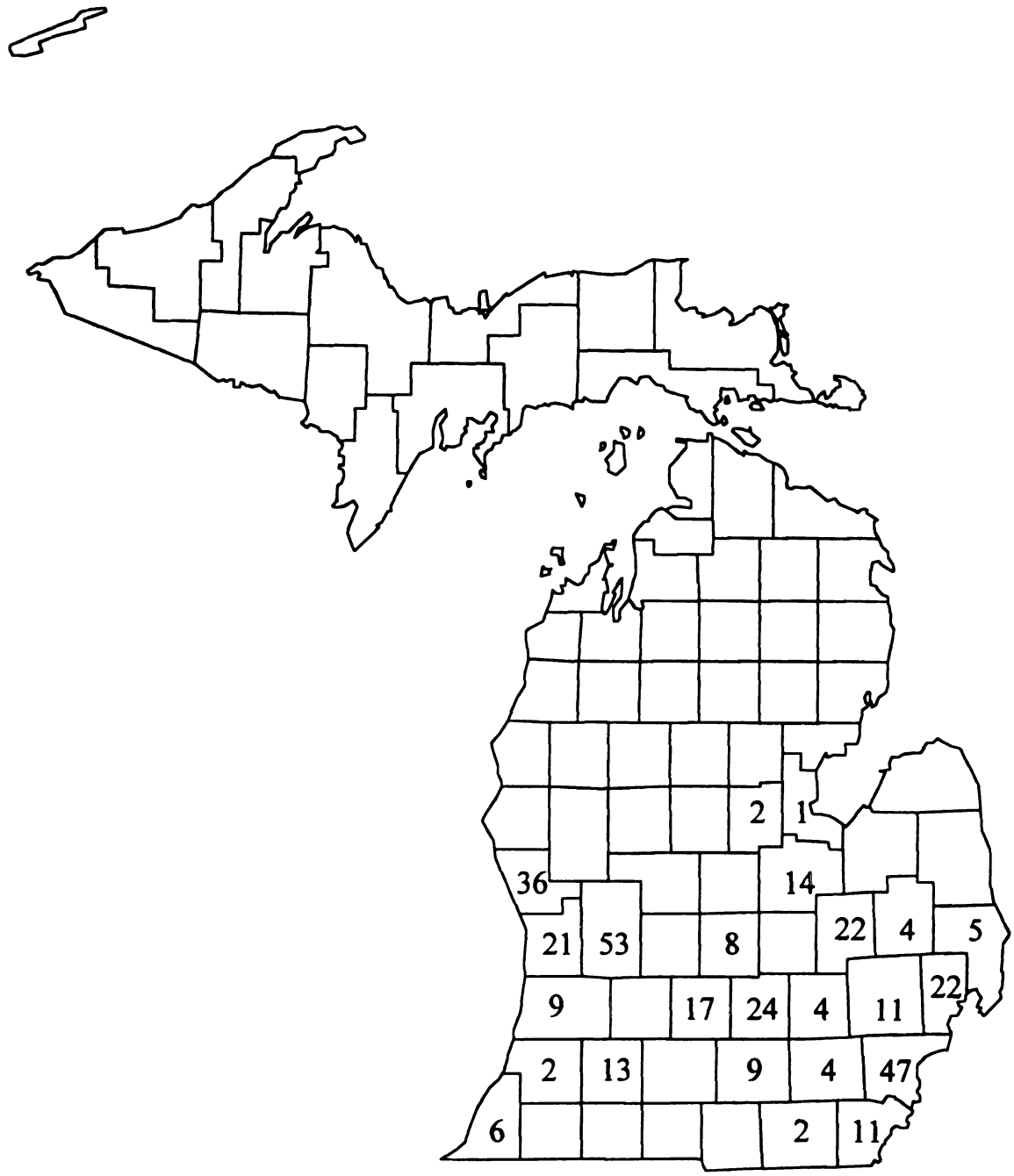


Figure 15. Deer hunter survey respondents across the Metropolitan Areas in Michigan. The number of respondents who resided in the county during most of 1993 is shown within the county (n=348). One Live Out respondent removed the survey cover, so the identification code was not available.

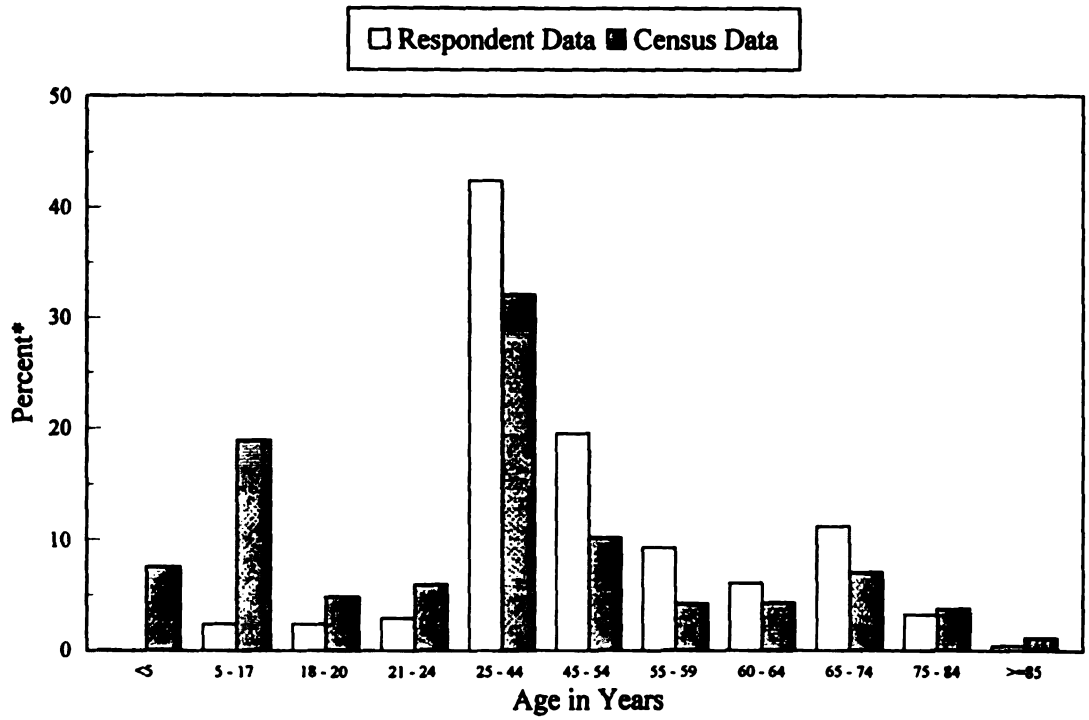


Figure 16. Comparison of the age distribution between deer hunter survey respondents and the overall Michigan population. (Note: Must be at least 14 years of age to purchase a Firearm Deer License.)

* For respondents, this is the percent of those who responded to the item who were this age in 1995 (n=783).
For census data, this is the percent of Michigan residents (N=9,295,297) (Bureau of Census 1990).

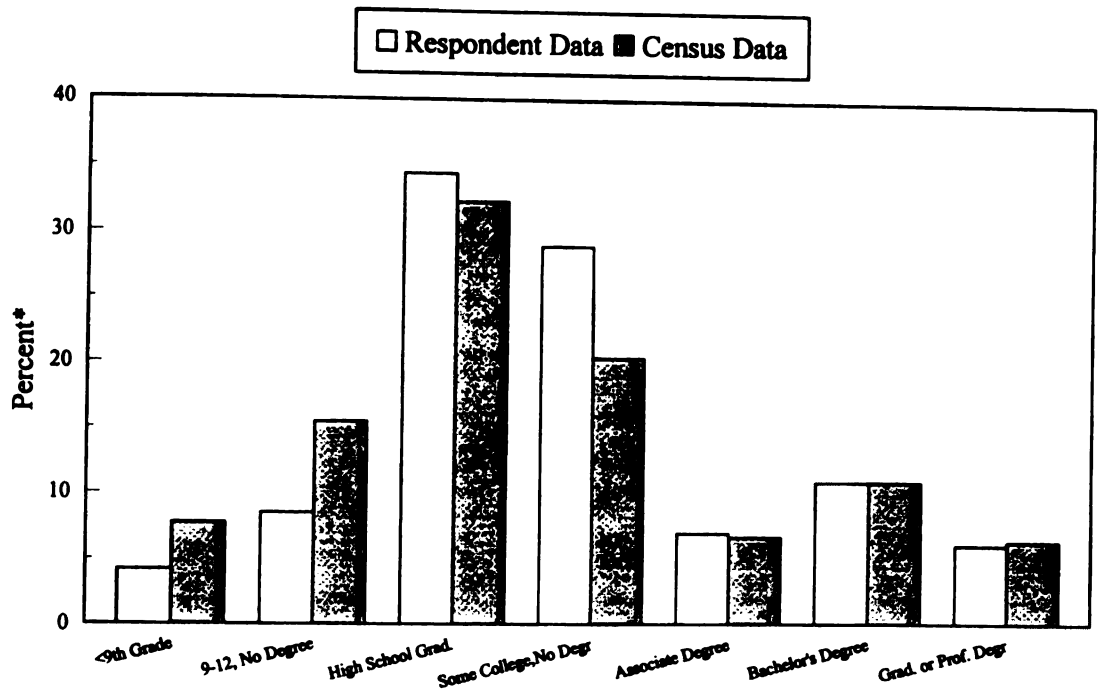


Figure 17. Comparison of educational attainment between deer hunter survey respondents and the overall Michigan population.

* For respondents, this is the percent of deer hunters age 25 years and over who responded to the item (n=716).
For census data, this is the percent of Michigan residents age 25 years and over (N=5,842,642) (Bureau of Census 1990).

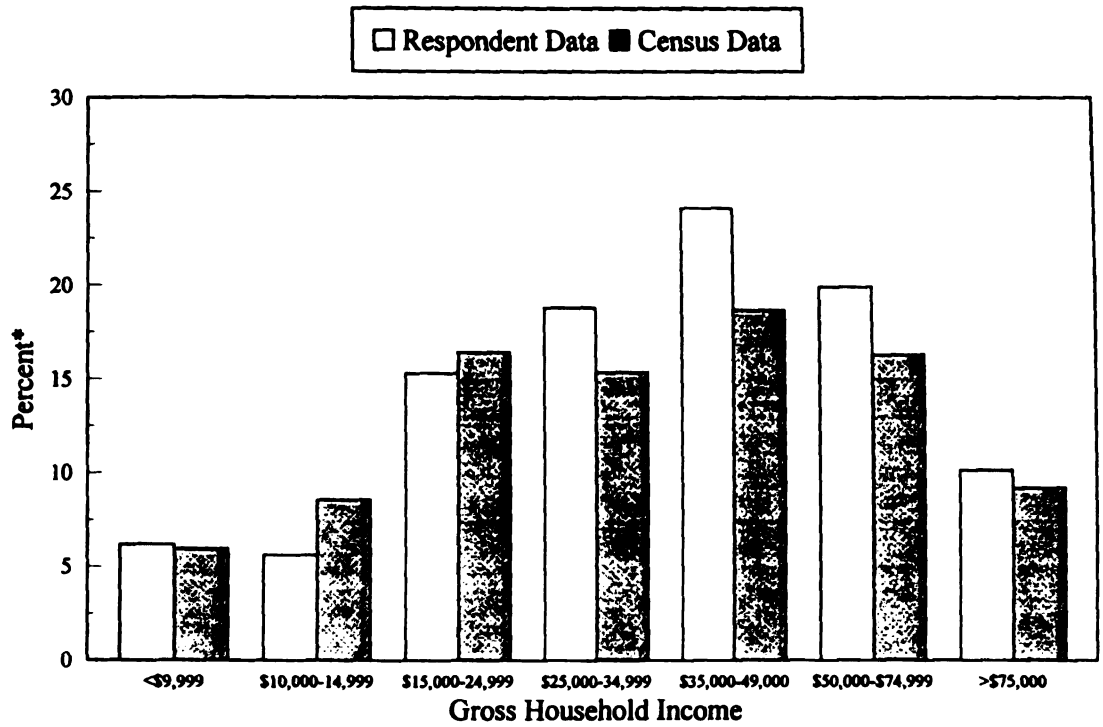


Figure 18. Comparison of gross household income between deer hunter survey respondents and the overall Michigan population.

* For respondents, this is the percent of those who were willing to disclose their 1994 gross household income (n=675).
For census data, this is the percent of Michigan households (N=3,424,122) earning this amount, which was calculated as the algebraic sum of gross wages and net self-employment earnings (Bureau of Census 1990).

Table 18. Deer hunter survey respondents' participation in farming by county.

	Farming Occupation Stratum		
	Full-time Farmers[a] (%)	Part-time Farmers[b] (%)	Non-Farmers[c] (%)
Benzie (n=46)	2.2	15.2	82.6
Calhoun (n=165)	3.6	29.1	67.3
Leelanau (n=49)	10.2	18.4	71.4
Menominee (n=82)	2.4	20.7	76.8
Montcalm (n=196)	4.6	30.1	65.3
Oceana (n=129)	3.1	20.9	76.0
Presque Isle (n=125)	3.2	20.8	76.0

[a] Appendix F, Question #69, checked first box on left.

[b] Appendix F, Question #69, checked fourth box on left.

[c] Appendix F, Question #69, checked neither the first or fourth box on left. Assumes that the 13 survey respondents who skipped Question #69 entirely were not farmers.

Deer Hunting Participation

About half (51.1%, n=401) began deer hunting in Michigan before 1980, and fewer than one in ten (7.4%, n=58) began deer hunting in the five years immediately prior to implementation of this survey (i.e., between 1990 to 1994). On average, respondents had hunted in Michigan for 23.6 years (SD13.7, n=787). A fourth of the respondents (24.3%, n=191) had actually gone deer hunting in Michigan for 10 to 19 years, and another fourth (25.4%, n=200) had deer hunted in Michigan for 20 to 29 years. About 17% (n=133) had deer hunted in Michigan for less than 10 years. About the same number of respondents (50.3%, n=398) deer hunted only with firearms as deer hunted with both bow and firearm (49.2%, n=389) in a typical year.

The number of deer hunter respondents per county ranged from 46 for Benzie to 196 for Montcalm (Table 14). The majority of respondents (83.3%, n=660) deer hunted in the study county in both 1993 and 1994, with 10.4% (n=82) hunting in the county in 1993 but not 1994. Five percent (n=42) of the respondents claimed to have not deer hunted in the study county in either 1993 or 1994, despite the fact that according to their response to the MDNR 1993 Firearm Deer Survey they had deer hunted in the county in at least 1993.

Respondents tended to deer hunt in the respective study county on a repeated basis. Over half of the respondents (54.5%, n=391) had deer hunted in the respective study county in each of the 10 years prior to taking the survey (i.e., 1984 to 1994), and just over a fourth of the respondents (27.2%, n=195) had deer hunted in the respective study county for 5 to 9 of the previous 10 years. Roughly one in five (18.4%, n=132) had

deer hunted in the respective study county for less than 5 of the past 10 years. On average, those who lived in the county had hunted in the county significantly longer than had those who did not reside in the county ($\bar{x}$=8.5(SD2.5) years and 6.9(SD3.1) years, respectively; MW z=-7.53, p<0.001).

Overall, respondents deer hunted for an average of 7.9 days (SD3.9, n=727) during the November firearm season in the most recent year that they deer hunted in the county. On average, those who lived in the county had hunted significantly more days in the firearm season than had those who did not reside in the county ($\bar{x}$=9.1(SD3.8) years and 6.2(SD3.4) years, respectively; MW z=-9.97, p<0.001).

The majority of the respondents (57.8%, n=429) deer hunted entirely on private land in the study county, and 14.4% (n=107) deer hunted entirely on public land in the study county. Those who lived in one of the study counties spent less of their deer-hunting time on public land ($\bar{x}$=19.7% of their deer-hunting time (SD33.9%), n=427) compared to those who lived outside of the study counties ($\bar{x}$=34.7% of their deer-hunting time (SD42.7%), n=315) (MW z=-4.4578, p<0.001). The extent of hunting time spent on public land may be in part due to whether the deer hunter had ready access to property in the county. About half of the respondents (48.1%, n=375) owned or leased land where they could deer hunt, with those who lived in a study county more likely than those who lived outside the study counties to own or lease land for deer hunting (χ^2 = 34.88, 1df, p<0.001). Yet, about a third of those who lived outside the study counties (36.2%, n=124) did own or lease land where they could deer hunt.

Twenty-seven percent (n=213) of the respondents rated deer hunting as the most

important recreational activity in which they participate. One third (33.0%, n=261) rated deer hunting as more important than most other recreational activities, and another third (33.5%, n=265) rated deer hunting as about as important as the other recreational activities in which they participate. Most of the respondents (70.2%, n=521) were not members of a Michigan-based deer-hunting-related or conservation organization, and of those who were a member (29.8%, n=221), only a few (7.3%, n=16) had been an officer of the organization within the past 5 years.

Satisfaction with Deer Hunting

Of those who deer hunted in 1994, most (59.3%, n=441) were either satisfied or very satisfied with their overall 1994 deer hunting experience. Only a few (7.0%, n=52) were very dissatisfied, and roughly the same number were undecided about their level of satisfaction (16.4%, n=122) as were dissatisfied (17.2%, n=128). The same pattern of responses was found for the respondents' satisfaction with their deer hunting experience in the study county in the most recent year that they deer hunted there (Appendix F, Question 11).

Antlerless Deer License Strata

In terms of the sample stratification criterion of whether the deer hunter applied for an antlerless permit in 1993, 43.2% (n=340) of the respondents had applied and received an antlerless permit, 18.7% (n=147) applied but did not receive a permit, and 38.1% (n=300) did not apply for an antlerless permit (Table 14). There was a significant difference in antlerless application status between deer hunters who lived in the study county and those who lived outside of the study county ($\chi^2 = 12.19$, 2df, p=0.002) (Table

19). Those who lived in a study county were more likely to not have applied in 1993 than were those who lived in a study county, and those who lived outside the study counties tended to be less successful at receiving a license in 1993 than were those who lived in the study counties. There was also a significant difference in antlerless application status across the study counties ($\chi^2 = 206.16$, 12df, $p<0.001$) (Table 19), which may be explained by the closed antlerless seasons in parts of some counties in 1993 (see Table 7 in Methodology section). Finally, there was also a significant difference in antlerless application status between those who deer hunted only with a firearm and those who deer hunted with both bow and firearm ($\chi^2=8.81$, 2df, $p=0.012$) (Table 19).

The act of applying for an antlerless permit was used as a behavioral measure of willingness to harvest antlerless deer. To supplement this behavioral measure, deer hunters were asked their opinion regarding the legal recreational harvest of antlerless deer. Most of the respondents (71.6%, n=564) indicated a willingness to personally harvest antlerless deer, and 16.6% (n=131) said that they supported the choice of other hunters to harvest antlerless deer but were not willing to personally do so. Only 8.2% (n=65) were opposed to the harvest of antlerless deer by hunters.

Table 19. Respondent profile of 1993 antlerless application status for each study county, resident stratum, and type of deer hunting equipment used in a typical year.

		1993 Antlerless Application Stratum		
		Applied and Received (%)	Applied but Did Not Receive (%)	Did Not Apply (%)
Study County (χ^2=206.16, 12df, p<0.001)	Benzie (n=46)	15.2	30.4	54.3
	Calhoun (n=165)	71.5	3.0	25.5
	Leelanau (n=49)	20.4	40.8	38.8
	Menominee (n=80)	22.5	16.3	61.3
	Montcalm (n=195)	54.9	21.0	24.1
	Oceana (n=128)	10.2	20.3	69.5
	Presque Isle (n=124)	54.0	22.6	23.4
Resident Stratum (χ^2=2.19, 2df, p=0.002)	Live In a Study County (n=440)	43.2	14.8	42.0
	Live Outside Study Counties (n=347)	43.2	23.6	33.1
Deer Hunting Equipment Used (χ^2=8.81, 2df, p=0.012)	Firearm Only (n=394)	44.2	14.7	41.1
	Both Firearm and Bow (n=388)	42.5	22.7	34.8

Farmers

About 52% of those who received a farmer survey returned a questionnaire. However, only 596 of the 1,059 returned surveys had been completed by individuals who reported being a full- or part-time farmer [1] with more than 1 acre of farmland in a study county, making the usable response rate very low (29%). The remaining 463 surveys were returned from individuals who reported either not being farmers, being farmers but not in the target study county, or being retired from farming. This large number of noneligible individuals in the sample frame occurred in spite of efforts to procure a list of only active farmers in the study counties.

If the original sample were adjusted to reflect only full- and part-time farmers, the response rate would likely have been substantially higher. About 56% of the returned surveys were from full- or part-time farmers (596 out of 1059), and about 59% of the non-respondents who we spoke with were full- or part-time farmers (112 out of 191). If we assume that only 60% of the original deliverable sample of 2,041 were full- or part-time farmers, then the adjusted response rate of eligible respondents would be about 48.7% (i.e., 596/1225). A more conservative approach to adjusting the farmer survey response rate involves the following formula (Dillman 1978:50):

Response Rate = [Number of Eligible Returns/(Number in Sample - (Noneligible + Nonreachable))]x100

Using this formula, the overall farmer survey response rate would be 37.8%. (i.e., 596/(2134-(463+93)] x 100) (Table 20).

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[1] For this research, full-time farmers were defined as those who reported spending more than 50% of their working time farming and described farming as their primary occupation. Part-time farmers were defined as those who reported spending less than 50% of their working time farming and described farming as not their primary occupation.

About 20% (n=191) of the non-respondents were telephoned to assess nonresponse bias, and no substantively important significant differences between eligible respondents and eligible nonrespondents were detected. Overall, most farmer respondents (69.8%, n=397) indicated that they were also deer hunters. Part-time farmers were more likely to be hunters than were full-time farmers (Table 21).

Table 20. Number of farmer surveys sent and returned for each study county and response rate adjusted for non-deliverable and non-eligible respondents.[a]

Study County	No. of Surveys Sent	No. of Non-Deliverable Surveys	No. of Non-Eligible Surveys Returned[b]	No. of Eligible Surveys Returned[c]	Adjusted Response Rate[a] (%)
Benzie	100	1	26	21	28.8
Calhoun	545	38	148	133	37.0
Leelanau	263	3	55	108	52.7
Menominee	200	3	30	63	37.7
Montcalm	329	16	66	104	42.1
Oceana	379	12	64	115	38.0
Presque Isle	318	20	74	52	23.2
TOTAL	2,134	93	463	596	37.8

[a] No. Eligible Returns/(No. in Sample-(No. Noneligible + No. Nonreachable))]x100 (Dillman 1978:50).
[b] Respondents who reported that they were *not* full- or part-time farmers in the target study county.
[c] Respondents who reported that they were full- or part-time farmers in the target study county.

Table 21. Percent of full- and part-time farmers who reported that they deer hunt (Fisher's Exact Test 2-tailed p=0.002).

Farmer Stratum[a]	Deer Hunting Participation[b]	
	No	Yes
Full-time Farmer (n=393)	34.4% (n=135)	65.6% (n=258)
Part-time Farmer (n=176)	21.0% (n=37)	79.0% (n=139)

[a] Appendix G, Question #1
[b] Appendix G, Question #25.

Analysis Segmentation

Four segmentation bases predominated in the analysis:

1. hunting/farming participation,
2. study county,
3. county of residence (a study county or not a study county), and
4. farmers with intolerable crop loss and those without.

Farming/Hunting Segmentation Basis

As noted, there was considerable overlap in hunting and farming participation between respondents to the two surveys such that some deer hunter survey respondents were also farmers and many farmer survey respondents were also deer hunters. To minimize confounding due to this overlap, four mutually exclusive respondent segments were created by combining respondents to the two surveys. The four segments were

(1) farmers who do not deer hunt (n=172);
(2) full-time farmers who deer hunt (n=289);
(3) part-time farmers who deer hunt (n=332); and
(4) non-farming deer hunters (n=568).

The first segment was composed entirely of farmer survey respondents and included both full- and part-time farmers who did not deer hunt. The second segment included those respondents to the deer hunter survey who indicated that farming was their primary occupation (n=31) and those respondents to the farmer survey who indicated that they were full-time farmers who deer hunt (n=258). The third segment included those respondents to the deer hunter survey who indicated that they farmed but not as a primary occupation (n=193) and those respondents to the farmer survey who indicated that they were part-time farmers who deer hunt (n=139). The fourth segment was composed entirely of deer hunter survey respondents and included those who did not indicate that

they were farmers.

The only hunting-related characteristic that was comparable between the two surveys was the importance of deer hunting relative to other recreational activities (Appendix F, Question #4; Appendix G, Question #26). Deer hunter respondents placed a significantly higher level of importance on hunting than did farmer survey respondents who deer hunted (MW $z=-3.66$, $p<0.001$). When respondents from the two sample frames were combined and then segmented by hunting and farming participation, non-farming hunters and part-time farming hunters placed a significantly higher level of importance on hunting than did full-time farming hunters (KW $\chi^2=10.62$, 2df, $p=0.005$).

These segments were used in analyses where it was possible and important to do so, and in other instances, analyses were done with the original two segments of hunter survey respondents and farmer survey respondents. For instance, for testing the first hypothesis, the 1993 antlerless deer license application status was known only for respondents to the deer hunter survey; therefore, data on deer hunting farmers from the farmer survey were not included in the analysis for this hypothesis. In other cases, the particular dependent measure was not included on the farmer survey (e.g., 1-item measure of approval of Shooting Permits), so only hunter survey respondents could be used. In the interpretation of results of analyses based on the original survey respondent segments, recognition should be given to the fact that these two segments were not mutually exclusive in terms of hunting and farming participation.

Study County Segmentation Basis

Six study county units were investigated in this analysis. By design, Benzie and Leelanau counties were grouped together as one study county unit. Benzie and Leelanau are adjoining counties that are similar in terms of agricultural characteristics and MDNR actual deer density estimates. Therefore, little variation between these two counties was expected. To test this assumption, several important variables were investigated (Table 22). The only significant difference found between the two counties was age of deer hunter survey respondents (Table 22).

County Residence Segmentation Basis

Because, by design, farmer survey respondents resided in a study county, the third segmentation basis was used only for respondents to the deer hunter survey. Throughout the remainder of this report, those deer hunter respondents who lived in a study county are referred to as "Live Ins," and those deer hunter respondents who did not live in a study county are referred to as "Live Outs."

Farmer Crop Loss Rating Segmentation Basis

Farmer survey respondents were asked to rate the severity of their 1994 crop loss to deer (Appendix G, Question #13). Fifty-eight percent (n=331) of the farmer survey respondents reported that their losses were not a problem or were tolerable, whereas 42% (n=240) rated their losses as intolerable. There was no significant difference in rating of crop loss between farmer survey respondents who deer hunted and those who did not (Fisher's Exact Test 1-tailed $p=0.45$). However, full-time farmers were significantly more likely to rate their losses as intolerable than were part-time farmers (Fisher's Exact Test 1-tailed $p<0.001$).

Table 22. Comparison of Benzie and Leelanau respondents to the farmer survey and the deer hunter survey on six variables.

Survey Respondents	Study County	Mean Tolerance (SD) of Deer[a]	Mean (SD) Perception of Trend in Deer Population[b]	Mean Perceived Expertise (SD) of MDNR to Manage Deer[c]	Mean Perceived Severity (SD) of 1994 Deer Crop Damage[d]	Mean Issue Activity Rating (SD)[e]	Mean Age (SD)[f]
Farmer Survey	Benzie	3.79(1.18)^{x} (n=19)	1.65(0.81)^{x} (n=20)	2.85(1.39)^{x} (n=20)	2.29(0.78)^{x} (n=21)	1.90(2.51)^{x} (n=21)	55.2(10.8)^{x} (n=20)
	Leelanau	3.73(1.10)^{x} (n=99)	1.76(0.83)^{x} (n=100)	2.92(1.02)^{x} (n=102)	2.12(0.83)^{x} (n=100)	0.73(1.45)^{x} (n=108)	54.0(12.6)^{x} (n=102)
Deer Hunter Survey	Benzie	2.23(0.75)^{x} (n=43)	2.59(0.69)^{x} (n=46)	2.83(0.95)^{x} (n=46)	--	0.82(1.24)^{x} (n=44)	48.3(14.3)^{x} (n=46)
	Leelanau	2.21(0.81)^{x} (n=42)	2.50(0.73)^{x} (n=44)	2.65(1.12)^{x} (n=48)	--	0.89(1.10)^{x} (n=44)	43.0(14.2)^{y} (n=49)

[a] Scale 1 (Too Few, and I Intend to Try to Do Something About It) to 5 (Too Many, and I Intend to Try to Do Something About It) (Appendix G, Question # 56; Appendix F, Question #23).

[b] Scale 1 (Increasing) to 4 (I Don't Know) (Appendix G, Question # 59; Appendix F, Question #27).

[c] Scale 1 (Strongly Agree) to 5 (Strongly Disagree). A lower value indicates a more favorable attitude toward the Michigan Department of Natural Resources (Appendix G, Question # 61, Item 2; Appendix F, Question #28, Item 1).

[d] Scale 1 (Not a Problem) to 3 (A Problem and I Intend to Increase my Efforts to Reduce the Losses, i.e., an intolerable problem) (Appendix G, Question # 13). This item was not included in the deer hunter survey.

[e] Farmer respondent 14-point scale calculated as sum of boxes checked in last seven rows in first two columns of Question #19 (Appendix G). Hunter respondent 10-point scale calculated as sum of boxes checked in first two columns in Question 62-66 (Appendix F).

[f] Age in 1995 (Appendix G, Question # 67; Appendix F, Question #75).

[xy] Means with the same letter within the same column and respondent category are not significantly different (MW $p>0.05$). The difference in mean age of hunter respondents was significant with a $p=0.050$ (MW $z=-1.96$).

Study Design Hypotheses

Applying for an Antlerless Permit and Willingness to Harvest Antlerless Deer

Hypothesis$_a$ 1:

Deer hunters who did not apply for an antlerless permit in 1993 are more likely to be opposed to antlerless deer harvest and unwilling to harvest antlerless deer compared to those who did apply for an antlerless permit in 1993.

Deer hunter respondents who had not applied for an antlerless permit in 1993 were more likely to be opposed to antlerless deer harvest than were those who had applied (χ^2=15.8, 1df, p<0.001) (Table 23). In addition, deer hunter respondents who had not applied for an antlerless permit in 1993 were more likely to be unwilling to harvest antlerless deer as compared to those who had applied (χ^2=49.7, 1df, p<0.001) (Table 23). The alternate hypothesis was supported.

Table 23. Attitudes of deer hunter respondents who had and had not applied for a 1993 antlerless deer license toward antlerless harvest and their willingness to personally harvest antlerless deer.

		1993 Antlerless Deer License Applicants v. Nonapplicants	
		Applied (n=469)	Did Not Apply (n=286)
Attitude toward Antlerless Harvest (χ^2=15.8, 1df, p<0.001)	Support	94.7% (n=444)	86.4% (n=247)
	Oppose	5.3% (n=25)	13.6% (n=39)
Willingness to Harvest Antlerless Deer (χ^2=49.7, 1df, p<0.001)	Willing	82.9% (n=389)	59.8% (n=171)
	Unwilling	17.1% (n=80)	40.2% (n=115)

Issue Intensity of Study Counties

Hypothesis$_a$ 2:

> Farmer and deer hunter respondents who lived and/or hunted in Menominee or Presque Isle county were more likely to report engaging in issue activity in or around 1994 than were those who lived and/or hunted in Benzie, Calhoun, Leelanau, Montcalm, or Oceana county.

Farmer respondents from Menominee reported taking significantly more issue actions in or around 1994 than did farmer respondents from all other counties except Presque Isle (Table 24). However, the frequency of issue actions by farmer respondents from Presque Isle did not significantly differ from that of farmer respondents from any of the other study counties. Results indicate that Menominee was a hotter bed of issue intensity for farmers than were the other counties, and so the alternate hypothesis regarding farmer issue activity was partially supported.

Hunter respondents who deer hunted in Menominee or Presque Isle reported taking significantly more issue actions than did those who deer hunted in Calhoun (Table 24). However, the frequency of issue actions by Menominee and Presque Isle deer hunter respondents did not significantly differ from that of Benzie/Leelanau, Montcalm, or Oceana hunter respondents. Overall, the frequency of issue activity by deer hunters who lived in a study county was not significantly different than that by deer hunters who lived outside the study counties (MW $z=-0.978$, $p=0.33$). However, when each resident stratum of deer hunters was analyzed separately, it became clear that the variation in issue activity across counties was due to actions taken by deer hunters who lived in a study county (Table 25). The alternate hypothesis regarding deer hunter issue activity was partially supported.

Table 24. Mean number of issue actions taken (standard deviation) in or around 1994 by farmer survey respondents and deer hunter survey respondents for each study county.

Study County	Mean Number of Issue Actions Taken (SD) in or around 1994	
	Farmer Respondents[a]	Deer Hunter Respondents[b]
Benzie/Leelanau	0.92(1.71)^{x} (n=129)	0.85(1.17)^{xy} (n=88)
Calhoun	0.33(1.05)^{x} (n=133)	0.63(1.04)^{x} (n=148)
Menominee	2.50(2.90)^{y} (n=63)	1.32(1.51)^{y} (n=75)
Montcalm	0.59(1.37)^{x} (n=104)	0.99(1.29)^{xy} (n=171)
Oceana	0.80(1.54)^{x} (n=115)	1.03(1.31)^{xy} (n=108)
Presque Isle	1.25(2.11)^{xy} (n=52)	1.34(1.54)^{y} (n=107)

[a] Farmer respondent 14-point scale calculated as sum of boxes checked in last seven rows in first two columns of Question #19 (Appendix G).

[b] Hunter respondent 10-point scale calculated as sum of boxes checked in first two columns in Question 62-66 (Appendix F).

^{xy} Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

Table 25. Mean number of issue actions[a] taken (standard deviation) in or around 1994 by deer hunter survey respondents for each study county, by resident stratum.

Study County	Mean Number of Issue Actions Taken (SD) in or around 1994 by Deer Hunter Resident Stratum	
	Live In[b]	Live Out[c]
Benzie/Leelanau	1.02(1.34)^{xy} (n=44)	0.68(0.96)^{x} (n=44)
Calhoun	0.57(0.95)^{x} (n=102)	0.76(1.21)^{x} (n=46)
Menominee	1.47(1.55)^{y} (n=43)	1.13(1.45)^{x} (n=32)
Montcalm	1.00(1.26)^{xy} (n=106)	0.97(1.33)^{x} (n=65)
Oceana	1.30(1.38)^{x} (n=60)	0.69(1.15)^{x} (n=48)
Presque Isle	1.40(1.75)^{xy} (n=48)	1.29(1.37)^{x} (n=59)

[a] Hunter respondent 10-point scale calculated as sum of boxes checked in first two columns in Question 62-66 (Appendix F).

[b] Deer hunter respondents who live in one of the study counties.

[c] Deer hunter respondents who do not live in one of the study counties.

^{xy} Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

Exploring Potential Measurements Associated with the CCC Framework

Overall Perception of the Trend in the Deer Population

Hypothesis$_a$ 3:

Non-farming deer hunters believe that deer have been decreasing, whereas non-hunting farmers believe that deer have been increasing.

There was a significant difference between the perceived trend in deer numbers among the four segments of respondents (χ^2=259.6, 9df, p<0.001) (Table 26). Most non-farming deer hunter respondents felt that deer numbers in the area of the study county where they hunted most often during the November firearm season had decreased over that past 5 years (Table 26). Most non-hunting farmers felt that deer numbers for the portion of the study county where they did the majority of their farming had increased over the past 5 years (Table 26). Full- and part-time farmers who deer hunt were more evenly split on their perceptions of the trend in deer numbers (Table 26). The alternate hypothesis was supported.

Table 26. Perceived trend in deer numbers in the county over the past 5 years by farmers and deer hunters (χ^2=259.6, 9df, p<0.001).

Farming/ Hunting Segment	Perceived Trend in Deer Numbers[a]			
	Increasing	Stable	Decreasing	Undecided
Farmers who Do Not Deer Hunt (n=164)	53.0%	31.1%	13.4%	2.4%
Full-time Farmers who Deer Hunt[b] (n=279)	46.2%	30.8%	22.6%	0.4%
Part-time Farmers who Deer Hunt[c] (n=316)	15.8%	35.4%	46.5%	2.2%
Deer Hunters who are Not Farmers (n=508)	9.6%	29.9%	55.7%	4.7%

[a] Appendix F, Question #27; Appendix G, Question #59.

[b] This segment includes those respondents to the deer hunter survey who indicated that farming was their primary occupation (n=31) and those respondents to the farmer survey who indicated that they were full-time farmers who deer hunt (n=258).

[c] This segment includes those respondents to the deer hunter survey who indicated that they farmed but not as a primary occupation (n=193) and those respondents to the farmer survey who indicated that they were part-time farmers who deer hunt (n=139).

"Congruence" of Perceived Trends

MDNR deer density and trend information was not available from Montcalm and Oceana counties. Therefore, analyses regarding congruence of stakeholders' perceptions with MDNR data were done only for Calhoun, Benzie, Leelanau, Menominee, and Presque Isle counties.

Hypothesis$_a$ 4:

> Most deer hunters and farmers have perceptions of the deer population trend that are incongruent with the trend judged by MDNR field personnel (i.e., most stakeholders have "inaccurate" perceptions).

There was little congruence between MDNR judgments regarding the trend in deer numbers and the perceptions of stakeholders (farmer and hunter survey respondents combined) about the trend in deer over the past 5 years across the study counties (χ^2=35.3, 6df, $p<0.001$) (Table 27). When the four segments of respondents based on deer hunting and farming participation were analyzed separately, congruence was no better except for that which likely was an artifact of the overall trend direction perceived by each segment (Table 28). That is, because most non-farming deer hunters believed the deer population had decreased, a majority of these hunters were "correct" in their perceptions for the areas judged by the MDNR to have declining deer numbers (Table 26). Similarly, because most non-hunting farmers believed that the deer population had increased, there was a fair amount of congruence between these farmers' perceptions of the deer trend and MDNR judgments for the areas judged by the MDNR to have increasing deer numbers. As the majority of each segment had incongruent perceptions of the trend in deer numbers (Table 29), the alternate hypothesis was supported.

Table 27. Congruence between MDNR judgments regarding trend in deer numbers and the perceptions by farmer and hunter survey respondents combined about the trend in deer over the past 5 years, all counties combined (excluding Montcalm and Oceana) (χ^2=35.3, 6df, p<0.001).

MDNR Judgment of Trend in Deer Numbers[a]	Perceived Trend in Deer Numbers by Farmer and Hunter Survey Respondents Combined[b]			
	Increasing	Stable	Decreasing	Undecided
Increasing (n=224[c])	**30.8%**[d]	32.1%	33.9%	3.1%
Stable (n=244)	35.7%	**32.8%**	31.1%	0.4%
Decreasing (n=217)	14.3%	35.9%	**47.5%**	2.3%

[a] Pers. Commun. with MDNR Field Staff.

[b] Appendix F, Question #27; Appendix G, Question #59. Results include only those respondents who identified a location on the county map in the survey and provided a trend.

[c] No. of respondents who identified a location on the map of the county that fell within a DMU that had this trend in deer numbers and who answered the question on their perception of the trend in deer numbers.

[d] Bolded values represent "accurate" stakeholder perceptions.

Table 28. Congruence between MDNR judgments regarding trend in deer numbers and the perceptions of four segments of respondents (based on deer hunting and farming participation) about the trend in deer over the past 5 years, all counties combined (excluding Montcalm and Oceana).

MDNR Judgment of Trend in Deer Numbers[a]	Farming/ Hunting Segment	Perceived Trend in Deer Numbers[b]			
		Increasing	Stable	Decreasing	Undecided
DMUs with Increasing Deer Numbers	Farmers who Do Not Deer Hunt (n=35[c])	**60.0%**[d]	31.4%	2.9%	5.7%
	Full-time Farmers who Deer Hunt (n=65)	**50.8%**	27.7%	21.5%	0.0%
	Part-time Farmers who Deer Hunt (n=41)	**9.8%**	39.0%	43.9%	7.3%
	Deer Hunters who are Not Farmers (n=80)	**12.5%**	32.5%	52.5%	2.5%
DMUs with Stable Deer Numbers	Farmers who Do Not Deer Hunt (n=49)	67.3%	**24.5%**	8.2%	0.0%
	Full-time Farmers who Deer Hunt (n=48)	52.1%	**22.9%**	22.9%	2.1%
	Part-time Farmers who Deer Hunt (n=66)	28.8%	**39.4%**	31.8%	0.0%
	Deer Hunters who are Not Farmers (n=78)	10.3%	**38.5%**	51.3%	0.0%
DMUs with Decreasing Deer Numbers	Farmers who Do Not Deer Hunt (n=19)	21.1%	63.2%	**15.8%**	0.0%
	Full-time Farmers who Deer Hunt (n=47)	38.3%	38.3%	**23.4%**	0.0%
	Part-time Farmers who Deer Hunt (n=46)	6.5%	43.5%	**50.0%**	0.0%
	Deer Hunters who are Not Farmers (n=101)	5.9%	25.7%	**63.4%**	5.0%

[a] Pers. Commun. with MDNR Field Staff.

[b] Appendix F, Question #27; Appendix G, Question #59. Results include only those respondents who identified a location on the county map in the survey and provided a trend.

[c] No. of respondents in this segment who identified a location on the map of the county that fell within a DMU that had this trend in deer numbers and who answered the question on their perception of the trend in deer numbers.

[d] Bolded values represent "accurate" stakeholder perceptions.

Table 29. Congruence of four respondent segments' (based on deer hunting and farming participation) perceptions of the trend in deer numbers with the MDNR's judgment of the trend in deer numbers for the respective Deer Management Unit in the study county (excluding Montcalm and Oceana counties) (χ^2=2.6, 3df, p=0.47).

Farming/ Hunting Segment	Congruence of Perceived Trend with MDNR Trend[a]	
	Congruent	Incongruent
Farmers who Do Not Deer Hunt (n=101)	35.6%	64.4%
Full-time Farmers who Deer Hunt (n=159)	34.6%	65.4%
Part-time Farmers who Deer Hunt (n=150)	35.3%	64.7%
Deer Hunters who are Not Farmers (n=252)	41.3%	58.7%

[a] A "congruent" perceived trend indicates that the stakeholder judged the trend in deer numbers to be the same as that judged by MDNR field staff in the study counties (i.e., the stakeholder's perception of the trend in deer numbers was "accurate"). Those who checked "I don't know" on the trend item were excluded. Results include only those respondents who identified a location on the county map in the survey and provided a trend.

Hypothesis$_a$ 5:

> Deer hunters who are residents of a study county are more likely to have perceptions of the deer population trend that are congruent with the trend judged by MDNR field personnel than are those who are not residents of the study county.

There was a significant difference in the perception of the trend in deer numbers between deer hunters who lived in a study county and those who did not, although the differences were not meaningful (χ^2=9.0, 3df, p<0.03) (Table 30). Those who lived in a study county tended to judge the trend as increasing more than expected, whereas those who lived outside a study county were more unsure about the trend than expected (Table 30).

However, there was no significant difference in the congruence of perceived trends with actual trends between these two segments of deer hunters (Fisher's Exact Test 1-tailed p=0.16) (Table 31). The congruence that did occur likely was an artifact of the fact that deer hunters tended to say that deer were decreasing. That is, a majority of both resident strata correctly perceived the trend only for those areas that were judged by the MDNR to have decreasing herds (Table 32). The only exception to this was that just over half of those who lived outside the study counties and hunted in an area of the county in which the MDNR judged the trend to be stable accurately perceived the deer population trend. The alternate hypothesis was not supported.

Table 30. Deer hunter survey respondents' perception of the trend in deer numbers in the county over the past 5 years, by resident stratum (χ^2=9.0, 3df, p<0.03).

Resident Stratum[a]	Perceived Trend in Deer Numbers[b]			
	Increasing	Stable	Decreasing	Undecided
Live In (n=421)	11.4%	31.4%	54.9%	2.4%
Live Out (n=310)	7.1%	31.0%	56.1%	5.8%

[a] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").

[b] Appendix F, Question #27.

Table 31. Congruence of deer hunter survey respondents' perceptions of the trend in deer numbers with the MDNR's judgment of the trend in deer numbers for the respective Deer Management Unit in the study county (excluding Montcalm and Oceana), by resident stratum (Fisher's Exact Test 1-tailed p=0.16).

Deer Hunter Resident Stratum[a]	Congruence of Perceived Trend with MDNR Trend[b]	
	Congruent	Incongruent
Live In (n=209)	38.3%	61.7%
Live Out (n=147)	44.2%	55.8%

[a] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").

[b] A "congruent" perceived trend indicates that the deer hunter judged the trend in deer numbers to be the same as that judged by MDNR field staff in the study counties (i.e., the deer hunter's perception of the trend in deer numbers was "accurate"). Those who checked "I don't know" on the trend item were excluded. Results include only those respondents who identified a location on the county map in the survey and provided a trend.

Table 32. Congruence between MDNR judgments regarding trend in deer numbers and the perceptions by deer hunter respondents about the trend in deer numbers over the past 5 years, by resident stratum (excluding Montcalm and Oceana counties).

MDNR Judgment of Trend in Deer Numbers[a]	Resident Stratum[b]	Perceived Trend in Deer Numbers by Deer Hunter Survey Respondents[c]			
		Increasing	Stable	Decreasing	Undecided
Increasing	Live In (n=51[d])	**11.8%**[e]	41.2%	47.1%	0.0%
	Live Out (n=54)	**9.3%**	20.4%	63.0%	7.4%
Stable	Live In (n=91)	14.3%	**35.2%**	50.5%	0.0%
	Live Out (n=29)	13.8%	**51.7%**	34.5%	0.0%
Decreasing	Live In (n=69)	8.7%	27.5%	**60.9%**	2.9%
	Live Out (n=71)	2.8%	29.6%	**63.4%**	4.2%

[a] Pers. Commun. with MDNR Field Staff.

[b] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").

[c] Appendix F, Question #27. Results include only those respondents who identified a location on the county map in the survey and provided a trend.

[d] No. of respondents in this segment who identified a location on the map of the county that fell within a DMU that had this trend in deer numbers and who answered the question on their perception of the trend in deer numbers.

[e] Bolded values represent "accurate" deer hunter perceptions.

Hypothesis$_a$ 6:

Farmers who judge their losses to deer as intolerable are less likely to have perceptions of the deer population trend that are congruent with the trend judged by MDNR field personnel than are farmers who judge their losses to be tolerable or not a problem.

There was a significant difference in the perception of the trend in deer numbers between farmers who judged their 1994 crop losses to deer as intolerable and those who did not (χ^2=68.7, 3df, p<0.001) (Table 33). Farmers who judged their crop losses to be intolerable tended to perceive that the deer population had been increasing over the past 5 years, whereas farmers who did not judge their crop losses as intolerable were evenly split in their perception of the trend in deer numbers (Table 33). However, there was no significant difference in the congruence of perceived trends with actual trends between these two segments of farmers (Fisher's Exact Test 1-tailed p=0.35) (Table 34). Similar to earlier findings, the finding that a majority of the farmers who judged their losses to be intolerable accurately perceived the trend in deer numbers *only* if they farmed in a DMU where the herd was actually increasing seemed to be a matter of coincidence because less than 10% of that segment were "accurate" in areas where the herd was actually stable or decreasing (Table 35). The alternate hypothesis was not supported.

Table 33. Farmer survey respondents' perceptions of the trend in deer numbers in the county over the past 5 years, by whether the farmer judged his/her 1994 crop losses to deer as intolerable (χ^2=68.7, 3df, p<0.001).

Farmer Perceived Severity of Crop Loss Stratum[a]	Perceived Trend in Deer Numbers[b]			
	Increasing	Stable	Decreasing	Undecided
Not Intolerable (n=319)	32.0%	34.8%	31.7%	1.6%
Intolerable (n=227)	63.4%	28.6%	7.0%	0.9%

[a] Appendix G, Question #13 ("Not a Problem" and "Tolerable Problem" response options from question #13 combined into "Not Intolerable" rating category).

[b] Appendix G, Question #59.

Table 34. Congruence of farmers' perceptions of the trend in deer numbers with the MDNR's judgment of the trend in deer numbers for the respective Deer Management Unit in the study county (excluding Montcalm and Oceana), by whether the farmer judged his/her 1994 crop losses to deer as intolerable (Fisher's Exact Test 1-tailed p=0.35).

Farmer Perceived Severity of Crop Loss Stratum[a]	Congruence of Perceived Trend with MDNR Trend[b]	
	Congruent	Incongruent
Not Intolerable (n=178)	35.4%	64.6%
Intolerable (n=129)	32.6 %	67.4%

[a] Appendix G, Question #13 ("Not a Problem" and "Tolerable Problem" response options from question #13 combined into "Not Intolerable" rating category).

[b] A "congruent" perceived trend indicates that the farmer judged the trend in deer numbers to be the same as that judged by MDNR field staff in the study counties (i.e., the farmer's perception of the trend in deer numbers was "accurate"). Those who checked "I don't know" on the trend item were excluded. Results include only those respondents who identified a location on the county map in the survey and provided a trend.

Table 35. Congruence between MDNR judgments regarding trend in deer numbers and the perceptions by farmer respondents about the trend in deer over the past 5 years by rating of damage severity, all counties combined (excluding Montcalm and Oceana).

MDNR Judgment of Trend in Deer Numbers[a]	Farmer Rating of 1994 Crop Loss to Deer[b]	Perceived Trend in Deer Numbers by Farmer Survey Respondents[c]			
		Increasing	Stable	Decreasing	Undecided
Increasing	Not Intolerable (n=65[d])	**33.8%**[e]	41.5%	23.1%	1.5%
	Intolerable (n=50)	**70.0%**	22.0%	4.0%	4.0%
Stable	Not Intolerable[d] (n=82)	39.0%	**35.4%**	24.4%	1.2%
	Intolerable[e] (n=39)	92.3%	**7.7%**	0.0%	0.0%
Decreasing	Not Intolerable[d] (n=33)	24.2%	39.4%	**36.4%**	0.0%
	Intolerable[e] (n=42)	35.7%	54.8%	**9.5%**	0.0%

[a] Pers. Commun. with MDNR Field Staff.

[b] Appendix G, Question #13 ("Not a Problem" and "Tolerable Problem" response options from question #13 combined into "Not Intolerable" rating category).

[c] Appendix G, Question #59. Results include only those respondents who identified a location on the county map in the survey and provided a trend.

[d] No. of respondents in this segment who identified a location on the map of the county that fell within a DMU that had this trend in deer numbers and who answered the question on their perception of the trend in deer numbers.

[e] Bolded values represent "accurate" farmer perceptions.

Estimation of Deer Densities

Map Location

Most of the deer hunter respondents (87.4%, n=630) were able to identify on the map the approximate location(s) where they had hunted (Table 36). Deer hunters who lived in a study county were significantly more likely to identify a location on the map than were those who lived outside the study counties (Fisher's Exact Test $p<0.001$) (Table 37). Respondents to the Calhoun survey tended to be less able to identify where they hunted on the map as compared to respondents from the other counties (Table 36). Most of the respondents who were able to identify on the map where they hunted (81.1%, n=512) had hunted in only one location in the county during the November firearm season. Only 49 deer hunter respondents hunted in more than one Deer Management Unit in the county.

Most of the farmer respondents (89.4%, n=532) were able to identify on the map the approximate location of their primary farming operation where they did the majority of their farming (Table 36). Farmer survey respondents who reported intolerable crop losses to deer in 1994 were no more likely than those who didn't to identify a location on the map (Fisher's Exact Test 1-tailed $p=0.40$) (Table 37). Over three-fourths of the farmers from each county were able to identify a location on the map (Table 36). Only 46 farmer respondents who identified a location on the map farmed in more than one Deer Management Unit in the county.

Table 36. Percent of farmer survey respondents and deer hunter survey respondents that identified a location on the map in the survey where they farmed or deer hunted, respectively, in the study county.

Study County	Percent of Respondents for Each County who Identified a Location on the Map of the County in the Respective Survey	
	Farmer Survey[a]	Deer Hunter Survey[b]
Benzie	85.7% (n=18)	80.4% (n=37)
Calhoun	91.0% (n=121)	73.3% (n=121)
Leelanau	98.1% (n=106)	100.0% (n=49)
Menominee	81.0% (n=51)	80.5% (n=66)
Montcalm	91.3% (n=95)	84.7% (n=166)
Oceana	87.0% (n=100)	76.0% (n=98)
Presque Isle	78.8% (n=41)	84.8% (n=106)

[a] Appendix G, Question #5.
[b] Appendix F, Question #20.

Table 37. Percent of respondents who identified a location on the map of the county in the survey and who provided an estimate of the average number of deer per square mile in the area of the county, by deer hunter resident stratum and perceived severity of deer crop damage.

	Respondent Segment	Percent of Each Segment who Identified a Location on the Map[a]	Percent of Each Segment who Provided an Estimate of the Average Deer Density[b]
Deer Hunter Resident Stratum[c]	Live In (n=444)	86.0%[x]	57.2%[x]
	Live Out (n=348)	75.0%[y]	42.0%[y]
Farmer Perceived Severity of Crop Loss Stratum[d]	Not Intolerable (n=331)	89.4%[x]	52.3%[x]
	Intolerable (n=240)	90.4%[x]	63.3%[y]

[a] Appendix F, Question #20; Appendix G, Question #5.
[b] Appendix F, Question #22; Appendix G, Question #55.
[c] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").
[d] Appendix G, Question #13 ("Not a Problem" and "Tolerable Problem" response options from question #13 combined into "Not Intolerable" rating category).
[xy] Percentages with the same letter within the same column and stratum are not significantly different (Fisher's Exact Test $p>0.05$).

Provision of an Estimate

Of all of the deer hunter survey respondents, 50.4% (n=399) provided a deer density estimate, 42.1% (n=333) indicated that they had no idea whatsoever about the deer density, and 7.6% (n=60) skipped the entire question. Deer hunter survey respondents who lived in a study county were significantly more likely to provide a deer density estimate than were those who lived outside of the study counties (Fisher's Exact Test 1-tailed $p<0.001$) (Table 37). There was no significant difference in deer hunter survey respondents across counties in terms of the likelihood of providing an average deer density estimate ($\chi^2=8.76$, 6df, $p=0.187$). Estimates from those who offered one averaged 21.3 deer per square mile (SD23.2, n=399).

Of all of the farmer survey respondents, 56.1% (n=334) provided a deer density estimate, 39.2% (n=233) indicated that they had no idea whatsoever about the deer density, and 4.9% (n=29) skipped the entire question. Farmer survey respondents who reported intolerable losses to deer in 1994 were significantly more likely to provide an estimate of the average deer density than were those who did not report intolerable crop losses (Fisher's Exact Test 1-tailed $p=0.005$) (Table 37). There was no significant difference in farmer survey respondents across counties in terms of the likelihood of providing an average deer density estimate ($\chi^2=11.70$, 6df, $p=0.069$). Estimates from those who offered one averaged 47.5 deer per square mile (SD100.0, n=334).

Congruence of Deer Density Estimates

MDNR deer density and trend information was not available from Montcalm and Oceana counties. Therefore, analyses regarding congruence of stakeholders' estimates of deer densities with MDNR data were done only with Calhoun, Benzie, Leelanau, Menominee, and Presque Isle counties. For the analysis of congruence between respondents' deer density estimates and the MDNR deer density index for the respective DMU, only those respondents who identified a location on the map could be used (the map location was necessary to identify the DMU for the respondent). Estimates by deer hunter survey respondents should be evaluated with the awareness that there may be some bias due to the fact that deer hunters who lived in a study county were more likely than those who lived outside a study county to identify a location on the map. For the roughly 8% (n=95) of the respondents from both surveys who identified locations on the map that fell within more than one DMU, the DMU where the majority of hunting or farming took place was used. Figure 19 shows the deer density indices (October 1994) for each DMU in the study counties and the MDNR judgments of the trend in deer numbers over the past 5 years in the DMU. Deer density indices should **not** be interpreted as the absolute abundance of deer in the DMU.

Hypothesis 7:

> Stakeholder deer density estimates are positively correlated with MDNR deer density estimates, with those who are full-time farmers who also deer hunt having the strongest positive correlation with the MDNR's deer density estimates.

A significant positive correlation was found between the average estimates of deer density on a DMU basis provided by stakeholders overall (farmers and deer hunter survey respondents combined) and the MDNR deer density index for the DMU (Spearman

r=0.34, n=390, 1-tailed p<0.001) (Table 38). The same was true for each stakeholder segment based on hunting and farming participation, with full-time farmers who deer hunted having the strongest of the correlations (Table 38). In addition, respondents' estimates of the deer density for the DMUs with the lowest MDNR deer density indices were significantly lower than those for the DMUs with the highest MDNR deer density indices (KW χ^2=88.63, 5df, p<0.001) (Table 38). The alternate hypothesis was supported.

As MDNR deer density indices increased, deer density estimates made by farmers and those made by hunters diverged, as shown by the significant differences labeled within each row of Table 38. Farmers tended to overestimate the density for DMUs with the lowest actual density, whereas hunters tended to underestimate the density for DMUs with highest actual density.

Non-farming deer hunters were significantly more confident in their deer density estimates than were non-hunting farmers and full-time farmers who hunt (Table 38).

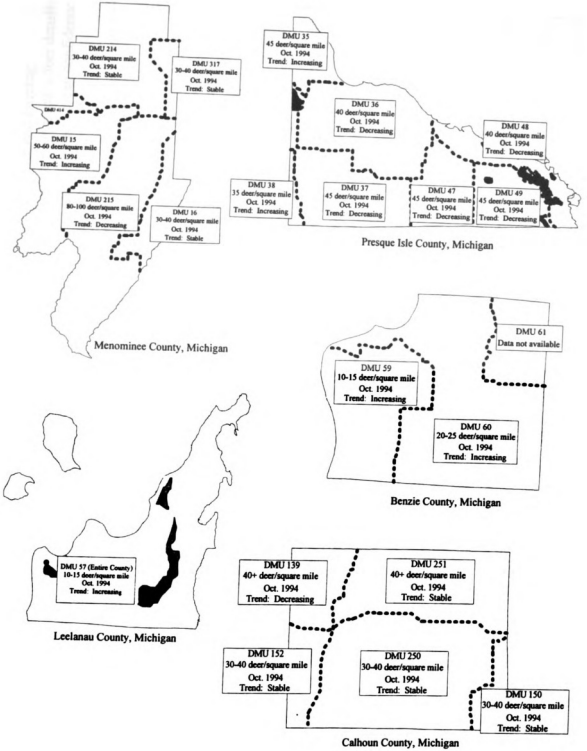


Figure 19. Deer Management Units (DMU) within each study county (except Montcalm and Oceana) showing MDNR deer density indices (Oct. 1994) and MDNR judgment of trend in deer numbers over past 5 years within the DMU. Deer density indices are **not** estimates of the absolute number of deer in the DMU. Maps are not to scale.

Table 38. Average deer density estimates (standard deviation) by four stakeholder segments (based on hunting and farming participation) by Deer Management Units with similar MDNR deer density indices, and the correlation of each segment's deer density estimates with MDNR deer density indices for respective DMUs (excluding Montcalm and Oceana counties). Also, mean confidence (standard deviation) of each segment in their deer density estimates (excluding Montcalm and Oceana counties).

Deer Management Units[a]	MDNR Deer Density Indices (deer/mile^2), Oct. 1994[b]	Average Deer Density Estimate (deer/mile^2) (SD), Oct. 1994[c]				
		Farmers who Do Not Hunt	Full-time Farmers who Deer Hunt	Part-time Farmers who Deer Hunt	Deer Hunters Who are Not Farmers	OVERALL
57, 59	10-15	41.6(51.2)^{Axy} (n=10)	20.4(27.2)^{Ax} (n=35)	12.3(8.2)^{Ax} (n=20)	10.2(6.1)^{Axz} (n=20)	18.6(26.3)^{x} (n=85)
60	20-25	9.5(7.8)^{Axy} (n=2)	2.5(--)^{Axy} (n=1)	28.3(34.9)^{Axy} (n=4)	7.9(4.6)^{Ax} (n=16)	11.4(15.8)^{x} (n=23)
16, 38, 150, 152, 250, 317	30-39	60.7(59.3)^{Axy} (n=26)	62.0(67.0)^{ACy} (n=20)[d]	33.6(30.8)^{BCxy} (n=28)	30.5(30.8)^{By} (n=25)	45.7(49.8)^{yz}(n=99)
35, 36, 37, 47, 48, 49, 139[e], 251[e]	40-49	24.2(23.2)^{ABx} (n=9)	42.3(30.7)^{By} (n=25)	27.5(24.8)^{Axy} (n=36)	21.9(22.2)^{Ayz} (n=60)	27.5(25.7)^{y} (n=130)
15	50-60	--	98.8(15.9)^{Axy} (n=2)	25.2(15.0)^{Axy} (n=5)	33.1(25.3)^{Axy} (n=5)	40.8(32.9)^{yz} (n=12)
215	80-100	115.0(74.4)^{Cy} (n=7)	68.2(34.9)^{BCy} (n=15)	39.9(24.7)^{ABy} (n=8)	37.6(26.0)^{Ay} (n=10)	63.1(48.2)^{z} (n=40)
Correlation of Deer Density Estimate by Stakeholder Segment with MDNR Deer Density Index		0.23* (n=54)	0.58* (n=98)	0.25* (n=101)	0.34* (n=136)	0.34* (n=389)

Table 38 (Cont'd).

Mean Confidence (SD) in their Deer Density Estimate[f]	22.7(29.1)^{B} (n=54)	15.4(20.5)^{B} (n=98)	11.1(10.4)^{AB} (n=101)	10.2(13.5)^{A} (n=136)

[a] DMU 414 is not included here because no respondent reported deer hunting/farming primarily in the portion of DMU 414 that extends into Menominee county. Data from DMU 61 in Benzie were not available, so that DMU is not included.

[b] Pers. Commun. MDNR Field Staff for each study county, Mar. 1996. These data are used only as trend indices by the MDNR, and caution should be used in evaluating them as point estimates.

[c] Respondent estimates for DMUs provided only for those who identified a location on the county map in the survey.

[d] One full-time farmer who deer hunts was excluded as an outlier because his/her deer density estimate was 1600 deer/mile^2.

[e] The MDNR deer density index for DMUs 139 and 251 in Calhoun county was "40+," so deer density indices in these DMUs may be beyond the range of 40-50.

[f] Confidence calculated as upper end of estimated range minus lower end of estimated range. One full-time farmer who deer hunts was excluded as an outlier because his/her confidence range was 2800. Includes only those who identified a location on the county map.

[ABC] Means with the same letter within the same ROW are not significantly different (KW Multiple Comparison $p>0.05$).

[xyz] Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

[•] Significant Spearman correlation (1-tailed $p\leq0.05$). Correlation included only those respondents who identified a location on the county map in the survey and provided a deer density estimate.

Table 39. Deer hunter survey respondents' and farmer survey respondents' average estimates (standard deviation) of the deer density in the area of the study county where they deer hunted or farmed, respectively, and MDNR deer density indices by Deer Management Unit.

Study County (Overall and by Deer Management Unit[a])		Average Deer Density Estimate (deer/mile^2) (SD), Oct. 1994		
		Farmer Survey Respondents[b]	Deer Hunter Survey Respondents[c]	MDNR Deer Population Indices[d]
Benzie/ Leelanau[e]	Overall	21.9(30.8) (n=59)	10.8(11.5) (n=56)	
	DMU 59, 57	23.1(32.1) (n=53)	10.8(7.5) (n=33)	10-15
	DMU 60	8.3(6.0) (n=4)	12.0(17.2) (19)	20-25
Calhoun	Overall	55.7(176.2) (n=82)	28.4(28.4) (n=69)	
	DMU 150, 152, 250	71.9(220.0) (n=52)	32.2(31.8) (n=33)	30-40
	DMU 139 and 251	28.9(20.1) (n=22)	26.2(27.4) (n=27)	40+
Menom-inee[f]	Overall	93.2(56.1) (n=43)	29.4(19.9) (n=39)	
	DMU 16, 214, 317	137(65.0) (n=9)	15.6(7.5) (n=7)	30-40
	DMU 15	98.8(15.9) (n=2)	29.2(20.0) (n=10)	50-60
	DMU 215	80.9(52.8) (n=24)	34.7(22.5) (n=17)	80-100
Montcalm[g]	Overall	39.6(45.1) (n=60)	24.1(27.6) (n=104)	
Oceana[g]	Overall	34.4(59.4) (n=61)	13.3(12.7) (n=68)	
Presque Isle	Overall	52.7(72.5) (n=29)	21.9(22.1) (n=64)	
	DMU 38	--	25.0 (n=1)	35
	DMU 36, 48	75.1(112.8) (n=9)	14.8(13.3) (n=13)	40
	DMU 35, 37, 47, 49	47.4(34.3) (n=15)	23.5(24.9) (n=45)	45
OVERALL		47.5(100.0) (n=334)	21.3(23.2) (n=400)	
Correlation of Deer Density Estimate by Respondent Segment with MDNR Deer Density Index		0.46* (n=190)	0.31* (n=205)	

[a] Respondent estimates for DMUs provided only for those who identified a location on the county map in the survey.
[b] Appendix G, Question #55
[c] Appendix F, Question #22
[d] Pers. Commun. MDNR Field Staff for each study county, Mar. 1996. These data are used only as trend indices by the MDNR, and **caution should be used in evaluating them as point estimates.** Blank spaces in table are due to the fact that MDNR calculates deer density indices per DMU and not per county overall.
[e] Data from DMU 61 in Benzie were not available, so that DMU is not included. Only 2 respondents (one from each survey) hunted/farmed primarily in this DMU (each was a part-time farming hunter).
[f] No respondent reported deer hunting/farming primarily in the portion of DMU 414 that extends into Menominee county, so it is not included here. Data from DMU 61 in Benzie were not available, so that DMU is not included.
[g] DMU deer density data not available for Montcalm and Oceana counties.
* Significant Spearman correlation (1-tailed $p<0.001$).

Hypothesis$_a$ 8:

> Deer hunters who live in the county where they deer hunt are more likely than deer hunters who live outside the county where they deer hunt to provide deer density estimates for the county that are positively correlated with MDNR deer density estimates for the county.

Overall, there was no significant difference between the average deer density estimates made by deer hunters who lived in a study county and deer hunters who lived outside of the study counties (MW z=-1.33, p=0.185) (Table 40). For areas with higher deer densities, both of these groups tended to underestimate the density of deer. Each of these segments' deer density estimates was significantly positively correlated with the MDNR deer density index for the respective DMU (Table 40). The alternate hypothesis was not supported.

Although a significant difference (KW χ^2=13.67, 5df, p=0.0179) was found among deer density estimates by Live Out deer hunters across DMUs, the Kruskal-Wallis multiple comparison test was unable to determine which groups were different. Deer hunters who lived in a study county and hunted in the DMU with the highest deer density index (80-100 deer/mile^2) gave a significantly higher deer density estimate than did deer hunters who lived in a study county and hunted in the DMU with the lowest deer density index (10-15 deer/mile^2) (KW χ^2=22.38, 5df, p<0.001) (Table 40).

Table 40. Deer hunter survey respondents' average estimate (standard deviation) of deer density in the area of the study county where they hunted and their correlation with MDNR deer density indices for the respective Deer Management Unit, by resident stratum (excluding Montcalm and Oceana counties).

Deer Management Units[a]	MDNR Deer Density Indices (deer/mile^2), Oct. 1994[b]	Average Deer Density Estimate (deer/mile^2) (SD), Oct. 1994[c]	
		Live In[d]	Live Out[d]
57, 59	10-15	9.3(6.6)^{Ax} (n=16)	12.4(8.2)^{Ax} (n=17)
60	20-25	14.7(23.4)^{Axz} (n=10)	9.1(5.3)^{Ax} (n=9)
16, 38, 150, 152, 250, 317	30-39	30.2(30.9)^{Ayz} (n=31)	26.2(25.1)^{Ax} (n=10)
35, 36, 37, 47, 48, 49, 139[e], 251[e]	40-49	24.8(24.4)^{Ayz} (n=50)	20.5(24.6)^{Ax} (n=35)
15	50-60	22.3(13.9)^{Axy} (n=6)	39.5(25.3)^{Ax} (n=4)
215	80-100	30.9(18.5)^{Ay} (n=12)	44.0(30.4)^{Ax} (n=5)
OVERALL		23.8(24.5)^{A} (n=125)	20.6(22.5)^{A} (n=80)
Correlation of Deer Density Estimate by Hunter Segment with MDNR Deer Density Index		0.31* (n=125)	0.28* (n=80)

[a] DMU 414 is not included here because no respondent reported deer hunting primarily in the portion of DMU 414 that extends into Menominee county. Data from DMU 61 in Benzie were not available, so that DMU is not included.

[b] Pers. Commun. MDNR Field Staff for each study county, Mar. 1996. These data are used only as trend indices by the MDNR, and **caution should be used in evaluating them as point estimates.**

[c] Respondent estimates for DMUs provided only for those who identified a location on the county map in the survey. Appendix F, Question #20.

[d] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").

[e] The MDNR deer density index for DMUs 139 and 251 in Calhoun county was "40+," so deer density indices in these DMUs may be beyond the range of 40-50.

[AB] Means with the same letter within the same ROW are not significantly different (MW $p>0.05$).

[xyz] Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

* Significant Spearman correlation (1-tailed $p\leq 0.05$). Correlation included only those respondents who identified a location on the county map in the survey and provided a deer density estimate. Mean confidence in estimates for these segments is shown in Table 42.

Hypothesis$_a$ 9:

Farmers who judge their crop losses to deer as intolerable will estimate higher deer densities than will farmers who do not judge their crop losses to deer as intolerable.

Farmers who judged their 1994 crop losses to deer as intolerable estimated a significantly higher deer density in the area where they farmed than did farmers who did not judge their crop losses as intolerable (MW $z=-5.48$, $p<0.001$) (Table 41). Deer density estimates by each of these two segments had a significant positive correlation with the MDNR deer density index for the respective DMU (Table 41). The alternate hypothesis was supported.

Farmer survey respondents' deer density estimates for the DMU with the lowest deer density index (10-15 deer/mile^2) were significantly lower than estimates for the DMU with the highest deer density index (80-100 deer/mile^2), regardless of perceived severity of 1994 crop losses (Table 41).

Perceptions of the Severity of Crop Loss

There was a significant positive correlation between farmer survey respondents' intolerance of deer and their ratings of the severity of deer crop losses (Spearman $r=0.68$, $p<0.001$). Farmer survey respondents' ratings of the severity of their crop losses were less strongly correlated with their perceptions of deer density (Spearman $r=0.38$, 1-tailed $p<0.001$). The correlation between farmer survey respondents' ratings of the severity of their crop losses and MDNR's deer density indices was weak (Spearman $r=0.10$, 1-tailed $p=0.045$).

Table 41. Farmer survey respondents' average estimate (standard deviation) of deer density in the area of the study county where they farmed and their correlation with MDNR deer density indices for the respective Deer Management Unit, by perceived severity of 1994 deer crop losses (excluding Montcalm and Oceana counties). Also, mean confidence (standard deviation) of each segment in their deer density estimates (excluding Montcalm and Oceana counties).

Deer Management Units[a]	MDNR Deer Density Indices (deer/mile^2), Oct. 1994[b]	Average Deer Density Estimate (deer/mile^2) (SD), Oct. 1994[c]	
		Farmers whose Losses were Not Intolerable[d]	Farmers whose Losses were Intolerable[d]
57, 59	10-15	16.4(17.7)^{Ax} (n=27)	32.8(43.4)^{Ax} (n=23)
60	20-25	8.3(6.0)^{x} (n=4)	--
16, 38, 150, 152, 250, 317	30-39	32.3(43.5)^{Axy} (n=32)	83.6(59.0)^{By} (n=28)[e]
35, 36, 37, 47, 48, 49, 139[f], 251[f]	40-49	31.4(24.2)^{Axy} (n=27)	44.4(28.1)^{Axy} (n=17)
15	50-60	--	98.8(15.9)^{xy} (n=2)
215	80-100	98.0(74.5)^{Ay} (n=5)	76.4(47.2)^{Ay} (n=19)
OVERALL		30.0(37.6)^{A} (n=95)	61.8(51.5)^{B} (n=89)
Correlation of Deer Density Estimate by Farmer Segment with MDNR Deer Density Index		0.46* (n=95)	0.35*(n=89)
Mean Confidence (SD) in their Deer Density Estimate[g]		12.8(19.7)^{A}(n=95)	22.8(24.1)^{B} (n=89)

[a] DMU 414 is not included here because no respondent reported deer farming primarily in the portion of DMU 414 that extends into Menominee county. Data from DMU 61 in Benzie were not available, so that DMU is not included.

[b] Pers. Commun. MDNR Field Staff for each study county, Mar. 1996. These data are used only as trend indices by the MDNR, and caution should be used in evaluating them as point estimates.

[c] Respondent estimates for DMUs provided only for those who identified a location on the county map in the survey. Appendix G, Question #55.

[d] Appendix G, Question #13 ("Not a Problem" and "Tolerable Problem" response options from question #13 combined into "Not Intolerable" rating category).

[e] One farmer with intolerable losses was excluded as an outlier because his/her deer density estimate was 1600 deer/mile^2.

[f] The MDNR deer density index for DMUs 139 and 251 in Calhoun county was "40+," so deer density indices in these DMUs may be beyond the range of 40-50.

[g] Confidence calculated as upper end of estimated range minus lower end of estimated range. One farmer was excluded as an outlier because his/her confidence range was 2800. Includes only those who identified a location on the county map.

AB Means with the same letter within the same ROW are not significantly different (MW $p>0.05$).

xy Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

* Significant Spearman correlation (1-tailed $p\leq 0.05$). Correlation included only those respondents who identified a location on the county map in the survey and provided a deer density estimate.

Estimates of the Parameters in the CCC Framework

As discussed in the section on study design hypotheses in this chapter, hunter issue activity was found to be significantly higher for those who deer hunted in Menominee or Presque Isle county than for those who deer hunted in Calhoun (Table 24). Because the next hypothesis was intended to compare high issue activity counties to lower issue activity counties, it was rewritten according to the significant differences established earlier.

Hypothesis$_a$ 10:

> There is greater overlap in preferences for deer ("latitudes of acceptance") for the four segments of respondents (based on hunting and farming participation) in Calhoun county (i.e., counties with relatively low deer-management-related issue activity) than for those in Menominee or Presque Isle counties (counties with relatively high deer-management-related issue activity).

As described in the Methodology Chapter (see page 119), respondents were asked three questions to ascertain the parameters of the response curves within the CCC framework; these included the inverse apex of the curve, which was the most desirable deer density; the minimum demand point (far left point in each curve); and the wildlife acceptance capacity (far right point in each curve) (Appendix F, Questions #24-26; Appendix G, Questions #57 and 58, parts A and B). For each respondent, the value of each of the three points was divided by his/her average deer density estimate. This quotient was then multiplied by the MDNR deer density index for the DMU, and the means for that respondent segment were plotted on a graph (Figure 20). In addition, the interquartile range was charted for each of the three response curve points. Deer Management Units in the same county with the same MDNR deer density index were combined, and those DMU aggregates with adequate sample sizes for plotting of

response curves (one in each of Calhoun, Menominee, and Presque Isle) are presented in Figure 20. Because the figures would have been too difficult to interpret if responses from all segments in a DMU aggregate were charted on one graph, each segment is presented on its own x-y graph. To identify where the latitudes of acceptance overlap, the reader must view the response curves for each segment in a county as a composite. There tended to be greater overlap in mean response curves among the respondent segments in Calhoun county than in either Menominee or Presque Isle county (Figure 20). The alternate hypothesis was supported; however, given the wide variance around the means, support for this hypothesis is tentative.

Non-farming deer hunters tended to prefer a higher average deer density than did non-hunting farmers. Also, the most desirable mean deer density by non-hunting farmers tended to be below the MDNR index, whereas the most desirable mean deer density by non-farming deer hunters was above the MDNR index.

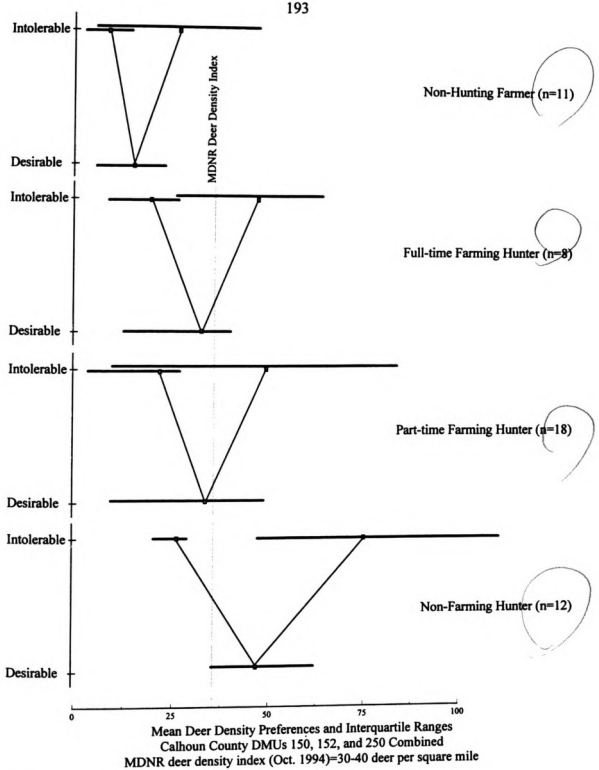


Figure 20. Cultural Carrying Capacity response "curves" for farmer/hunter stakeholder segments for Calhoun, Menominee, and Presque Isle counties. Deer Management Units (DMU) with similar MDNR deer density indices were combined in each county, and those with reasonable sample sizes are presented here. Horizontal axis is average deer per square mile, calculated by taking the estimates of the three points on the curve for each respondent and dividing each by his/her estimate of the actual deer density and then multiplying this quotient by the MDNR deer density index. Then, the mean for each point for each respondent segment was graphed along with interquartile ranges for each. Vertical axis is attitude toward the deer density (Appendix F, Questions #24-26; Appendix G Questions #57 and 58).

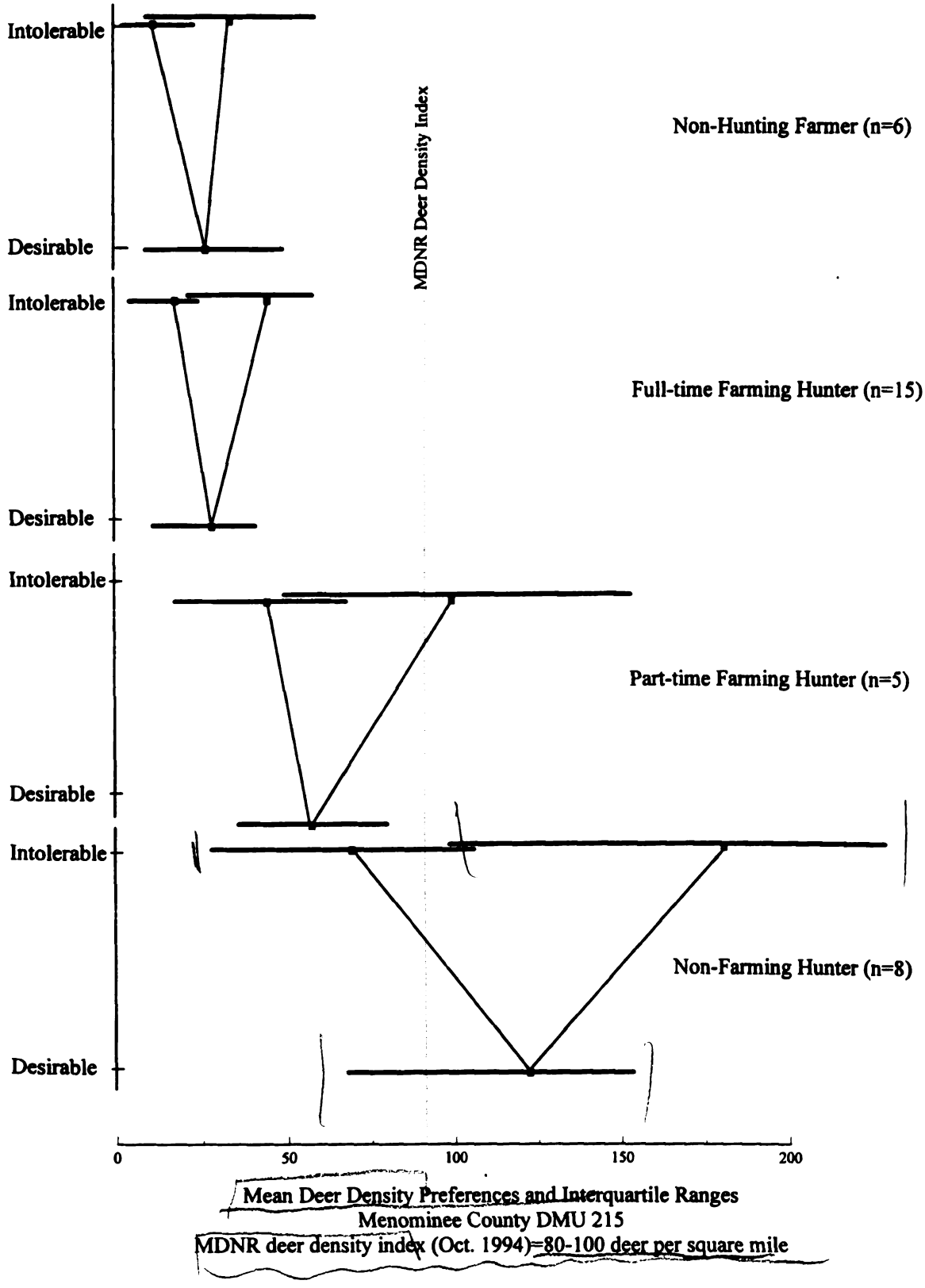
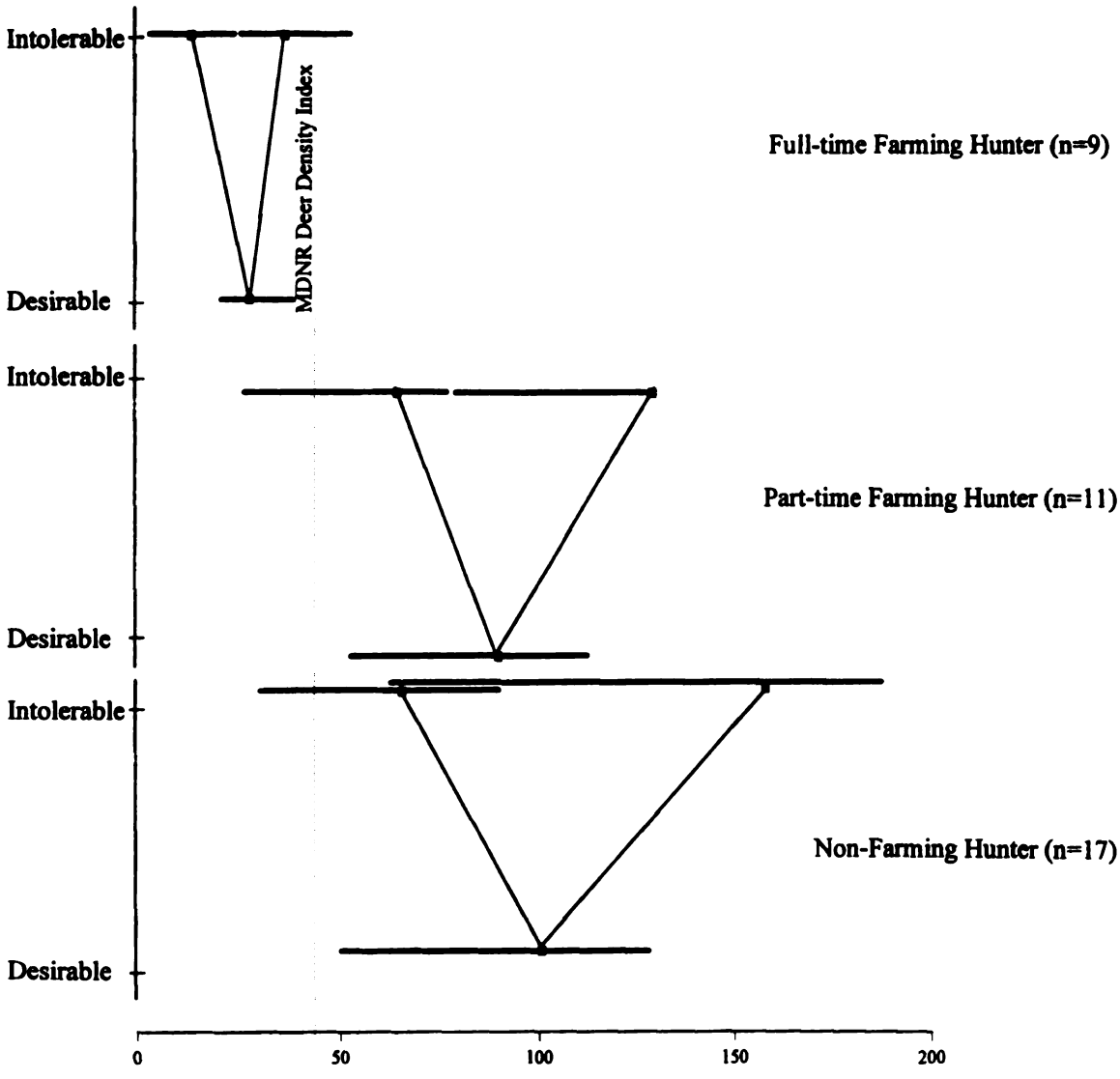


Figure 20 (Cont'd).



Mean Deer Density Preferences and Interquartile Ranges
Presque Isle County DMUs 35, 37, 47, and 49 Combined
MDNR deer density index (Oct. 1994)=45 deer per square mile
(Non-Hunting Farmers not shown because no non-hunting farmers who farmed in these DMUs answered all 4 deer density-related questions)

Figure 20 (Cont'd).

Confidence in Deer Density Estimates

As described in the Methodology Chapter, a confidence index was calculated by subtracting the lower end of the estimated deer density range from the upper end of the estimated deer density range (Appendix F, Question #22, second blank minus first blank). It was assumed that a wide range of estimated deer densities reflected less confidence than did a narrow range.

Hypothesis$_a$ 11:

Deer hunters who live in a study county as compared to deer hunters who do not live in a study county are more confident in their estimate of the deer density in the county.

Deer hunters who lived in a study county were no more confident in their estimate of the deer density than were those who lived outside the study counties (MW z=-1.39, p=0.16) (Table 42). The alternate hypothesis was not supported.

Table 42. Deer hunter survey respondents' mean confidence (standard deviation) in their estimate of deer density and the correlation between their deer density estimate and the MDNR deer density index for the respective DMU, by resident stratum (excluding Montcalm and Oceana counties).

Deer Hunter Resident Stratum[a]	Mean Confidence (SD) in their Deer Density Estimate[b]	Correlation of Deer Density Estimate with MDNR Deer Density Index for the DMU[c]
Live In	10.2(12.8)[x] (n=125)	0.31* (n= 125)
Live Out	9.1(11.1)[x] (n=80)	0.28* (n=80)

[a] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").

[b] Confidence calculated as upper end of estimated range minus lower end of estimated range. Includes all hunter survey respondents who provided a deer density estimate.

[c] Correlation included only those respondents who identified a location on the county map in the survey and provided a deer density estimate.

[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

* Significant Spearman correlation (1-tailed p<0.05).

Hypothesis$_a$ 12:

Deer hunters who are members of an organization are more likely to offer an estimate of the deer density in the county than are nonmembers.

Hypothesis$_a$ 13:

Deer hunters who are members of an organization are more confident in their estimate of the average deer density than are nonmembers.

Members of deer-hunting-related organizations were significantly more likely to offer an estimate of the deer density than were nonmembers (Fisher's Exact Test $p<0.001$) (Table 43). Members of deer-hunting-related organizations were also significantly more confident than nonmembers in their estimate of the average deer density in the area of the county where they deer hunted (MW $z=-2.0$, $p=0.046$) (Table 43). Both alternate hypothesis 12 and alternate hypothesis 13 were supported.

Table 43. Percent of deer hunter survey respondents who provided an estimate of the deer density for the area of the study county where they deer hunted most often during the November firearm season, their mean confidence (standard deviation) in their estimate of deer density, and the correlation between their deer density estimate and the MDNR deer density index for the respective DMU, by membership in a Michigan-based deer-hunting-related or conservation organization.

Membership Stratum	Percent of Each Membership Stratum that Gave an Estimate[a]	Mean Confidence (SD) in their Deer Density Estimate[b]	Correlation of Deer Density Estimate with MDNR Deer Density Index for the DMU[c]
Members (n=221)	62.0% (n=137)	7.7(8.3)^x (n=137)	0.22* (n=80)
Non-Members (n=521)	45.7% (n=238)	9.8(12.0)^y (n=238)	0.37* (n=109)

[a] Membership Strata by Provision of an Estimate (Yes/No) Fisher's Exact Test $p<0.001$.

[b] Confidence calculated as upper end of estimated range minus lower end of estimated range. Includes all hunter survey respondents who provided a deer density estimate (i.e., includes Montcalm and Oceana).

[c] Correlation included only those respondents who identified a location on the county map in the survey and provided a deer density estimate, excluding Montcalm and Oceana counties because MDNR data were not available.

[xy] Means with the same letter within the same column are not significantly different (MW $p>0.05$).

[*] Significant Spearman correlation (1-tailed $p<0.05$).

Tolerance of Deer

Hypothesis$_a$ 14:

Given the same actual deer density (MDNR index), non-farming deer hunters believe there are too few deer, whereas non-hunting farmers believe that there are too many deer.

Overall, non-farming deer hunters felt that there were too few deer, and non-hunting farmers felt that there were too many deer (Table 44). For areas with similar MDNR deer density indices, non-farming deer hunters were significantly more likely to believe that there were too few deer as compared to non-hunting farmers (Table 45). This was true for each MDNR deer density range except the 20-25 deer per square mile range. However, the pattern of mean tolerance between non-farming hunters and non-hunting farmers in the 20-25 deer per square mile range was consistent with that of the other MDNR deer density ranges. The alternate hypothesis was supported.

Table 44. Tolerance of deer population for four respondent segments (based on hunting and farming participation) in the area of the county where they farmed or deer hunted.

Farming/ Hunting Segment	Tolerance of Deer Population[a]					Mean Tolerance (SD)[b]
	Too Few and Intolerable	Too Few but Tolerable	Satisfactory	Too Many but Tolerable	Too Many and Intolerable	
Farmers who Do Not Deer Hunt (n=159)	0.6%	0.0%	30.2%	28.9%	40.3%	4.08(0.87)^x
Full-time Farmers who Deer Hunt (n=275)	5.5%	5.8%	30.9%	12.0%	45.8%	3.87(1.22)^x
Part-time Farmers who Deer Hunt (n=312)	20.2%	19.6%	40.1%	7.7%	12.5%	2.73(1.23)^y
Deer Hunters who are Not Farmers (n=480)	23.8%	29.4%	43.8%	1.5%	1.7%	2.28(0.90)^z

[a] Appendix G, Question # 56; Appendix F, Question #23.

[b] Scale from 1 ("Too Few, and I Intend to Try to Do Something About It.") to 5 ("Too Many, and I Intend to Try to Do Something About It.").

^{xyz} Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

Table 45. Mean tolerance of deer (standard deviation) by four stakeholder segments (based on hunting and farming participation) by Deer Management Units with similar MDNR deer density indices (excluding Montcalm and Oceana counties).

Deer Management Units[a]	MDNR Deer Density Indices (deer/mile^2), Oct. 1994[b]	Mean Tolerance (SD)[c]				
		Farmers who Do Not Hunt	Full-time Farmers who Deer Hunt	Part-time Farmers who Deer Hunt	Deer Hunters Who are Not Farmers	OVERALL
57, 59	10-15	3.94(1.01)^{Ax} (n=32)	3.83(1.16)^{Ax} (n=58)	2.93(1.12)^{Bxy} (n=28)	2.17(0.85)^{Cx} (n=36)	3.30(1.27)^{x} (n=154)
60	20-25	3.33(0.58)^{Ax} (n=3)	3.00(--)^{Axy} (n=2)	2.40(0.89)^{Axy} (n=5)	2.10(0.77)^{Ax} (n=21)	2.32(0.83)^{y} (n=31)
16, 38, 150, 152, 250, 317	30-39	4.15(0.74)^{Ax} (n=40)	3.43(1.50)^{Bx} (n=35)	3.38(1.15)^{Bx} (n=42)	2.58(0.99)^{Cx} (n=48)	3.35(1.24)^{x} (n=165)
35, 36, 37, 47, 48, 49, 139[d], 251[e]	40-49	3.87(0.83)^{Ax} (n=15)	3.97(1.12)^{Axy} (n=37)	2.54(1.31)^{By} (n=56)	2.29(0.93)^{Bx} (n=105)	2.76(1.26)^{y} (n=213)
15	50-60	--	5.00(0.00)^{Axy} (n=3)	2.83(1.33)^{Bxy} (n=6)	2.80(0.63)^{Bx} (n=10)	3.16(1.17)^{xy} (n=19)
215	80-100	4.58(0.67)^{Ax} (n=12)	4.82(0.59)^{Ay} (n=22)	3.31(0.95)^{Bxy} (n=13)	2.67(1.02)^{Bx} (n=21)	3.82(1.25)^{x} (n=68)

[a] DMU 414 is not included here because no respondent reported deer hunting/farming primarily in the portion of DMU 414 that extends into Menominee county. Data from DMU 61 in Benzie were not available, so that DMU is not included.

[b] Pers. Commun. MDNR Field Staff for each study county, Mar. 1996. These data are used only as trend indices by the MDNR, and **caution should be used in evaluating them as point estimates.**

[c] Scale from 1 (Too Few, and I Intend to Try to Do Something About It) to 5 (Too Many, and I Intend to Try to Do Something About It) (Appendix G, Question # 56; Appendix F, Question #23).

[d] Respondent estimates for DMUs provided only for those who identified a location on the county map in the survey.

[e] The MDNR deer density index for DMUs 139 and 251 in Calhoun county was "40+," so deer density indices in these DMUs may be beyond the range of 40-50.

ABC Means with the same letter within the same ROW are not significantly different (KW Multiple Comparison $p>0.05$).

xyz Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

Decision Criteria in Deer Hunters' Evaluation of the Deer Population

Deer hunter survey respondents were asked to rate four items in terms of their importance as considerations in forming their opinion on the acceptability of the deer population size in the county: the number of deer-related vehicle accidents in the county, personal benefits from deer, benefits others get from having deer in the county, and farmers' crop losses due to deer (Appendix F, Question #10). The vast majority of respondents felt that each of the considerations was of some degree of importance (Table 46).

Hypothesis$_a$ 15:

> Deer hunters rank their personal benefits from deer as a more important consideration in their opinion of the deer density in the county than others' benefits from deer, the number of deer-related vehicle accidents, and farmers' crop losses due to deer.

Overall, deer hunters ranked their personal benefits from deer as a more important consideration in their opinion of the deer density in the county than any of the other considerations provided (Table 46). The alternate hypothesis was supported. The mean importance placed on personal benefits and others' benefits did not significantly differ across study counties (Table 47). However, mean importance of DRVA and farmers' crop losses did vary across counties, with deer hunter respondents for Calhoun placing significantly more importance on these considerations than did hunters from some of the other counties (Table 47).

Table 46. Percent of deer hunter survey respondents who rated the number of deer-related vehicle accidents in the county, their personal benefits from deer, the benefits others derive from having deer in the county, and farmers' crop losses due to deer as important considerations in their opinion of the acceptability of the deer population size in the county, and the mean importance rating (standard deviation) of each consideration.

Item for Consideration[a]	Percent who felt the Item was... [b]		Mean Importance (SD)[c]
	Important	Not Important	
No. of DRVA in the County (n=702)	86.3%	13.7%	1.85(1.02)[x]
Personal Benefits from Deer (n=729)	97.5%	2.5%	2.51(0.73)[z]
Benefits Others get from Having Deer in the County (n=692)	92.5%	7.5%	2.09(0.92)[y]
Farmers' Crop Losses due to Deer (n=696)	82.9%	17.1%	1.68(1.04)[x]

[a] Appendix F, Question #10, items 1-4, respectively.

[b] Importance as a consideration in respondents' opinion on whether the deer population size in the county was acceptable. "Very Important," "Somewhat Important," and "Slightly Important" response options grouped into "Important" category; "Unsure" responses excluded.

[c] Scale from 0 (not important) to 3 (very important); "Unsure" responses excluded.

[xyz] Means with the same letter within the same column are not significantly different (Friedman Multiple Comparison $p>0.05$).

Table 47. Deer hunter respondents' mean importance (standard deviation) of deer-related vehicle accidents, personal benefits from deer, benefits others derive from deer, and farmers' losses in the study county overall and by resident stratum, of those respondents who offered an opinion.[a]

Study County	County Resident Stratum	Mean Importance (SD) of Deer-Related Vehicle Accidents[b]	Mean Importance (SD) of Personal Benefits from Deer[c]	Mean Importance (SD) of Benefits Others Get from Deer[d]	Mean Importance (SD) of Farmers' Crop Losses Due to Deer[a]
Benzie/ Leelanau	Overall	1.81(0.94)^{xy} (n=89)	2.40(0.74)^{x} (n=92)	1.99(0.93)^{x} (n=86)	1.71(0.96)^{xy} (n=87)
	Live In[f]	1.98(0.97) (n=45)	2.42(0.75) (n=45)	1.95(1.03) (n=42)	1.82(0.90) (n=44)
	Live Out[f]	1.64(0.89) (n=44)	2.38(0.73) (n=47)	2.02(0.82) (n=44)	1.60(1.03) (n=43)
Calhoun	Overall	2.17(0.96)^{x} (n=151)	2.61(0.64)^{x} (n=156)	2.20(0.89)^{x} (n=148)	2.03(1.01)^{x} (n=148)
	Live In	2.26(0.95) (n=107)	2.57(0.63) (n=110)	2.16(0.88) (n=104)	1.99(1.03) (n=106)
	Live Out	1.95(0.99) (n=44)	2.70(0.66) (n=46)	2.27(0.92) (n=44)	2.14(0.98) (n=42)
Menominee	Overall	1.73(0.96)^{y} (n=73)	2.44(0.79)^{x} (n=75)	1.77(1.02)^{x} (n=71)	1.66(1.09)^{xy} (n=74)
	Live In	1.73(1.03) (n=41)	2.39(0.83) (n=41)	1.79(0.98) (n=39)	1.63(1.13) (n=41)
	Live Out	1.72(0.89) (n=32)	2.50(0.75) (n=34)	1.75(1.08) (n=32)	1.70(1.06) (n=33)
Montcalm	Overall	1.83(1.05)^{xy} (n=170)	2.55(0.72)^{x} (n=175)	2.10(0.90)^{x} (n=169)	1.51(1.07)^{y} (n=168)
	Live In	1.91(1.01) (n=107)	2.55(0.71) (n=110)	2.08(0.90) (n=107)	1.44(1.07) (n=107)
	Live Out	1.70(1.12) (n=63)	2.54(0.75) (n=65)	2.13(0.90) (n=62)	1.64(1.05) (n=61)
Oceana	Overall	1.76(0.99)^{y} (n=107)	2.51(0.74)^{x} (n=114)	2.11(0.92)^{x} (n=106)	1.43(1.04)^{y} (n=109)
	Live In	1.82(0.97) (n=61)	2.63(0.63) (n=62)	2.03(0.92) (n=58)	1.39(1.02) (n=61)
	Live Out	1.67(1.01) (n=46)	2.37(0.84) (n=52)	2.21(0.92) (n=48)	1.48(1.07) (n=48)

Table 47 (cont'd).

Presque Isle	Overall	1.66(1.10)^{y} (n=112)	2.47(0.76)^{x} (n=117)	2.20(0.91)^{x} (n=112)	1.69(0.97)^{xy} (n=110)
	Live In	1.76(0.97) (n=51)	2.38(0.84) (n=52)	2.33(0.88) (n=49)	1.84(0.92) (n=49)
	Live Out	1.57(1.19) (n=61)	2.54(0.69) (n=65)	2.10(0.93) (n=63)	1.57(1.01) (n=61)

[a] Scale from 0 (not important) to 3 (very important); "Unsure" responses excluded.
[b] Appendix F, Question #10, Item 1.
[c] Appendix F, Question #10, Item 2.
[d] Appendix F, Question #10, Item 3.
[e] Appendix F, Question #10, Item 4.
[f] No significant differences were found in any of these variables between Live Ins and Live Outs for any one county (MW $p>0.05$).
[xy] Overall means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

Hypothesis$_a$ 16:

Deer hunters who live in a study county are more likely than those who live outside the county to rate the number of deer-related vehicle accidents as an important consideration in their opinion of the deer density in the county.

Deer hunters who lived in a study county were significantly more likely to rate the number of deer-related vehicle accidents (DRVA) in the county as an important consideration in their opinion on the acceptability of the deer population in the county (Fisher's Exact Test 1 tailed $p<0.03$) (Table 48). However, the differences were not substantively meaningful, and the majority of deer hunters from each resident stratum rated DRVA as an important consideration (Table 48).

A similar pattern was found for the degree of importance placed on DRVA. Those who lived in a study county gave a significantly higher mean importance rating of DRVA than did those who lived outside the study counties (MW $z=-3.32$, $p<0.001$) (Table 48). The alternate hypothesis was supported.

Table 48. Deer hunter survey respondents' rating of the importance of deer-related vehicle accidents in the county as a consideration in their opinion of the acceptability of the deer population size in the county, by resident stratum.

Deer Hunter Resident Stratum[a]	Percent of Each Stratum who felt that the No. of Deer-Related Vehicle Accidents in the County was...[b]		Mean Importance (SD) of Deer-Related Vehicle Accidents[c]
	Important	Not Important	
Live In (n=412)	88.6%	11.4%	1.96(0.99)[x]
Live Out (n=290)	83.1%	16.9%	1.70(1.04)[y]

[a] Deer hunters who lived in a study county ("Live In") and those who lived outside the study counties ("Live Out").

[b] Importance of DRVA as a consideration in respondents' opinion on whether the deer population size in the county was acceptable (Appendix F, Question #10, first item). "Very Important," "Somewhat Important," and "Slightly Important" response options grouped into "Important" category; "Unsure" responses excluded. Fisher's Exact Test 1 tailed $p<0.03$.

[c] Scale from 0 (not important) to 3 (very important); "Unsure" responses excluded.

[xy] Means with the same letter within the same column are not significantly different (MW $p>0.05$).

Deer Hunter Attitudes Associated with the Crop Damage Issue

Background on Deer Hunters' Attitudes toward the Crop Damage Issue

According to deer hunters, the crop loss issue is clearly not the single most important deer management issue in Michigan, with about the same number of respondents saying that the crop loss issue was the most important issue facing deer management in Michigan (10.7%, n=83) as thought that the crop loss issue was not at all important (10.3%, n=80). Yet, most deer hunter respondents (55.6%, n=432) said that it was as or more important than most other issues facing deer management in Michigan. About 23% (n=181) thought the crop loss issue was less important than most other deer management issues.

Deer hunter respondents were divided regarding their opinion of the general policy of killing deer to control crop damage. Overall, 37.4% (n=291) of the deer hunter respondents approved or strongly approved of the MDNR's policy of intentionally reducing deer numbers in certain areas in order to decrease the extent of deer damage to agricultural crops, and 45.5% (n=354) disapproved or strongly disapproved of the policy. About 17% (n=133) were undecided about the policy.

Few (5.3%, n=41) of the respondents reported that they were unaware of the current MDNR Crop Damage Control Program, which was described in the survey as including regular antlerless permits (lottery) for hunters and deer control permits for use on farms (Appendix F, Question #30). Of those who were aware of the program, there was a fairly even split in opinions about the program, with 42.7% (n=311) approving or strongly approving of the control program, 16.6% (n=121) being undecided, and 40.7% (n=296) disapproving or strongly disapproving of the program.

Approval of Shooting and Block Permits

Hypothesis$_a$ 17:

Deer hunters have more favorable attitudes toward Block Permits than toward Shooting Permits.

On the whole, deer hunter respondents' attitudes were significantly more favorable toward Block Permits than toward Shooting Permits (Wilcoxon z=-8.29, $p<0.001$, n=682) (Table 49). The alternate hypothesis was supported. However, overall, deer hunter respondents tended to disapprove of each of the permit programs (Table 49).

Table 49. Distribution of deer hunter survey respondents' attitudes toward Shooting and Block Permits and mean approval (standard deviation) of each permit type.

Permit Type	Attitude Toward the Permits					Mean Approval[c] (SD)
	Strongly Approve	Approve	Undecided	Disapprove	Strongly Disapprove	
Shooting[a] (n=718)	3.5%	15.5%	21.2%	30.9%	29.0%	3.66[x]
Block[b] (n=701)	6.4%	26.5%	22.4%	25.8%	18.8%	3.24[y]

[a] Appendix F, Question #50.
[b] Appendix F, Question #55.
[c] Scale from 1 (strongly approve) to 5 (strongly disapprove).
[xy] Means with the same letter within the same column are not significantly different (Wilcoxon Matched-Pairs $p>0.05$).

About 38% (n=257) of the respondents who answered both questions disapproved or strongly disapproved of both permit systems, whereas 11.4% (n=78) approved or strongly approved of both permit systems (Table 50). About 16% of the deer hunter respondents approved of one of the permit systems but disapproved of the other, with more respondents approving of Block Permits while disapproving of Shooting Permits (15.5%, n=106) than vice versa (Table 50).

Table 50. Distribution of deer hunter respondents' attitudes toward Shooting and Block Permits for those respondents who answered both of the items.

Overall n = 682		Attitude Toward Block Permits[b]		
		Approve/ Strongly Approve	Undecided	Disapprove/ Strongly Disapprove
Attitude Toward Shooting Permits[a]	Approve/ Strongly Approve	11.4% (n=78)	3.7% (n=25)	3.4% (n=23)
	Undecided	5.6% (n=38)	11.7% (n=80)	3.8% (n=26)
	Disapprove/ Strongly Disapprove	15.5% (n=106)	7.2% (n=49)	37.7% (n=257)

[a] Appendix F, Question #50.
[b] Appendix F, Question #55.

Participation in Program and Approval of Program

Hypothesis$_a$ 18:

Deer hunters who have not been a designated shooter are more disapproving of Shooting Permits than are those who have been a designated shooter.

Hypothesis$_a$ 19:

Deer hunters who have not used a Block Permit are more disapproving of Block Permits than are those who have used a Block Permit.

There was no significant difference in approval of Shooting Permits between those who had been a designated shooter and those who had not (Table 51). However, deer hunter respondents who had hunted with a Block Permit were significantly more approving of Block Permits than were those who had not hunted with a Block Permit (MW $z=-5.34$, $p<0.001$) (Table 52). Alternate hypothesis 18 regarding participation in Shooting Permits was not supported, but the alternate hypothesis 19 regarding participation in Block Permits was supported.

Table 51. Deer hunter respondents' mean approval[a] (standard deviation) of Shooting Permits by their participation in the program as a designated shooter.

Shooting Permit Designated Shooter[b]	Mean Approval (SD) of Shooting Permits[c]
Yes	3.44(1.42)[x] (n=45)
No	3.68(1.13)[x] (n=669)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).
[b] Appendix F, Question #53.
[c] Appendix F, Question #50.
[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Table 52. Deer hunter respondents' mean approval[a] (standard deviation) of Block Permits by their participation in the program through use of a Block Permit.

Block Permit User[b]	Mean Approval (SD) of Block Permits[c]
Yes	2.62(1.27)[x] (n=97)
No	3.35(1.18)[y] (n=591)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).
[b] Appendix F, Question #58.
[c] Appendix F, Question #55.
[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Hypothesis$_a$ 20:

> Approval of Shooting and Block Permits is highest among deer hunters who depend on farming for a living. That is, deer hunters whose primary occupation is farming are more likely to approve of Shooting and Block Permits than are deer hunters who have farmed to an extent but not as a primary occupation (i.e., "part-time farmers"), and both of these farming segments are more likely to approve of Shooting and Block Permits than are deer hunters who are not farmers.

Deer hunters whose primary occupation was farming were significantly more approving of Shooting Permits than were part-time farmers (Table 53). However, approval of Shooting Permits did not significantly differ between deer hunters who were full-time farmers and those who were not farmers (Table 53). These were unexpected findings regarding Shooting Permits. Deer hunters whose primary occupation was farming were significantly more approving of Block Permits than were those who were part-time farmers or were not farmers (Table 53). The alternate hypothesis was not supported.

Table 53. Deer hunter survey respondents' mean approval[a] (standard deviation) of Shooting Permits and Block Permits by farming occupation stratum.

Deer Hunters' Farming Occupation Stratum	Mean Approval (SD) of Shooting Permits[b]	Mean Approval (SD) of Block Permits[c]
Full-time Farmers[d]	2.97(1.35)^{x} (n=30)	2.55(1.33)^{x} (n=29)
Part-time Farmers[e]	3.83(1.20)^{y} (n=180)	3.35(1.30)^{y} (n=175)
Non-Farmers[f]	3.65(1.11)^{xy} (n=508)	3.24(1.17)^{y} (n=497)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove). Because the exact items on overall approval of Shooting and Block Permits that appeared in the hunter survey instrument were not included in the survey of farmers, the farmer survey respondents who were also deer hunters were not included in this analysis.

[b] Appendix F, Question #50.

[c] Appendix F, Question #55.

[d] Appendix F, Question #69, checked first box on left.

[e] Appendix F, Question #69, checked fourth box on left.

[f] Appendix F, Question #69, checked neither the first or fourth box on left. Assumes that the 13 survey respondents who skipped Question #69 entirely were not farmers.

[xy] Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

Acquaintance with Farmers and Disapproval of Permit Systems

Hypothesis$_a$ 21:

Deer hunters who have friends or family who are farmers are more likely to approve of Shooting and Block Permits than are those who do not have friends or family who are farmers.

There was no significant difference in attitude toward either permit systems between those who reported having friends or family members who were farmers and those who did not report having friends or family members who were farmers (Table 54). The alternate hypothesis was not supported.

Table 54. Deer hunter respondents' mean approval[a] (standard deviation) of Shooting Permits and Block Permits by whether they reported having friends or family whose primary occupation is farming.

Have Friends or Family whose Primary Occupation is Farming	Mean Approval (SD) of Shooting Permits[b]	Mean Approval (SD) of Block Permits[c]
Yes[d]	3.67(1.19)[x] (n=446)	3.23(1.27)[x] (n=430)
No[e]	3.66(1.07)[x] (n=262)	3.25(1.13)[x] (n=262)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).
[b] Appendix F, Question #50.
[c] Appendix F, Question #55.
[d] Appendix F, Question #69, checked second box on right.
[e] Appendix F, Question #69, did not check second box on right.
[xy] Means with the same letter within the same column are not significantly different (MW $p>0.05$).

Youth Residence and Disapproval of Permit Systems

Hypothesis$_a$ 22:

Deer hunters who were raised in a rural farming area are more likely to approve of Shooting and Block Permits than are those who were not raised in a rural farming area.

Deer hunter respondents who reported growing up in a rural farming area were significantly more disapproving of both permit systems than were those who did not report growing up in a rural farming area, although the means were quite similar (Table 55). The alternate hypothesis was not supported.

Table 55. Deer hunter respondents' mean approval[a] (standard deviation) of Shooting Permits and Block Permits by whether they reported growing up in a rural farming area.

Youth Residence Stratum	Mean Approval (SD) of Shooting Permits[b]	Mean Approval (SD) of Block Permits[c]
Rural Farming Area[d]	3.75(1.15)^x (n=416)	3.32(1.26)^x (n=408)
Not a Rural Farming Area[e]	3.54(1.14)^y (n=292)	3.13(1.15)^y (n=284)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).
[b] Appendix F, Question #50.
[c] Appendix F, Question #55.
[d] Appendix F, Question #69, checked first box on right.
[e] Appendix F, Question #69, did not check first box on right.
[xy] Means with the same letter within the same column are not significantly different (MW $p>0.05$).

Youth Dependence on Farming and Disapproval of Permit Systems

Hypothesis$_a$ 23:

Deer hunters whose families depended on farming during their youth are more likely to approve of Shooting and Block Permits than are those whose families did not depend on farming during their youth.

There was no significant difference in approval of Shooting Permits between deer hunter respondents who reported that during their youth their family depended on farming and those who did not. However, those whose families depended on farming during their youth were significantly more disapproving of Block Permits than those who did not report that their family depended on farming during their youth, which was opposite of the prediction made in the hypothesis (Table 56). However, the difference in the means was negligible, and the significant difference held only for those hunters who lived outside of the study counties. The alternative hypothesis was not supported.

Table 56. Deer hunter respondents' mean approval[a] (standard deviation) of Shooting Permits and Block Permits by their self-report of their family's dependence on farming during youth.

Dependence of Family during Youth on Farming	Mean Approval (SD) of Shooting Permits[b]	Mean Approval (SD) of Block Permits[c]
During Youth, Family Depended on Farming[d]	3.60(1.23)^x (n=211)	3.42(1.24)^x (n=203)
During Youth, Family Did Not Depend on Farming[e]	3.69(1.11)^x (n=497)	3.16(1.20)^y (n=489)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).
[b] Appendix F, Question #50.
[c] Appendix F, Question #55.
[d] Appendix F, Question #69, checked third box on right.
[e] Appendix F, Question #69, did not check third box on right.
[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Attitudes toward Antlerless Harvest and Disapproval of Permit Systems

Hypothesis$_a$ 24:

Deer hunters who oppose the harvest of antlerless deer or are unwilling to personally harvest antlerless deer are more likely to disapprove of Shooting and Block Permits than are deer hunters who support the harvest of antlerless deer or are personally willing to harvest antlerless deer.

Those who were opposed to the legal recreational harvest of antlerless deer were significantly more likely to disapprove of both permit systems than were those whose attitude toward antlerless deer hunting was favorable (Table 57).

Table 57. Deer hunter respondents' mean approval[a] (standard deviation) of Shooting Permits and Block Permits by attitude toward antlerless deer hunting.

Attitude toward the Legal Recreational Harvest of Antlerless Deer[b]	Mean Approval (SD) of Shooting Permits[c]	Mean Approval (SD) of Block Permits[d]
Support	3.64(1.14)^x (n=631)	3.17(1.22)^x (n=618)
Oppose	4.05(1.22)^y (n=62)	3.98(1.01)^y (n=61)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).

[b] Appendix F, Question #6. Second and third response options combined into "Support" category. "Not Sure" responses excluded.

[c] Appendix F, Question #50.

[d] Appendix F, Question #55.

[xy] Means with the same letter within the same column are not significantly different (MW $p>0.05$).

Applying for a license to harvest antlerless deer was used as the behavioral measure of a deer hunters' willingness to harvest antlerless deer. Deer hunters who had applied for an antlerless deer license in 1993 were significantly more likely to disapprove of Shooting Permits ($\bar{x}$=3.73 (SD1.14), n=444) than were those who had not applied for an antlerless deer license in 1993 ($\bar{x}$=3.55(SD1.17), n=269) (MW z=-2.04, p=0.041). Overall, however, deer hunter respondents' attitudes toward Block Permits did not

significantly differ between those who had applied for an antlerless deer license in 1993 and those who had not applied for an antlerless deer license in 1993, with both segments being slightly disapproving. Yet, deer hunters who had not applied for an antlerless deer license in 1993 were found to be more undecided about Block Permits than expected, whereas antlerless deer license applicants were less undecided about Block Permits than expected (χ^2=12.10, 4df, p=0.017).

Based on the respondents' self-report of their willingness to harvest antlerless deer, those who were not willing to harvest antlerless deer were significantly more disapproving of both permit systems than were those who were willing to harvest antlerless deer (Table 58). The alternate hypothesis was supported.

Table 58. Deer hunter respondents' mean approval[a] (standard deviation) of Shooting Permits and Block Permits by self-report of willingness to harvest antlerless deer.

Willingness to Harvest Antlerless Deer[b]	Mean Approval (SD) of Shooting Permits[c]	Mean Approval (SD) of Block Permits[d]
Willing	3.61(1.15)^x (n=510)	3.10(1.23)^x (n=504)
Unwilling	3.86(1.15)^y (n=183)	3.66(1.12)^y (n=175)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).

[b] Appendix F, Question #6. First and second response options combined into "Unwilling" category. "Not Sure" responses excluded.

[c] Appendix F, Question #50.

[d] Appendix F, Question #55.

[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Public v. Private Land Hunting and Disapproval of Permit Systems

Hypothesis$_a$ 25:

Deer hunters who hunt on public land are more likely to disapprove of Shooting and Block Permits than are deer hunters who hunt on private land.

There was no significant difference in attitudes toward either permit system between deer hunters who hunted exclusively on public land and those who hunted exclusively on private land. In addition, there was no significant difference in attitudes toward either permit system when hunting land ownership was segmented into four categories (all private, mostly private, mostly public, all public) (Table 59). The alternate hypothesis was not supported.

Table 59. Deer hunter respondents' mean approval[a] (standard deviation) of Shooting Permits and Block Permits by the ownership of land they deer hunt in the study county (measured as the percent of time spent deer hunting on public land in the study county).

Ownership of Land where Deer Hunt in Study County[b]	Mean Approval (SD) of Shooting Permits[c]	Mean Approval (SD) of Block Permits[d]
All Private	3.61(1.19)^x (n=409)	3.28(1.25)^x (n=399)
Mostly Private	3.74(1.12)^x (n=97)	3.07(1.19)^x (n=96)
Mostly Public	3.66(1.09)^x (n=102)	3.28(1.17)^x (n=100)
All Public	3.82(1.06)^x (n=105)	3.21(1.17)^x (n=100)

[a] Rating from 1 (Strongly Approve) to 5 (Strongly Disapprove).

[b] Appendix F, Question #12.
Responses categorized as follows: 0% = All Private; 1-49% Mostly Private; 50-99% Mostly Public; 100% All Public.

[c] Appendix F, Question #50.

[d] Appendix F, Question #55.

[xy] Means with the same letter within the same column are not significantly different (KW Multiple Comparison $p>0.05$).

Ownership/Leasing of Land for Hunting and Disapproval of Permit Systems

Hypothesis$_a$ 26:

Deer hunters who own or lease land where they can deer hunt are more likely to approve of Shooting and Block Permits than are those who do not own or lease land where they can deer hunt.

There was no significant difference in deer hunter survey respondents' mean attitude toward either of the permit systems between those who owned/leased land where they could deer hunt and those who did not (Table 60). The alternate hypothesis was not supported. However, those who owned/leased land where they could deer hunt were less undecided and more disapproving of Block Permits than expected, and those who did not own/lease land where they can deer hunt were more undecided and less disapproving of Block Permits than expected (χ^2=11.49, 4df, p=0.022) (Table 61).

Table 60. Deer hunter survey respondents' attitude toward Shooting Permits, stratified by whether they owned/leased land where they can deer hunt (χ^2=2.35, 4df, p=0.672).

Own/Lease Land where Can Deer Hunt[a]	Attitude Toward Shooting Permits[b]					Mean Approval[c] (SD)
	Strongly Approve	Approve	Undecided	Disapprove	Strongly Disapprove	
Yes (n=352)	3.7%	16.5%	19.3%	30.4%	30.1%	3.67(1.17)^x
No (n=358)	3.4%	14.2%	22.9%	32.1%	27.4%	3.66(1.12)^x

[a] Appendix F, Question #68.

[b] Appendix F, Question #50.

[c] Scale from 1 (strongly approve) to 5 (strongly disapprove).

[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Table 61. Deer hunter survey respondents' attitude toward Block Permits, stratified by whether they owned/leased land where they can deer hunt (χ^2=11.49, 4df, p=0.022).

Own/Lease Land where Can Deer Hunt[a]	Attitude Toward Block Permits[b]					Mean Approval[c] (SD)
	Strongly Approve	Approve	Undecided	Disapprove	Strongly Disapprove	
Yes (n=348)	7.2%	27.0%	17.2%	28.7%	19.8%	3.27(1.25)[x]
No (n=345)	5.8%	26.1%	27.5%	22.9%	17.7%	3.21(1.18)[x]

[a] Appendix F, Question #68.
[b] Appendix F, Question #55.
[c] Scale from 1 (strongly approve) to 5 (strongly disapprove).
[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Membership in an Organization and Disapproval of Permit Systems

The majority of both members (69.8%, n=143) and nonmembers (56.1%, n=263) of deer-hunting-related organizations disapproved or strongly disapproved of Shooting Permits (χ^2=12.63, 4df, p=0.013) (Table 62). There was no clear consensus among nonmembers regarding Block Permits, but about half of members (50.9%, n=105) disapproved or strongly disapproved of Block Permits (Table 63) (χ^2=6.12, 4df, p=0.19).

Hypothesis$_a$ 27:

Deer hunters who are members of a hunting-related organization are more likely to disapprove of Shooting and Block Permits than are non-members.

Members of Michigan-based deer-hunting-related or conservation organizations were significantly more disapproving of Shooting Permits (MW z=-3.21, p=0.001) and Block Permits (MW z=-2.08, p=0.037) than were nonmembers (Table 62 and 63, respectively). The alternate hypothesis was supported. Substantively, however, the differences in attitude were not meaningful.

Table 62. Deer hunter survey respondents' attitude toward Shooting Permits, stratified by membership in a Michigan-based deer-hunting-related or conservation organization.

Membership Stratum	Attitude Toward Shooting Permits[a]					Mean Approval[b] (SD)
	Strongly Approve	Approve	Undecided	Disapprove	Strongly Disapprove	
Members[c] (n=205)	2.0%	10.2%	18.0%	36.1%	33.7%	3.89(1.05)[x]
Non-Members[d] (n=469)	4.3%	17.5%	22.2%	29.0%	27.1%	3.57(1.18)[y]

[a] Appendix F, Question #50. (χ^2=12.63, 4df, p=0.013)
[b] Scale from 1 (strongly approve) to 5 (strongly disapprove).
[c] Appendix F, Question #70. Did not check first box on left but did check at least one of the other boxes in the question, which identified them as members of an organization.
[d] Appendix F, Question #70. Checked first box on left.
[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Table 63. Deer hunter respondents' attitude toward Block Permits, stratified by membership in a Michigan-based deer-hunting-related or conservation organization.

Membership Stratum	Attitude Toward Block Permits[a]					Mean Approval[b] (SD)
	Strongly Approve	Approve	Undecided	Disapprove	Strongly Disapprove	
Members[c] (n=206)	5.8%	24.8%	18.4%	28.6%	22.3%	3.37(1.24)[x]
Non-Members[d] (n=456)	6.8%	28.3%	23.7%	24.8%	16.4%	3.16(1.20)[y]

[a] Appendix F, Question #55. (χ^2=6.12, 4df, p=0.19)
[b] Scale from 1 (strongly approve) to 5 (strongly disapprove).
[c] Appendix F, Question #70. Did not check first box on left but did check at least one of the other boxes in the question, which identified them as members of an organization.
[d] Appendix F, Question #70. Checked first box on left.
[xy] Means with the same letter within the same column are not significantly different (MW p>0.05).

Perceived MDNR Deer-Management Credibility

Three dimensions of MDNR deer-management credibility were probed among deer hunter respondents: perceived expertise in managing the deer herd; perceived trustworthiness in considering interests of deer hunters when making deer management decisions; and perceived adequacy of the agency's information on the deer population (Appendix F, Question #28). Based on the deer-management credibility scale which combined these perceptions of expertise, trust, and adequacy of information, 46.8% (n=361) of the deer hunter respondents gave the MDNR a favorable rating, and 39.9% (n=307) of the respondents gave the MDNR an unfavorable rating, with about 13% (n=102) being undecided about the MDNR's deer-management credibility.

Perceived Agency Deer-Management Credibility by Deer Hunter Resident Strata

Hypothesis 28:

> Deer hunters who live in a study county have a more unfavorable rating of MDNR deer-management credibility than do deer hunters who live outside of a study county, with the ratings by both groups being unfavorable.

The overall agency deer-management credibility rating by deer hunters who lived in a study county was not significantly different than the rating by deer hunters who lived outside the study counties (Mann-Whitney U $z=-1.9118$, $p=0.0559$). Both the ratings by deer hunters who lived in a study county and by those who lived outside a study county hovered around neutral (range +2 to -2) ($\bar{x} = -0.03$, n=427; $\bar{x} = 0.13$, n=343, respectively). The alternate hypothesis was not supported.

Perceived Credibility and Issue Activity

As discussed in the section on study design hypotheses, hunter issue activity was found to be significantly higher for those who deer hunted in Menominee or Presque Isle county than for those who deer hunted in Calhoun (Table 24). Because the next hypothesis was intended to compare high issue activity counties to lower issue activity counties, it was rewritten according to the significant differences established earlier. In addition, for this analysis deer hunters were not segmented by whether or not they lived in a study county because perceived credibility was found not to differ by deer hunter resident stratum.

Hypothesis$_a$ 29:

> Deer hunters who hunt in Menominee or Presque Isle (relatively higher deer-management-related issue intensity) are more likely to judge the MDNR credibility to manage deer as low than are those who hunt in Calhoun (relatively lower deer-management-related issue intensity).

MDNR deer-management credibility ratings by hunters who deer hunted in Presque Isle, Menominee, or Oceana county were significantly lower than the ratings by those who hunted in Calhoun county (KW χ^2=25.08, 5df, $p<0.001$) (Table 64). This difference across counties appeared to be driven by beliefs about whether the MDNR has enough information on the deer population to adequately decide how many deer to harvest in Michigan each year (Table 64). Deer-management credibility ratings by hunters who deer hunted in either Benzie/Leelanau or Montcalm were not significantly different from those of any other county. The alternate hypothesis was supported.

Table 64. Deer hunter survey respondents mean rating (standard deviation) of aspects of the deer-management credibility of the MDNR.

Study County	Mean (SD) MDNR Deer-Management Overall Credibility Rating[a]	Mean (SD) Rating of MDNR Deer Management Expertise[b]	Mean (SD) Rating of Trust of MDNR[c]	Mean (SD) Rating of Adequacy of MDNR Deer Information[d]
Benzie/ Leelanau	0.09(1.18)^{xy} (n=93)	2.7(1.0)^{xy} (n=93)	3.0(1.1)^{xz} (n=94)	3.1(1.2)^{xy} (n=93)
Calhoun	0.38(1.14)^{x} (n=155)	2.6(1.0)^{x} (n=157)	2.7(1.1)^{x} (n=157)	2.9(1.1)^{x} (n=158)
Menominee	-0.20(1.30)^{y} (n=81)	2.9(1.2)^{xy} (n=82)	3.1(1.2)^{xz} (n=81)	3.4(1.1)^{y} (n=81)
Montcalm	0.13(1.17)^{xy} (n=195)	2.8(1.1)^{xy} (n=195)	2.8(1.1)^{xz} (n=195)	3.1(1.1)^{xy} (n=196)
Oceana	-0.10(1.18)^{y} (n=126)	2.9(1.1)^{xy} (n=126)	3.1(1.1)^{yz} (n=126)	3.3(1.0)^{xy} (n=128)
Presque Isle	-0.25(1.20)^{y} (n=120)	3.0(1.1)^{y} (n=122)	3.1(1.1)^{y} (n=121)	3.5(1.2)^{y} (n=120)
OVERALL	0.05(1.20) (n=770)	2.8(1.1) (n=776)	2.9(1.1) (n=774)	3.2(1.1) (n=776)

[a] Range +2 (most favorable) to -2 (most unfavorable); Calculated as a summated scale of three items (Appendix F, Question #28), where item responses were coded as 1 (strongly agree) to 5 (strongly disagree), summed, and then reduced to 5-point scale from +2 to -2.

[b] 1 = most favorable rating; 5= least favorable rating. Appendix F, Question #28 first item.

[c] 1 = most favorable rating; 5= least favorable rating. Appendix F, Question #28 second item.

[d] 1 = most favorable rating; 5= least favorable rating. Appendix F, Question #28 third item.

[xyz] Means with the same letter within the same column are not significantly different (KW Multiple Comparison p>0.05).

Perceptions of the MDNR's Consideration of Stakeholders

Hypothesis$_a$ 30:

> Farmers who do not deer hunt and full-time farmers who do deer hunt are more likely than deer hunters whose primary occupation is not farming to feel that significantly more consideration should be given to farmers' interests than to hunters' interests by the MDNR when it sets deer population goals for the county.

Farmer and deer hunter survey respondents were asked their opinion of the relative consideration that farmers' and hunters' interests were currently given and should be given by the MDNR when it sets deer population goals. Measurement involved the respondents allocating points to each interest group to indicate how much consideration they believed was currently being given and should be given to the interests of each group's interests (Appendix F, Question #44). Options included farmers' interests, hunters' interests, and "Other" (Table 65).

In an analysis of only the points allocated to farmers' and hunters' interests, most non-hunting farmers and most full-time farmers who deer hunt believed that the MDNR currently favored the interests of deer hunters when setting deer population goals for the county (Table 66). Part-time farmers who deer hunt were evenly split on whose interests they believed were currently favored by the MDNR, and just over half of the non-farming hunters believed that farmers' interests were currently favored (Table 66). About a third of each of the segments felt that neither farmers' nor hunters' interests were currently favored.

In terms of whose interests should be favored, most non-hunting farmers felt that farming interests should be favored over hunting interests, and most non-farming hunters felt that hunting interest should be favored over farming interests (Table 66). Close to half of the farmers (full- or part-time) who deer hunt felt that neither interest group should

be favored (Table 66).

Looking at the actual point allocation to farmers', hunters', and others' interests, there was a significant difference between each of the segments with regard to their beliefs about whose interests were currently being considered (Table 67). There was an orderly progression across the segments of points allocated to each interest. Farmers who did not deer hunt said that farmers' interests were currently being given less consideration than hunters' interests, whereas hunters who did not farm said that hunters' interests were currently being given less consideration than farmers' interests. Non-hunting farmers and full-time farming hunters said that other interests were being given over a fifth of the consideration.

Farmers who did not deer hunt were significantly more likely than the other three segments to feel that more weight should be placed on farmers' interests (Table 67). Furthermore, full-time farmers who deer hunt were significantly more likely than both part-time farmers who deer hunt and non-farming hunters to feel that more weight should be placed on farmers' interests (Table 67). The alternate hypothesis was supported.

Table 65. Mean points (standard deviation) allocated by deer hunter survey respondents to interests other than farmers and deer hunters in terms of how much each is currently considered and should be considered by the MDNR when it sets deer population goals for the county[a]. Also, ranking of interests based on mean points.

"Other" Interest Identified by Respondents to Deer Hunter Survey	Amount of Importance Currently Placed on this Interest		Amount of Importance that Should be Placed on this Interest	
	Mean Points (SD) Allocated to this Interest	Rank	Mean Points (SD) Allocated to this Interest	Rank
Michigan Department of Natural Resources (MDNR) -- General	62.0(21.7) (n=5)	1	--	--
Doe Permits	60.0 (n=1)	2	10.0 (n=1)	16
Money for MDNR	50.3(35.1) (n=16)	3	13.3(15.3) (n=3)	15
Environment/Habitat	46.3(14.9) (n=4)	4	29.0(6.2) (n=4)	4
Insurance Companies	42.3(20.5) (n=28)	5	20.3(22.3) (n=17)	8
Fishing	30.0(28.3) (n=2)	6	20.0 (n=1)	11
Special Interest Groups	29.4(24.4) (n=9)	7	19.1(9.4) (n=8)	13
Landowners/Hunt Clubs	25.8(37.2) (n=6)	8	23.3(23.1) (n=3)	6
Politics	23.3(5.8) (n=3)	9	--	--
Deer-Related Vehicle Accidents	20.4(14.3) (n=14)	10	26.1(22.1) (n=12)	5
Everything but Hunters	20 (n=1)	11	--	--
Publics other than Farmers and Hunters	19.0(11.4) (n=5)	12	7.0(4.5) (n=5)	18
Tourists	17.5(17.7) (n=2)	13	14.0(5.3) (n=3)	14
Businesses	16.7(11.5) (n=3)	14	23.3(5.8) (n=3)	7
Health of Deer	10.0 (n=1)	15	41.9(24.8) (n=8)	2
Stopping Poachers	10.0 (n=2)	16	36.7(29.3) (n=3)	3
Elk	5.0 (n=1)	17	10.0 (n=1)	17
Not Block Permits	--	--	90.0 (n=1)	1
Trespassing	--	--	20.0 (n=1)	9
Buck to Doe Ratio	--	--	20.0 (n=1)	10
Amount of Public Land	--	--	20.0 (n=1)	12

[a] Appendix F, Question #44.

Table 66. Perceptions of four segments of respondents (based on deer hunting and farming participation) regarding whether farmer or hunter interests are currently favored by the MDNR and whose interests should be favored by MDNR in decisions about deer population goals for the county.

Farming/ Hunting Segment	Percent who Believed that Interests are *Currently* Favored by MDNR[a]				Percent who Believed Interests *Should be* Favored by MDNR[b]			
	Farmers' Interests	Hunters' Interests	Neither	n	Farmers' Interests	Hunters' Interests	Neither	n
Farmers who Do Not Deer Hunt	2.3%	68.9%	28.8%	132	54.7%	8.6%	36.7%	139
Full-time Farmers who Deer Hunt[c]	7.4%	64.3%	28.3%	244	45.0%	10.4%	44.6%	249
Part-time Farmers who Deer Hunt[d]	35.6%	30.8%	33.6%	295	14.8%	36.8%	48.5%	291
Deer Hunters who are Not Farmers	50.6%	18.1%	31.3%	470	8.3%	50.6%	41.1%	484

[a] Calculated as the points allocated to farmers minus the points allocated to hunters, for question that asks the importance that currently is placed on each. Positive difference values coded as "currently favors farmers;" negative difference values coded as "currently favors hunters;" differences of zero coded as "currently favors neither." Appendix F, Question #44 and Appendix G, Question #62, left-hand columns.
The distribution of responses was different across the four segments (χ^2=270.3, 6df, p<0.001).

[b] Calculated as the points allocated to farmers minus the points allocated to hunters, for question that asks the importance that should be placed on each. Positive difference values coded as "should favor farmers;" negative difference values coded as "should favor hunters;" differences of zero coded as "should favor neither." Appendix F, Question #44 and Appendix G, Question #62, right-hand columns.
The distribution of responses was different across the four segments (χ^2=277.1, 6df, p<0.001).

[c] This segment includes those respondents to the deer hunter survey who indicated that farming was their primary occupation (n=31) and those respondents to the farmer survey who indicated that they were full-time farmers who deer hunt (n=258).

[d] This segment includes those respondents to the deer hunter survey who indicated that they farmed but not as a primary occupation (n=193) and those respondents to the farmer survey who indicated that they were part-time farmers who deer hunt (n=139).

Table 67. Mean points[a] (standard deviation) that four segments of respondents (based on deer hunting and farming participation) believed are currently assigned and should be assigned to stakeholders' interests by MDNR when setting deer population goals for the county.

Farming/ Hunting Segment	Mean Points (SD) Assigned Regarding Importance that *Currently is* Placed on the Interests of Each Stakeholder Group[b]			Mean Points (SD) Assigned Regarding Importance that *Should be* Place on the Interests of Each Stakeholder Group[c]		
	Farmers' Interests	Hunters' Interests	Other Interests[d]	Farmers' Interests	Hunters' Interests	Other Interests
Farmers who Do Not Deer Hunt	28.0[w](19.0) (n=133)	69.9(21.1) (n=141)	21.4(20.7) (n=34)	63.4[x](21.8) (n=151)	35.1(17.8) (n=139)	18.4(17.9) (n=35)
Full-time Farmers who Deer Hunt[e]	32.1[x](20.1) (n=245)	62.0(23.6) (n=264)	27.1(29.4) (n=90)	58.3[y](18.7) (n=262)	40.8(15.7) (n=251)	9.7(10.9) (n=79)
Part-time Farmers who Deer Hunt[f]	46.0[y](24.1) (n=298)	44.6(24.4) (n=298)	12.9(22.2) (n=218)	42.0[x](20.1) (n=294)	54.0(20.6) (n=293)	5.5(14.2) (n=201)
Deer Hunters who are Not Farmers	55.1[z](22.1) (n=470)	38.4(20.6) (n=471)	5.9(17.4) (n=470)	37.1[z](18.5) (n=458)	59.2(20.1) (n=484)	3.1(10.4) (n=484)

[a] Rating from 0 (no consideration) to 100 points (full consideration).

[b] Appendix F, Question #44, left-hand column; Appendix G, Question #62, left-hand column.

[c] Appendix F, Question #44, right-hand column;
Appendix G, Question #62, right-hand column.

[d] A list of the "Other" stakeholder groups identified by respondents can be found in Table 65.

[e] This segment includes those respondents to the deer hunter survey who indicated that farming was their primary occupation (n=31) and those respondents to the farmer survey who indicated that they were full-time farmers who deer hunt (n=258).

[f] This segment includes those respondents to the deer hunter survey who indicated that they farmed but not as a primary occupation (n=193) and those respondents to the farmer survey who indicated that they were part-time farmers who deer hunt (n=139).

[wxyz] Means with the same letter within the same column are not significantly different (KW Multiple Comparison p>0.05). Because point totals were restricted to 100, columns 1-3 are related, and columns 4-6 are related. The pattern of significant differences shown in the "currently place importance on farmers' interests" column holds for columns 2 and 3. The pattern of significant differences shown in the "should place importance on farmers' interests" column holds for columns 5 and 6.

Causal Model of Deer Hunters' Approval of Crop Damage Control Permits

Model generation through structural equation modeling using LISREL®8 and path analysis using PACKAGE produced consistent results. Ordinary least squares regression statistics generated by PACKAGE are reported here.

The model that posited that approval of crop damage permits was directly influenced by perceived agency credibility and tolerance of deer was rejected (Figure 13). After the predicted model failed, other theoretically meaningful causal models were tested. One plausible model that fit the data well used approval of crop damage permits as an antecedent variable to perceived agency credibility and tolerance of deer (Figure 21).

The fit of this model was assessed in three ways. First, chi-square fit statistics were evaluated. The model yielded a small and nonsignficant global chi-square (χ=6.04, 10df, p=0.812; and χ=5.19, 10df, p=0.878 when the correlations corrected for attenuation due to error of measurement were used). Second, the significance of individual paths was evaluated. Each of the specified paths was significant ($p \leq 0.05$), and each of the non-specified paths was not significant ($p > 0.05$). Third, residuals (i.e., the difference between the obtained and predicted values) were small and within sampling error of zero. The correlations among the variables in this model and their descriptive statistics are presented in Table 68.

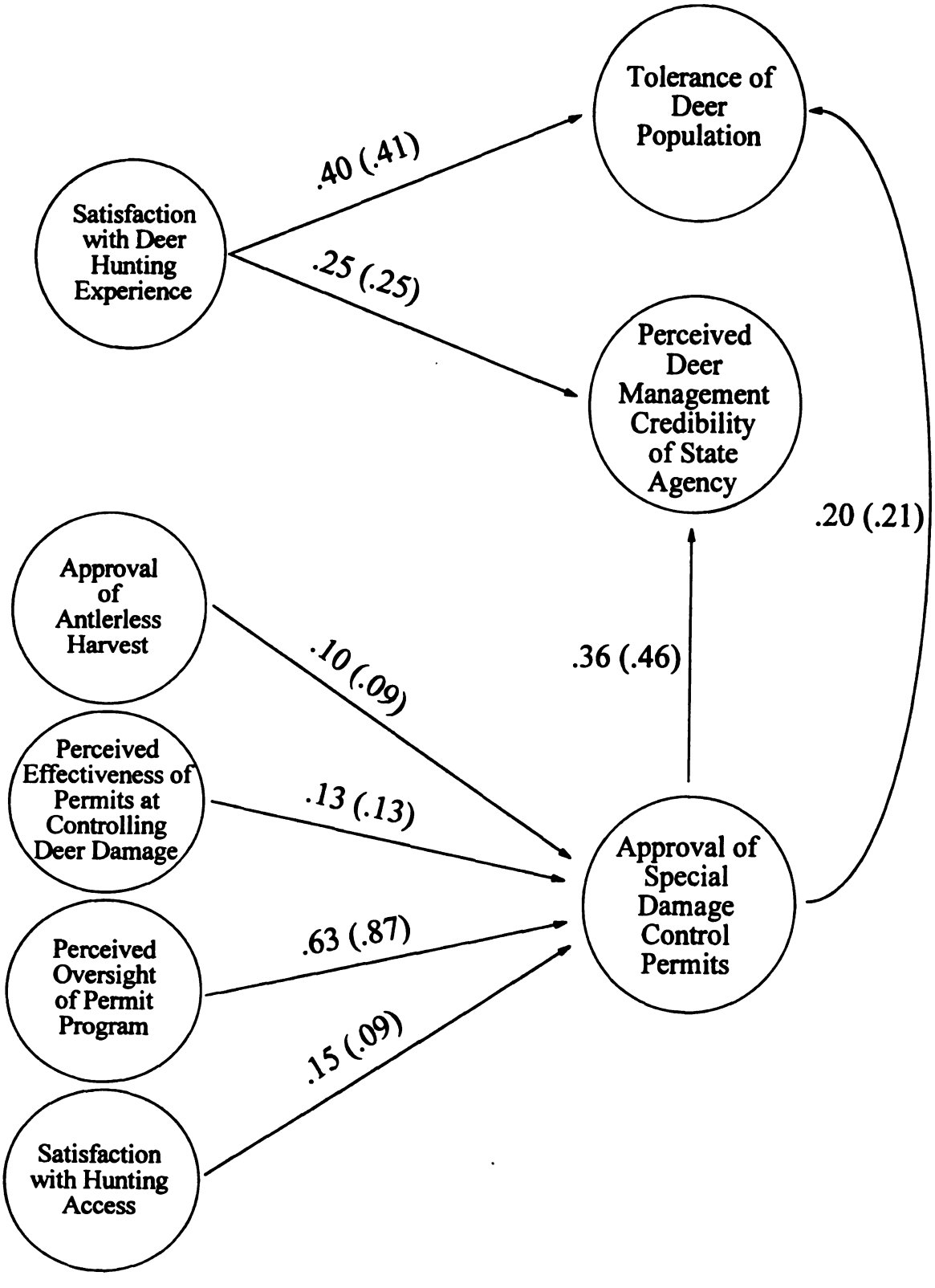


Figure 21. Model with path coefficients for deer hunters' approval of special deer damage control permits that was found to be consistent with the data. Path coefficients corrected for attenuation due to error of measurement are shown in parentheses.

Table 68. Correlations[a] and descriptive statistics for factors in the path model of approval of crop damage control permits (n=384).

Factors	Satisfaction with Deer Hunting Experience (SATHUNT)	Approval of Antlerless Harvest (DOEAPPR)	Perceived Effectiveness of Permits (EFF)	Perceived Oversight of Permit Program (OVER)	Satisfaction with Hunting Access (SATACCESS)	Tolerance of Deer Population (TOL)	Perceived Deer Management Credibility of Agency (CRED)	Approval of Crop Damage Permits (PERMIT)	Mean	Standard Deviation
SAT HUNT	1.0	0.23	0.06	0.32	0.23	0.49	0.41	0.35	8.78	3.32
DOE APPR	0.21	1.0	0.03	0.16	0.02	0.12	0.16	0.23	1.36	0.64
EFF	0.05	0.03	1.0	0.18	0.03	0.10	0.16	0.29	4.71	1.98
OVER	0.27	0.14	0.16	1.0	0.40	0.34	0.39	0.94	23.59	4.69
SAT ACCESS	0.21	0.02	0.03	0.36	1.0	0.20	0.29	0.44	3.31	1.27
TOL	0.46	0.12	0.10	0.31	0.20	1.0	0.38	0.36	1.89	0.85
CRED	0.35	0.15	0.14	0.32	0.27	0.35	1.0	0.55	9.02	2.93
PERMIT	0.28	0.20	0.24	0.72	0.38	0.31	0.43	1.0	10.31	3.03

[a] Correlations corrected for attenuation due to error of measurement shown in upper right quadrant.

Explaining Tolerance of Deer Populations

Hypothesis$_a$ 31:

Deer hunters' tolerance of deer is directly influenced by their satisfaction with their deer hunting experience.

Tolerance for deer was found to be significantly influenced by deer hunters' satisfaction with their deer hunting experience in the county (adjusted path coefficient = 0.41, $t=8.77$, $p<0.001$) (Figure 21). The alternate hypothesis was supported.

In addition, path analysis also indicated that deer hunters' evaluation of the permit program directly influences their tolerance of deer (adjusted path coefficient = 0.21, $t=4.21$, $p<0.001$) (Figure 21).

Explaining Agency Deer Management Credibility

Hypothesis$_a$ 32:

Deer hunters' perceptions of the agency's deer management credibility are directly influenced by their satisfaction with their deer hunting experience.

Perceived deer-management credibility was found to be significantly influenced by deer hunters' satisfaction with their deer hunting experience in the county (adjusted path coefficient = 0.41, $t=5.35$, $p<0.001$) (Figure 21). The alternate hypothesis was supported.

In addition, path analysis also indicated that deer hunters' evaluation of the permit program directly influences their perception of the agency's overall deer-management credibility (adjusted path coefficient = 0.46, $t=7.72$, $p<0.001$) (Figure 21).

Explaining Approval of Special Crop Damage Control Programs

Hypothesis, 33:

Deer hunters' attitudes toward the special deer damage control permit program are directly influenced by the following:

a. approval of antlerless harvest (increased approval of antlerless harvest, increased approval of permits)

b. the perceived effectiveness of the permits at controlling deer damage (increased perceived effectiveness, increased approval of permits)

c. the perceived extent to which the permits are overseen by the MDNR (increased perceived oversight, increased approval of permits)

d. satisfaction with hunting access (increased satisfaction with access, increased approval of permits)

e. the perceived credibility of the state agency to manage deer (increased perceived credibility of agency to manage deer, increased approval of permits)

f. their tolerance of deer (increased tolerance for deer population, increased approval of permits)

Results indicated that deer hunters' evaluation of the permit program was directly influenced as hypothesized by deer hunters' attitude toward antlerless harvest (adjusted path coefficient = 0.09, $t=2.94$, $p=0.004$); their perception of the effectiveness of the permits at controlling deer damage (adjusted path coefficient = 0.13, $t=3.84$, $p<0.001$); and their satisfaction with the hunting access provided by farmers (adjusted path coefficient = 0.09, $t=4.17$, $p<0.001$) (Figure 21).

In addition, deer hunters' perceptions of the agency's oversight of the permit program were a very strong predictor of deer hunters' overall evaluation of the permit systems (adjusted path coefficient = 0.87, $t=17.21$, $p<0.001$) (Figure 21). This suggests that if hunters believe that the permit programs are not closely monitored and regulated

by the agency, they will not approve of them.

However, the original model which included paths from tolerance of deer to approval of permits and from agency credibility to approval of permits did not fit the data. Path analysis results supported hypotheses a-d above, but hypotheses e and f were not supported.

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CULTURAL CARRYING CAPACITY AND STAKEHOLDERS' ATTITUDES ASSOCIATED WITH THE DEER CROP DAMAGE ISSUE IN MICHIGAN

Volume II

By

Donna Lynne Minnis

A DISSERTATION

Submitted to
Michigan State University
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for the degree of

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CHAPTER 5

DISCUSSION

Overview of this Chapter

This chapter begins with a review of the general limitations of this study, highlighting the cautions that pertain to the interpretation of the findings. Then, a conservative interpretation of the results is presented within the context of the limitations of this study.

First, findings regarding perceptions of trends in deer numbers, estimation of deer densities, and tolerance of deer are discussed. These measurements are evaluated in terms of their usefulness in making the Cultural Carrying Capacity framework operational. Subsequently, the potential utility of the CCC framework and tolerance model is discussed.

Second, findings associated with the crop damage issue are discussed, with emphasis on the causal model of deer hunters' attitudes toward crop damage control permits. Implications for issue management are presented. Finally, recommendations for further research on the CCC concept and attitudes toward special permit programs for the lethal control of deer damage are offered.

General Limitations of this Study

Sampling Frames

Deer Hunters

The sampling frame of deer hunters was restricted in at least two ways. First, it consisted only of individuals who had previously responded to an MDNR firearm harvest survey. Second, by design, most of the deer hunter respondents resided in but a handful of Michigan's 83 counties. Nonresponse bias to the MDNR firearm harvest survey was not assessed, so the representativeness of this frame is unknown. It is likely that surveys of deer hunters from other counties would have produced results similar to those from the study counties, given that the counties have a comparable level of issue activity. However, because the sample was not necessarily representative, findings of this research should not be generalized to all deer hunters in Michigan. It is possible that a different sampling frame encompassing those who were not respondents to an MDNR survey and/or represented a statewide sample of deer hunters might have produced different results than those found here.

Agricultural Producers

Limitations in the farmer sampling frame were similar to those due to the restricted deer hunter sampling frame. The farmer survey respondents were residents of only 7 counties in Michigan and were those whose names were included on MSU-E mailing lists. Results should not be generalized as representing all Michigan farmers.

Measurement Concerns

Several potential threats to the reliability and validity of survey items existed in

this study. Three in particular were the potential for recall bias, problems in the segmentation used in analysis, and item response bias.

Recall Bias

Some potential for recall bias existed. The deer hunter survey was completed by respondents in mid-1995, and several questions required that they think back to experiences and situations 1 or 2 years previously. Those deer hunter survey respondents who had not hunted in the study county in 1994 but had hunted there in 1993 (10.4%, n=82) were asked to recall their 1993 deer hunting satisfaction and deer-related perceptions. All respondents were asked to reference 1994 regarding crop-damage-related topics. Depending on their disposition toward crop damage and its control or deer management at the time of completing the survey, respondents may have responded with distorted or intensified opinions.

Segmentation by Farming and Hunting Participation

For several analyses, respondents from the two surveys with different sampling frames were combined, and this pool was then segmented into four groups based on participation in farming and hunting. A few concerns about this segmentation warrant mentioning.

First, little was known about the hunting characteristics of the respondents to the farmer survey who reported that they deer hunted. However, based on the what could be compared between farmer and hunter survey respondents regarding hunting participation, the segmentation seemed to be appropriate. For instance, respondents from the deer hunter sampling frame were known to be firearm deer hunters, with about half hunting

only with a firearm and half hunting with both a bow and firearm in a typical year. Because less than 7% of those who purchase a deer hunting license in Michigan in a given year use only a bow (Minnis and Peyton 1994), it is likely that the farmer survey respondents who deer hunted were not too different from the hunter survey respondents in terms of the type of equipment used.

Second, the question that was used to segment the hunter survey respondents by participation in farming employed a "check all that apply" response format (Appendix F, Question #69). It was assumed that those who did not check the first or fourth box in the left column of Question #69 were not farmers. Further it was assumed that those who checked the first box were full-time farmers with greater dependence on farming for their income, and those who checked the fourth box were part-time farmers with less dependence on farming for their income. There was some risk that those who did not check the response box were not indicating a lack of that particular trait. However, both non-farming hunters and part-time farming hunters (a segment which included 193 respondents from the hunter survey and 139 from the farmer survey) were found to place significantly higher importance on hunting compared to other recreational activities than did full-time farming hunters, which provided some evidence to suggest that the segmentation by farming involvement seemed to work well to differentiate among respondents to the two surveys.

Thus, despite the inherent differences in the sample frames, the four segments of respondents based on hunting and farming participation seemed to repeatedly produce a pattern of results that indicated a gradient of interest in hunting and farming.

Item Response Bias

Caution should be used in interpreting the responses to some of the questions because some segments of respondents were more likely to answer than other segments. In particular, there was some response bias in the questions that asked respondents to provide estimates of deer density. For instance, deer hunter survey respondents who lived in a study county and farmer survey respondents who reported intolerable losses to deer in 1994 were significantly more likely to provide deer density estimates than were those who lived outside a study county and those who reported that their losses were not intolerable, respectively. Because Live In hunters were more likely to respond than were Live Out hunters, and because all farmer survey respondents lived in a study county, there was a bias toward the preferences of residents of the study counties in the deer density findings.

In addition, deer hunter respondents to the Calhoun survey tended to be less able to identify where they hunted on the map as compared to respondents from the other counties, and this was likely due to the extreme detail of the map included in the Calhoun survey which made the map difficult to read. Yet, overall frequency of response to the deer density questions did not differ by study county, so there was no apparent bias in estimates on a study county basis.

Caveat

One caveat in the analyses needs to be mentioned. The reader should recognize that MDNR trend judgments and deer density estimates are based on a DMU-wide scale, and respondents' trend judgments are probably based on a much more localized (e.g.,

farm-wide) scale. Because of the finer scale, respondents' trend and/or density estimates may be more accurate than the MDNR's trends for the specific hunting or farming locality. However, what we were exploring in the measurements of trends and density estimates was whether they would be useful in the CCC framework, and the data that the MDNR uses are, by the default, the only agency data that are available for use in the framework. Therefore, for practical purposes, an assumption was made in the analyses that MDNR judgments would serve to represent reality.

Measurements Associated with the CCC Framework

Two of the primary objectives of this research were (1) to propose a conceptual framework for facilitating resource management agency consideration of multiple stakeholder preferences for deer populations, and (2) to explore the utility of the conceptual framework for deer management by testing various measurement approaches for making the framework operational. Toward these ends, the Cultural Carrying Capacity framework was developed, and farmer and deer hunter perceptions of deer population trends, estimates of deer density, and assessments of tolerance were investigated as potential measures to use within the framework.

Perceptions of Deer Population Trends

Overall Perception of the Trend

As hypothesized, respondents' perceptions of the recent past trend in deer numbers were consistent with the likely costs and benefits of deer to the respondents. That is, a majority of those who depended on farming and did not hunt felt that deer numbers had been increasing, and a majority of those who participated in deer hunting

and were not farmers felt that deer numbers had been decreasing. There was one exception to this overall pattern involving farmers and their perceptions of crop damage.

Like the overall pattern, a majority of farmers who incurred intolerable crop loss felt the deer numbers had been increasing; however, farmers whose losses to deer were not a problem or were tolerable were evenly split on whether the deer population had been increasing, stable, or decreasing, and this finding was consistent with those of Decker et al. (1984) and Queal (1968). An important underlying question here was whether the perceived increases in deer numbers by farmers with intolerable losses were due to actual increases in the deer population size. The answer to this question is unclear, but findings lean toward the conclusion that perceptions were not based on the real trend in deer numbers, assuming MDNR judgments of trends represent reality. For instance, in areas where the trend was stable (MDNR judgment), a vast majority (92.3%) of farmers with intolerable losses still felt that deer numbers were increasing, suggesting that the perceptions were not based on the actual deer trend. However, in areas where there was a decreasing trend (MDNR judgment), the majority (54.8%) of the farmers with intolerable losses felt that deer numbers were stable (i.e., there was no longer a majority saying that deer numbers had increased), suggesting some sensitivity of farmers with intolerable losses to the temporal abundance of deer. However, as will be elaborated on in the next section, farmers with intolerable losses were no better at accurately perceiving the deer population trend than were farmers whose losses were not intolerable.

Congruence of Perceived Trends

Generally, these farming and hunting respondent segments held these same overall perceptions of the trend in deer numbers regardless of the actual trend in the number of deer (MDNR judgment). As a consequence of the general tendency for most farmers to feel that deer numbers are increasing and most hunters to feel that deer numbers are decreasing, perceptions of the trend in deer numbers tended to be incongruent with the MDNR judgments for the respective DMU, except for some congruence which appeared to be a result of coincidence due to overall perceived trends in deer numbers. That is, for DMUs where the MDNR judged the deer population to be increasing, a majority of farmers (non-hunting and full-time hunting farmers) perceived the trend accurately, but few deer hunters (non-farming and part-time farming hunters) had accurate perceptions. The reverse pattern was found for DMUs where the MDNR judged the deer population to be decreasing, where half or more of the deer hunters (non-farming and part-time farming hunters) perceived the trend accurately, but less than one fourth of the farmers (non-hunting and full-time farming hunter) having accurate perceptions.

Contrary to the prediction, congruence of perceived trends did not significantly differ by deer hunter resident stratum. If the MDNR estimates are reliable, then the rationale that deer hunters who live where they hunt would have longer term exposure to the local deer population and thus have more accurate trend perceptions was faulty.

Also, the extent of congruence of farmers' perceptions of deer population trends did not significantly differ between those who reported experiencing intolerable crop

losses and those who judged their losses to be tolerable or not a problem. About a third of each of these farmer segments had congruent perceptions. This hypothesis was tested in order to check the findings of Decker et al. (1984) who reported that farmers who have experienced damage from deer were less likely to accurately perceive trends in deer abundance than those without such experience. As discussed in the Literature Review Chapter, the evidence that these authors provided to support their claim was unconvincing, and the research conducted herein would appear to confirm my suspicions regarding the questionable validity of their claim.

Explanation of Incongruent Trend Perceptions

The pervasive lack of congruence between stakeholders' and MDNR trend judgments may be a result of several factors. First, the frame of reference for the trend question may have been problematic. For instance, the question asked the respondent to judge the trend for the area of the county where the respondent hunted/farmed most often. In many of the counties there were multiple DMUs, and so there may have been different MDNR-judged trends within the same county (e.g., Calhoun, Menominee, Presque Isle). Exposure to different actual trends may confound the respondents' ability to judge the trend for any one particular area. In addition to restricting the geographic reference, the question was restrictive in terms of temporal reference. Specifically, the question referenced the trend over the past 5 years, and perhaps this relatively short time period was inadequate for the respondents' thinking about the trend. However, it is likely that the respondents did not restrict their thinking to only the past 5 years when forming their impression of the trend, so the impact of the stated time frame was probably minimal.

A second plausible explanation for the lack of congruence between stakeholders' trend perceptions and MDNR trend judgment is that changes in deer numbers over time may be too difficult for the average individual to detect. Changes in the size of the population may be slight, or the distribution of deer across the landscape may provide misleading clues to the overall trend. An individual who had experienced an area with a clumped distribution of deer may have perceived that deer were increasing when in fact the overall herd size in the area was decreasing. In contrast, deer in areas where the herd size is increasing may be sparsely distributed across the landscape such that the deer population is perceived as decreasing. The unequal distribution of deer across the landscape likely results in varying levels of deer-human interactions and varying perceptions of the trend in deer numbers.

Deer Density Estimation

Provision of an Estimate

Only about half of the hunter survey respondents and farmer survey respondents offered an estimate of the deer density, and about 40% of each set of survey respondents were willing to say that they had "no idea whatsoever" about the deer density in the area where they hunted or farmed most often in the county.

At least two reasons may account for the lack of willingness to offer a deer density estimate. First, one assumption was that the area where the respondent hunted or farmed "most often" was an area to which they had regular exposure and would be more likely to offer a deer density estimate than for other areas of the county. As mentioned earlier, deer hunters who lived in a study county were found to be more likely to offer an

estimate than were those who did not live in a study county, but still only about 57% of the Live In hunters offered an estimate. It seemed that even regular exposure to an area may not have been enough to bolster confidence to the point where respondents felt comfortable offering a deer density estimate. This leads to the second reason to explain why only half of the respondents provided a deer density estimate. It may have been that respondents who did not provide an estimate felt ill-prepared to offer an estimate of the deer density. Given that most of those who did not provide an estimate checked the box that said, "I have no idea whatsoever," it is unlikely that they chose not provide an estimate to avoid embarrassment (e.g., to avoid being found wrong by the researchers). As we suspected from the start, the concept of deer per square mile is probably too vague and intangible for many people.

Congruence of Deer Density Estimates

As hypothesized, stakeholders' deer density estimates had significant positive correlations with MDNR density indices. However, the correlations tended to be modest (r of around 25 to 35) for most segments except full-time farming deer hunters (r=0.56). Generally, those who hunted or farmed in the DMU with the lowest deer density index (10-15 deer/mile^2) reported significantly lower deer density estimates than those who hunted or farmed in the DMU with the highest deer density index (80-100 deer/mile^2). This tendency to estimate significantly lower deer densities in areas where the deer population size was smaller compared to areas where the deer herd was larger (according to the MDNR) was found for most respondent segments, although in some instances, such as with non-hunting farmers and Live Out hunters, low cell sizes precluded the

ability of statistical tests to detect differences in estimates among DMUs.

Live In versus Live Out Deer Density Estimates

Residence in the county did not seem to matter in the extent of congruence between deer density estimates by deer hunters and MDNR indices. Estimates by both Live In and Live Out deer hunters were significantly positively correlated with MDNR indices for the respective DMU. Furthermore, no significant difference was found in the mean confidence in the estimates by deer hunter survey respondents who lived in a study county and those who lived outside the study counties. The rationale for the hypothesis that deer hunters' estimates would differ based on resident stratum was essentially the same as that used for the hypothesis that stakeholder estimates would be positively correlated with MDNR indices (which *was* supported by the results). Namely, the rationale involved the idea that higher deer numbers would result in greater exposure to interactions with deer which would result in higher deer density estimates, with those who experienced more deer-related interactions estimating higher deer densities. It was assumed that deer hunters who lived in the county would experience an extent of interactions that more closely reflected the number of deer in the DMU than would those who live outside the county.

At least two explanations for the lack of difference in deer density estimates between Live In and Live Out hunters have some degree of plausibility. First, it could be that no appreciable differences existed in the extent of actual interaction with deer in the DMU where they hunted in the county for those who lived in the county versus those who lived outside the county. Second, those who lived in the county may have

experienced deer-related interactions across the county and not just primarily in the DMU where they hunted, and this may have served to confound their estimate for the particular DMU where they hunted, making it no better or worse than that by those who travel to the DMU to hunt.

Farmers With Intolerable Crop Loss versus Those Without Intolerable Crop Loss

Findings suggested that farmers who did not experience intolerable losses gave slightly more congruent deer density estimates than those who had. That is, estimates by both of these farming segments were significantly positively correlated with MDNR indices, with farmers with intolerable losses having the weaker of the two correlations ($r=0.35$ for those with intolerable loss; $r=0.46$ for those without intolerable loss). This weaker correlation for farmers with intolerable losses may be due to these farmers tending to offer a higher deer density than those who did not judge their crop losses as intolerable regardless of actual deer density (MDNR judgment). Regardless of perceived severity of crop losses, farmer survey respondents' deer density estimates for the DMU with the lowest deer density index (10-15 deer/mile^2) were significantly lower than estimates for the DMU with the highest deer density index (80-100 deer/mile^2).

Divergence of Estimates by Farmers and Hunters as Actual Densities Increased

As deer densities increased (based on MDNR indices), the difference between farmers' and hunters' estimates tended to increase. At the lowest deer densities, there was no significant difference among the four segments of respondents based on farming and hunting participation, but at the highest deer densities, farmers (non-hunting and full-time farming hunters) gave significantly higher deer density estimates than non-farming

hunters. This divergence may have been a result of the differential actual and/or perceived impacts of deer and the weighing of those impacts as densities increased. That is, it may have been that deer hunters experienced more gains from deer at higher deer densities, whereas farmers incurred more losses from deer at higher deer densities, although there is some evidence that the actual impact of deer on crops may vary more with distribution of deer than with overall deer density (e.g., Braun in press, Horton 1995). Regardless of the extent of actual impacts, perceptions of the extent of impacts may have increased. As actual and/or perceived impacts increased, the risks and benefits may have become differentially important as a consideration by the particular stakeholder, respectively, which may have been reflected in their divergent estimation of the density of the herd.

Confidence in Estimates

Members' Confidence in Estimates

Members of deer-hunting-related organizations were significantly more likely to offer an estimate of the deer density than were nonmembers, and they were also significantly more confident in their estimates than were non-members. This finding was consistent with the presumption that members have greater exposure to information about deer and deer management than do non-members. Greater exposure to information tends to increase confidence in knowledge of a subject, and this has been documented in previous studies. For instance, in a controlled experiment, Oskamp (1965) provided subjects with a 4-part case study to read. After reading each part of the case study, subjects answered a set of questions based on factual information contained in the

reading. The same set of questions was answered after each section, and each time a question was answered, the subjects estimated the likelihood that their answer was correct. Oskamp (1965) found that confidence increased with the amount of information subjects read, but accuracy did not. In the years since the Oskamp study, several others have found that individuals tend to be overconfident of their judgments, especially when accurate judgments are difficult to make (Plous 1993).

Greater confidence, however, does not necessarily correspond to greater accuracy, and this seemed true in the case of membership in hunting organizations. Although members were more confident than nonmembers in their deer density estimates, the correlation between their estimates and the MDNR indices was weaker than that for nonmembers (r=0.22 and 0.37, respectively). One implication for the management agency is that those who are heard from most often may not be as well informed as the impression they may give.

Farmer/Hunter Confidence in Estimates

Confidence in estimation of the deer density varied significantly among the farmer/hunter segments, with non-hunting farmers and full-time farming hunters being less confident than non-farming hunters. Not only were non-hunting farmers the least confident, but this segment's deer density estimates also had the lowest of the correlations with the MDNR indices (r=0.23), indicating that this segment was also the least accurate in their deer density estimates.

Although non-farming deer hunters were more confident than full-time farming hunters in their deer density estimates, the correlation between their estimates and the

MDNR indices was weaker than that for full-time farming hunters (r=0.34 and 0.58, respectively). Similar to results regarding membership confidence, those who are most confident are not necessarily the most accurate.

Tolerance and Actual Deer Densities

The relationship between respondents' qualitative assessment of the deer density (i.e., tolerance as expressed as too few or too many) and the MDNR deer density index varied by respondent segment. Generally, mean tolerance of deer by deer hunters who did not rely on farming did not differ across areas with different actual deer densities. However, full-time farmers tended to be more intolerant (of too many deer) at higher deer densities than at lower deer densities.

Mean tolerance of deer by non-hunting farmers did not significantly differ across deer densities, but cell sizes for this comparison may have been inadequate to detect differences. Or, perhaps the non-hunting farmers' intolerance for deer was in fact not dependent on actual deer density (MDNR index), which would be most likely true if deer damage was not necessarily dependent on actual DMU-wide deer density. Some support for this possibility was found in a Michigan study of deer crop damage where production losses of red kidney beans on a per field basis in low deer density areas (e.g., 12 deer/mile^2) were comparable to those in high deer density areas (e.g., 20-40 deer/mile^2) (Braun in press). Again, the unequal distribution of deer within any given DMU may bring with it an unequal distribution of impacts.

Potential of Perceived Trends and Deer Density Estimates as Measures in the CCC Framework

This research set out to explore measures of trends and deer densities with full recognition that responses would probably be tenuous at best. However, because we were seeking a measure of respondents' perceptions of deer that would predictably covary over time with MDNR data, the accuracy of the perceptions (or how close the values were to MDNR data) was less important than the precision of the perceptions (or how closely they varied concomitantly with MDNR data) for our purposes.

In review, respondents' perceptions of deer population trends generally were not consistent with the MDNR judgment of the trend, regardless of the stakeholders' farming and hunting participation, whether the deer hunter was a resident of the county or not, or if the farmer had experienced what he/she judged to be intolerable crop losses. Overall, these findings indicated that this particular measure of perceptions of the trend in deer numbers would not serve as a reliable measure in the CCC framework.

However, unlike stakeholders' qualitative perceptions of the relative abundance of deer over time in one geographic location (i.e., perceived trend in deer numbers), most of the respondent segments had quantitative perceptions of the abundance of deer at one point in time that positively correlated with those of the MDNR across geographic areas. The CCC graphs created from the data showed response curves consistent with what was hypothesized for the different counties with varying levels of deer management-related issue activity. There was more overlap in acceptable ranges of deer density for stakeholders in Calhoun than in either Presque Isle or Menominee.

It is important to note that the variance around the means of each of the three points in the various stakeholders' response curves was substantial, which may indicate that the response curves were not significantly different. However, for the purposes of the CCC framework, statistical difference may be less important than the substantive difference which was apparent when only the means were evaluated. Future research will need to evaluate the impact of the large variation in respondents' deer density estimates on the ability of the response curves to precisely represent changes in tolerances over time.

It is tentatively concluded that the calculation used to create the response curves was appropriate and useful for charting preferences for deer among multiple stakeholders. However, further testing of this approach is warranted for three reasons: (1) response curves for only three counties were graphed in this study in part due to the limited number of respondents who offered a deer density estimate, (2) the variance around the estimates tended to be large, and (3) the correlations between perceived deer densities and actual deer densities were modest ($0.23 \leq r \leq 0.58$).

To increase sample size, question wording might be altered to encourage a greater percentage of respondents to offer an estimate. During the design of the deer density questions, we had considered an alternative approach to asking for estimates of deer per square mile which involved asking respondents to give a percent of change (both in terms of an increase and a decrease) in the current deer density that they would be willing to tolerate. This and other methods of question wording and format should be tried to see if they increase the likelihood of response.

The value of the "I have no idea whatsoever" response should not be underestimated because it provides valuable information on stakeholders to the resource management agency. For instance, when deer hunters are critical of deer management but a large percentage of them admit to not having the facts, the agency has an opportunity to intervene and provide the relevant information. So, efforts that are made to encourage respondents' provision of deer density estimates should not be aimed at eliminating the option to provide a "not sure" response.

In sum, estimates of deer density by stakeholders, while not necessarily accurate, may follow the MDNR indices with some consistent degree of precision. These findings suggest that there is some promise of utility of the CCC framework in managing crop damage issues. And, although this cross-sectional look at the low and high issue intensity counties fell out as hypothesized, a more conservative use of this type of data would be to monitor the changes in response curves over time. Based purely on conjecture, if these same respondents had been asked this same set of questions on the deer population size periodically over the last decade or so, we may have been able to observe the divergence in response curves in Menominee and Presque Isle counties. In this way, agencies may be able to monitor issue development and be proactive to prevent disruptive issue activity. This recommended use of the data is consistent with the conclusion tentatively proposed earlier (in the Methodology Section) that the most appropriate application of the CCC framework may likely be to monitor concomitant changes in tolerance and deer densities over time and not to evaluate tolerance at any one point in time.

Opinion of Deer Density

Regardless of the actual deer density, farmers tended to say there were too many deer, and deer hunters tended to say that there were too few deer. Also, deer hunters preferred a higher deer density than did farmers regardless of the intensity of deer-management-related issues in the county. Similar to the results regarding perceptions of the trend in deer numbers discussed earlier, these perceptions and preferences for deer abundance reflected the values perceived to be at risk to the respondent. Those who farmed but did not hunt seemed to be primarily concerned about the negative impacts of too many deer, and those who hunted but did not farm seemed to be primarily concerned about the negative impacts of too few deer. As discussed in the next section, it was likely that most of the concern about the negative impacts of too many or too few deer were primarily directed at concern for oneself rather than for others.

Importance of Various Factors in Forming Opinion of Deer Density

Of the four factors provided for deer hunter survey respondents to consider, most respondents said that each factor was of some importance as a consideration when they formed their opinion on the acceptability of the deer population size in the county. Overall, personal benefits were ranked as the most important of the considerations. But, this does not negate the finding that a vast majority (about 83%) of the deer hunter respondents rated farmers' crop losses of some importance. Although a majority of each resident strata felt deer-related vehicle accidents (DRVA) were important as a consideration, deer hunters who lived in a study county placed slightly more importance on DRVA than did those who lived outside the counties probably because those who

lived in the county would be most likely to bear the brunt of the accidents.

Across all counties, the mean importance rating of personal benefits and others' benefits did not significantly differ. However, deer-related vehicle accidents were rated as significantly more important by Calhoun deer hunter respondents than by Menominee, Oceana, and Presque Isle respondents, despite the fact that, of the seven counties studied, Calhoun had one of the lowest deer-vehicle accident rates (Table 7). The apparently lower concern for DRVA in these three counties compared to Calhoun may be due to the higher issue activity in those counties resulting in less emphasis on those considerations that would be a "cost" of the presence of deer. But, because this logic did not hold for concern given to farmers' losses (discussed in next paragraph), another explanation seems more plausible. That is, the higher concern may be a result of a higher absolute number of deer-vehicle accidents in Calhoun (despite a lower *rate* of accidents which results due to the high traffic volume on major interstates that bisect Calhoun than on roadways in the other counties creating a greater number of miles driven in the denominator of the rate calculation).

Farmers' losses were rated significantly more important by Calhoun deer hunter respondents than by either Montcalm or Oceana deer hunter respondents, but *not* more important than ratings by Menominee or Presque Isle respondents. An explanation for this finding is not readily apparent. One possible explanation would be that a smaller percentage of the Montcalm and Oceana deer hunter respondents were farmers as compared to Calhoun respondents. However, there was little appreciable difference in the proportion of each of those three county's respondents who were full-time, part-time,

and non-farmers. Also, because there was no significant difference in the mean rating of farmers' losses overall between deer hunters' who lived in the study county and those who lived outside the study county (nor between Live Ins and Live Outs for any one study county), disproportions of these strata among Calhoun, Montcalm, and Oceana would not account for this finding. One hypothesis for explaining the difference among counties in concern given to farmers' losses is that those who hunt in counties with more public land and hunting access are less concerned about farmers' losses than those who hunt where hunting opportunities are essentially dependent on access provided by private landowners. As shown in Table 8, Calhoun was the only one of the seven study counties with no state or federal land base. This hypothesis, however, remains to be more thoroughly tested.

Tolerance Model

A third main objective of this research was to propose a conceptual model for understanding attitudinal and behavioral responses to deer populations and deer management. The resultant conceptual model involved five dimensions ranging from what actually exists through individuals' beliefs and attitudes to their intentions and behaviors to try to change the perceived situation. The two primary "attitude objects" of the model were the wildlife population and the agency management of the population. In my opinion, this model served well in guiding the integration of tolerance and estimates of deer with attitudes toward the agency and crop damage control permits.

This model complemented the CCC framework by providing specific targets for agency interventions. It suggested that wildlife managers might change not only actual

conditions (i.e., the deer population) but also beliefs and attitudes of stakeholders. As hypothesized in the tolerance model, the relationship between actual numbers of deer and tolerance of deer is mediated by the perceived extent of wildlife-human interactions that occurs. For instance, for farmers, the wildlife-human interaction of most interest is deer crop loss. This research found that farmers' intolerance of deer was strongly correlated with their ratings of the severity of their crop losses (r=0.68). However, farmers' ratings of the severity of their crop losses were only modestly correlated (r=0.38) with their perceptions of the size of the deer herd and virtually uncorrelated (r=0.10) with MDNR indices. In this case, to effect the greatest amount of change in farmers' tolerance of deer, managers might be well advised to focus their efforts on changing farmers' perception associated with the severity of their crop losses rather than the actual size of the deer herd in the DMU. For instance, making it known to farmers that both the MDNR and MSU-E are working on the problem and are concerned about losses may help to ease any feelings of helplessness among farmers that might exist. Efforts to further enhance farmers' sense of control over deer damage might be accomplished by providing on-site assistance on deer damage control options.

The tolerance model was useful in two ways. First, it forced us to think about the universe of potential influences on tolerance. From this comprehensive base, we then were able to systematically select the variables and paths to study with a greater awareness of the possible extraneous influences. Second, it offered implications for future research. Herein, we focused only on a few variables in the tolerance model: perceptions and evaluations of wildlife population size and past trends, satisfaction with

deer hunting, some of the perceived costs and benefits of deer, perceived agency credibility, and beliefs and attitudes toward the management technique of Shooting and Block Permits. Other variables and relationships remain to be explored, such as the influence of perceptions of wildlife population quality, perceptions of future trends, and perceived risks of the wildlife-human interaction on tolerance. The model was applied to white-tailed deer and the crop damage issue in this study and needs to be tested more fully on a variety of other resource management issues involving other species.

Summary of this Section

The CCC framework was proposed as an organizational tool to facilitate management of issues regarding appropriate wildlife population objectives. It was tentatively concluded that respondents' estimates of deer densities and preferences could be used to make the CCC framework operational such that agencies may be able to monitor issue development and be better able to act proactively to prevent disruptive issue activity. The tolerance model also proved to be useful in guiding this research and suggesting areas for future study.

Deer Hunter Attitudes Associated with the Crop Damage Issue

The final objective of this research was to develop and test a causal model for understanding and predicting deer hunter approval of deer-crop-damage lethal control programs. To supplement the path model, other statistical tests regarding agency credibility and approval of Shooting and Block Permits were done.

Approval of Crop Damage Control Permits

Deer hunter respondents generally disapproved of both Shooting and Block Permits, but tended to be less disapproving of Block Permits than of Shooting Permits. The Block Permit system is different from the Shooting Permit system in several ways, all of which would tend to be viewed as more favorable to hunters' interests. These include the fact that Block Permits are used during the regular deer season by licensed hunters, which holds many advantages such as a greater sense of fairness to hunters because they have some degree of access to them and less likelihood that deer would go to waste or that pregnant does would be shot.

The supposition that greater perceived access to Block Permits would be associated with more favorable attitudes toward the permits was supported by the finding that hunters who participated in the Block Permit program were significantly more likely to approve of Block Permits than were non-participants. In fact, this particular segmentation of hunters (users v. non-users of Block Permits) was one of the few that produced a segment with positive attitudes toward the permits. The other segment with positive attitudes toward Block Permits was full-time farmers who deer hunted.

Approval of either permit system did not differ by whether the deer hunter reportedly had friends or family who were farmers. We had assumed that having a friend or family member who farms would increase empathy for losses which would in turn increase approval of the special crop damage control permits. Although results suggested that this was not the case, a more rigorous, direct measure of empathy and its relationship to permit approval is warranted.

Oddly, deer hunter respondents who reported being raised in a rural farming area were significantly more disapproving of both permit systems than were those who did not report being raised in a rural farming area, which was opposite of the predicted hypothesis. In addition, deer hunter respondents who reported that their families depended on farming during their youth were significantly more disapproving of Block Permits than were those who did not report that their families depended on farming during their youth, which held only for those deer hunter respondents who lived outside the study counties. In both of these cases (raised in a rural farming area and families dependent on farming), the differences in means were found to be statistically significant but were not substantively appreciable (≤ 0.26 in magnitude in each case).

"Causal" Influences on Approval of Lethal Crop Damage Control Programs

By far the greatest influence on deer hunters' approval of crop damage control permits was their perception of how closely the program was overseen by the resource management agency. Other perceptions — including attitude toward antlerless harvest, satisfaction with access, and perceived effectiveness of the permits — contributed to explaining approval of permits but were of much less importance than the perceptions associated with how well the program was administered, monitored, and regulated.

The influence of attitudes toward antlerless harvest on approval of control permits found in the path analysis was consistent with results of univariate analyses which found that those who support antlerless harvest and/or are willing to harvest antlerless deer themselves are significantly less disapproving of both permit systems than are those who do not support antlerless harvest or are not willing to personally harvest antlerless deer.

The significant influence of satisfaction with access on approval of control permits found in the path analysis was important in part because it helped to explain findings from the univariate analysis. Namely, mean approval of either permit system did not differ by the percent of respondents' deer hunting time spent on public land in the study county or by whether the individual owned/leased land where they could deer hunt. These results suggested that deer hunters' opinions regarding hunting access may be a better predictor of approval of permits than their actual access to private land.

A major conclusion based on the path analysis was that hunters who believe that the permit systems are not closely regulated by the MDNR will not approve of the permit systems. The content validity of the perceived oversight construct was robust and offered a wide array of areas for improvement in the MDNR's implementation of the permit program or for changing deer hunters' belief systems. For instance, deer hunters might be made aware that, for most farming operations, experts generally agree that few if any cost-effective alternatives to control deer damage besides killing deer exist. The rationale behind the MDNR allowing crop damage permits in areas closed to regular antlerless harvest may need to be made explicit to deer hunters. Similarly, the intended purpose of special control permits, to control damage in targeted areas as to not reduce the deer on a large scale, needs to be made clear to deer hunters. This information, coupled with information that illustrates that the actual take of antlerless deer on the permits as a proportion of the entire antlerless harvest in a year is minimal, may offset some concerns about the permit program.

Stricter or more explicit policy guidelines regarding eligibility for permits may

promote approval of permits. Evidence that the MDNR is intent on providing these permits only to those who justifiably deserve permits should be shared with deer hunters whenever possible. In addition, assurance should be given to deer hunters that the agency strives to minimize any waste of deer and closely monitors the disposal of deer taken on the permits. Because members tended to be slightly more disapproving of Shooting and Block Permits than were nonmembers, one important venue for this information would be membership-related media, such as club newsletters or magazines, or even leaders of the organizations.

If these efforts to closely regulate the permit program are not the actual practice of the agency, then internal policies and attitudes need to be re-evaluated and changed. No degree of public relations to improve the image of the MDNR or crop damage control permits will be effective unless the MDNR's own policies and professionals merit it. In addition, the inconsistencies in policies regarding implementation and regulation of the permit programs across the state need to be addressed. Some variation may be necessary to adequately address the unique situations of crop damage control across the state, but attempts to standardize the program wherever feasible would be effective at allaying some confusion and concern on the part of hunters. For those components of the policy that cannot practically be standardized, clear explanations should be available to explain to stakeholders why the inconsistencies are needed.

MDNR Deer-Management Credibility

As hypothesized, deer hunters who hunted in counties with lower issue intensity had significantly higher rating of MDNR's deer-management credibility than did deer

hunters who hunted in counties with higher issue intensity. This finding suggested that perceptions of credibility were related to the intensity of the crop damage issue. In support of this, path model results showed that approval of crop damage control programs was directly and positively related to perceived deer-management credibility.

Univariate analyses suggested that the differences in credibility were driven by beliefs about the adequacy of the MDNR's information on deer management and may have been influenced by beliefs about whose interests currently were or should be considered by the agency. In review, non-hunting farmers believed that the MDNR currently favored the interests of deer hunters when setting deer population goals for the county but felt that farming interests should be favored over hunting interests. Most non-farming hunters believed that the MDNR currently favored the interests of farmers when setting deer population goals for the county but felt that hunting interest should be favored over farming interests. Farmers who deer hunt tended to say that neither interest group should be favored.

These findings suggested that the MDNR should continue to communicate its sincere concern and consideration in deer management decisions for the interests of both farmers and hunters. It may be helpful to concurrently communicate to both farmers and hunters about the dilemma faced by any resource management agency in terms of balancing the interests of multiple stakeholders. This may serve to foster empathy for the management agency or at least some degree of informed consent with regard to deer-management decisions that are made.

Furthermore, efforts should be increased to promote the image of the agency professionals not only as trustworthy but also as experts who base their decisions on the best available scientific information. Improving the accuracy of the MDNR estimate of the number of deer in the state was the highest rated issue in terms of importance for the agency to address (Appendix F, Question #29). The agency's method of estimating deer numbers may have been an important concern for those respondents who disagreed that the MDNR has "enough information on the deer population to adequately decide how many deer to harvest" (Appendix F, Question #28, part c). MDNR methods for estimating the deer population size have been repeatedly challenged by stakeholders in the popular media (e.g., DeAgostino 1990). In particular, publicity that one of the methods used for estimating the size of the deer population involves counting deer droppings tends to meet with the bewilderment of most laypersons, especially when the use of these data as indicators of trends over time (i.e., precise but not accurate) is not clearly and convincingly explained. Biological methods that may be perceived by the publics as unreliable or invalid should not be widely discussed unless they can be packaged in a way that makes them appear as solid science to the layperson. Interested stakeholders deserve to be informed regarding the biology behind deer management, but the tailoring and strategy surrounding how they are informed is an area that merits improvement.

Reversal of Direction of Hypothesized Paths

In the original path model, it was hypothesized that tolerance of deer and deer management credibility would directly affect approval of the crop damage control permit

program. However, the hypothesized paths were found not to be significant, but paths in the reverse direction *were* found to be significant. These findings were not too startling because in the development of the original model, paths in either direction were equally plausible. I chose to hypothesize the ones that I did because they seemed most logical to me at the time.

The rationale supporting the original hypothesized path from tolerance of deer to approval of permits was that deer hunters' beliefs that the deer population size is intolerable would lead to disapproval of the crop damage control permits because use of these permits further affects the number of deer. The rationale supporting the original hypothesized path from perceived deer-management credibility to approval of permits was that it seemed logical that deer hunters who judged the MDNR as credible to manage deer would be more likely to approve of the crop damage control permit programs.

Yet, it is also plausible that disapproval of the crop damage control permit program may result in a belief that the deer population is intolerably low due to the perceived take of deer on the control permits. Disapproval of the permit program may motivate deer hunters to take action to try to change the deer population size by attempting to make the agency change the permit program. Similarly, it is also logical that disapproval of the crop damage control permit program may result in a belief that the MDNR is not credible to manage deer. Also, the credibility construct may have been too general to "deer management" and may not necessarily have been seen as including the management of deer via the permit program such that it would directly affect approval of the permit program.

The Influence of Hunting Satisfaction

Both perceived deer-management credibility and tolerance of deer were found to be directly affected by deer hunters' satisfaction with their deer hunting experience in the county. It makes intuitive sense that increased satisfaction with the hunting experience would lead to increased tolerance of the deer population size and to a more favorable opinion of the management agency. Although it was originally hypothesized that hunting satisfaction would indirectly impact approval of permits through the hypothesized influence of credibility and tolerance on approval of permits, these latter paths were found to be nonsignificant as was discussed in the preceding paragraphs. This suggested that hunting satisfaction had limited if any influence on approval of crop damage control permits.

Summary of this Section

Overall, the issue of deer numbers being reduced in certain areas to control crop losses was not a top concern for most deer hunter survey respondents. Just as with the controversy surrounding the Wisconsin shooting permit program (Horton 1995), the disruptive issues over crop damage and its control in Michigan seem to be a result of a vocal minority who appeared to be composed primarily of residents of the county. However, this does not dismiss the importance of addressing widespread concern and interest among deer hunters that the permit program be closely regulated. For, without sincere attempts on the part of the management agency to allay these concerns, the current vocal minority might expand its ranks and become a more potent force for reckoning.

Recommendations For Further Research

Cultural Carrying Capacity

We have attempted to move the CCC concept beyond a notion to the status of a comprehensive, structured, and evolving model. This work on CCC has produced several areas to be further investigated. First, it will be important to validate the findings regarding the usefulness of the CCC framework. Response curves need to be charted for other issues of wildlife tolerance involving other stakeholder groups, such as nuisance wildlife in urban/suburban settings. Although the computation of points on the response curves worked well here, other approaches to measuring response curves should be tried. One alternative measure to try might include some type of benefit-cost tradeoff assessment of deer in the form of a discrete choice model (e.g., Adamowicz et al. 1994).

The qualitative measure of tolerance of deer used herein involved a single item. The inclusion of both an attitudinal and intention aspect within the response options seemed to work well to differentiate tolerance from intolerance. However, future studies should explore the development of a tolerance scale which includes multiple indicators.

The research above is recommended in order to fully operationalize the framework and attitudinal response model, but the value of the CCC framework depends on enhancing the practical management responses to wildlife population issues. Therefore, the final recommendation is to develop and evaluate management responses to the targets identified by the tolerance model, principally attitudes toward wildlife and the level of interaction with wildlife. Research needs to be done to identify the most effective means for changing tolerance of deer. For example, are there effective ways to

broaden a stakeholder's consideration of the cost-benefit comparisons so that impacts on other stakeholders are given more consideration? The ultimate utility of this model of cultural limits on wildlife populations rests on making it work to resolve real-world management issues.

Path Model

A theoretical model can be errant in at least two ways (Biddle and Marlin 1987). First, the wrong variables may be posited, or important variables may be unspecified. For instance, based on the proportion of variance left to be explained in each of these variables, it is probable that other variables directly affect tolerance of deer populations and deer-management-credibility of the agency (Adjusted R^2 of 53 and 59, respectively). Also, it would be interesting to develop and test a construct for deer hunters' empathy for farmers who experience crop loss due to deer and assess how empathy relates to approval of special damage-control permit programs. How these unspecified variables interact with the variables related to approval of the permit program remains to be tested.

Second, the causal relations specified may be inappropriate. Each of the paths identified in the final model was statistically significant and the advocated model fit best of those tested, but this does not rule out the possibility that other paths might also be found significant and other models not tested would fit better. Further testing of this path model is needed. In particular, I would encourage continued exploration into the effect of hunting satisfaction on approval of permits and testing of the relationships between approval of crop damage permits and perceived agency credibility and tolerance of deer.

Summary and Conclusions

Review of the Problem

At the risk of gross oversimplification, the issue over crop damage and its control is complex. The core of the issue deals with the fundamental dilemma of deer as a commons resource owned by all citizens equally who entrust the management of the resource to the state agency (Hardin 1968). From one perspective, farmers are seen as producing crops which serve as forage for deer, and deer are viewed as an unintended by-product of agricultural production for which no compensation is paid; hunters, then, reap a positive externality in the increase in deer (Hansen 1988). From another perspective, hunters are seen as footing the bill for the state agency's management of deer with the expectation of just returns and consideration above and beyond that given to the interests of other stakeholders. The situation is further confounded by a myriad of other possible perspectives on deer and deer management.

No one study will be the end-all to controversies over deer and deer management; However, this study aimed to make contributions toward the resolution of controversies over deer and deer management in agricultural areas. It involved a cross-sectional exploration into farmers' and hunters' attitudes and behaviors associated with deer management and crop-damage-related issues.

Attainment of Objectives and Goal

The four objectives of this study were achieved. First, a conceptual framework for facilitating resource management agency consideration of multiple stakeholder preferences for deer was developed. The resultant "Cultural Carrying Capacity"

framework provided a theoretical link between deer population size and human tolerance. Secondly, the utility of the framework was explored. As hypothesized, there was greater overlap in tolerance levels among stakeholder segments in counties with lower issue activity than in counties with higher issue activity. It was tentatively concluded that respondents' estimates of deer densities and preferences could be used to make the CCC framework operational such that agencies may be able to monitor issue development and be proactive to prevent disruptive issue activity.

Third, a conceptual model for understanding attitudinal and behavioral responses to deer populations and deer management was proposed. The tolerance model was useful because it forced us to think about the universe of potential influences on tolerance and because it offered insights and ideas for future research. Finally, a conceptual model for understanding and predicting deer hunter approval of deer-crop-damage lethal control programs was developed and tested. The strongest influence on approval of special permits was deer hunters' perceptions regarding how closely the permit programs were implemented and regulated by the management agency.

Upon reflection on the development of the CCC framework, steps toward making the framework operational, and insights gained into attitudes toward crop damage control programs, it seems that the dual goal of offering practical insight into crop damage issues for consideration by the management agencies and contributing to the scholarly knowledge base on wildlife tolerance and resource management was achieved.

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APPENDICES

APPENDIX A

EXAMPLES OF MEDIA COVERAGE OF THE ALPENA CROP DAMAGE ISSUE

"Alpena: Fewer deer hurt business" Newspaper Article (page 285)

"Area sportsmen say 'we told you so'" Newspaper Article (page 286)

Alpena: Fewer deer hurt business

Associated Press

ALPENA — Business leaders and hunters say state efforts to reduce Michigan's deer population are hurting the economy of the northern Lower Peninsula.

"We have some real economic losses being reported already with the declining deer herd," said Dan LaCross, co-chairman of the newly-formed Concerned Sports Persons and Business People of Northeast Michigan.

The group is asking the state Department of Natural Resources to re-evaluate the state's strategy of cutting back deer numbers.

The group is scheduled to meet in Alpena on Friday with DNR wildlife experts.

"Those who share our concerns over the status of the Michigan deer herd are strongly encouraged to attend this meeting and express their views," said LaCross.

The DNR estimates there were about 1.4 million to 1.6 million deer in the state at the start of the 1993 deer hunting season. There were more than 2 million deer in Michigan in 1989.

The department increased the quotas for hunters to reduce the herd. The goal was to improve the food supply and health for the remaining deer

"We came down from a very, very large herd in 1988 and 1989 to a herd that's much smaller," said Ed Langenau, DNR deer specialist in Lansing. "Now the issue is, are there too few deer and should we back off the harvest; are there too many deer, or is it just right?"

Richard McElroy, director of the Alpena Area Chamber of Commerce, said the smaller herd is hurting the area's economy.

"Local businesses have expressed concern that some hunters already were not coming here. And, with deer kill reports down as much as 50 percent to 70 percent, the hunting traffic would decrease even more," McElroy said.

Lansing State Journal. 5 March 1994. Local/State Section, page 313.

5-B, THE NEWS, Saturday, September 5, 1994

Area sportsmen say 'we told you so'

A group of northeast Michigan sportsmen and business operators are saying "We told you so" in light of new antlerless deer regulations showing up now in area sport shops.

For over a year, the leadership of Concerned Sportspersons & Businesses of Northeast Michigan has been telling the MDNR that the deer herd in northern Michigan is seriously down. What began as denial has ended in very few doe permits for all of northern lower Michigan.

"The curtailment of doe permits for the general public will only help solve part of the problem," said Concerned Sportspersons co-chairman Norm Zolnierek. "The other part of the problem, the issuance of summer kill permits and fall block permits to farmers, still goes on without control and accountability."

The Michigan Department of Natural Resources has already issued 16 summer deer damage control permits for the area, 13 in zones where doe permits are not available to regular hunters or private land owners. "You cannot stop only part of the killing," Zolnierek said. "If we are to build our herd, a solution to crop damage must be found that puts controls on what can be adequately monitored."

The group's other co-chairman has equally powerful feelings. "The MDNR seems to be strong on every policy except where kill permits are concerned," Dan LaCross said. "The DNR must take shooting high-powered rifles long after dark and into the early a.m., out of the repertoire of farmers for crop damage control. Besides the out-of-control destruction of deer, people can be hurt or killed." In a recent incident, a commercial building was shot four times during night permit shooting from across a major highway.

The group's mission is: To maintain a deer herd level that is sufficient to provide a quality hunting experience, which in turn will guarantee a consistent and prosperous business climate.

The group's 11-point program advocates the following:

1. Limit number of deer allowed each hunter per season to two.
2. Reduction of doe permits.
3. Develop a separate system for control of the deer herd by farmers that does not include killing.
4. Redesign doe permit and deer tagging systems.
5. Consider changes in season structure.
6. Increase planting of some type of support crops on state land by the DNR.
7. All funds from licensing fees shall be retained for wildlife use only.
8. Regional citizen input on policy changes each year should be sought by DNR.
9. Better control over license sales, i.e., computer tracking.
10. No purchase of deer license after start of the season.
11. Develop an accurate system for determining the deer herd numbers.

The group has been working hard on advancing its 11-point program in recent meetings with area politicians. In the past week they have met with Reps. Beverly Bodem and Tom Alley and candidate G.T. Long. Meetings are planned with Rep. Dianne Byrum and Michigan United Conservation Clubs lobbyist Rick Jamison.

"We're targeting legislators involved in tourism and conservation," Zolnierek said, "because the real problem with our deer herd is political." He advised other concerned citizens to get involved. "Call or write your legislator," Zolnierek directed. "Tell them to back off on the special interests and give the deer herd a chance."

Zolnierek asked sportsmen to get involved in their local clubs. "Our success is proof that the real action begins at home," he said. "Inquiries and involvement are welcome." Zolnierek can be reached at (517) 354-8771. Rep. Bodem's number is 1-800-292BODEM.

News File Photo

Area sportsmen said state's new antelrss deer regulations prove contentions they first voiced last year regarding size of the state's deer herd.

APPENDIX B

UCRIHS APPROVAL

Approval Letter for Survey of Agricultural Producers (page 287)

Approval Letter for Survey of Deer Hunters (page 288)

MICHIGAN STATE
UNIVERSITY

July 14, 1995

TO: Peter A. Fritzell Jr.
2A Natural Resources

RE: IRB#: 93-402
TITLE: ESTABLISHING BASELINE SOCIO-ECONOMIC DATA REGARDING AGRICULTURE LANDOWNER PERCEPTIONS ABOUT DEER AND DEER DAMAGE IN MICHIGAN
REVISION REQUESTED: 05/31/95
CATEGORY: 1-C
APPROVAL DATE: 07/10/95

The University Committee on Research Involving Human Subjects'(UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/ CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

David E. Wright

David E. Wright, Ph.D.
UCRIHS Chair

DEW:kaa/lcp

cc: R. B. Peyton

OFFICE OF
RESEARCH
AND
GRADUATE
STUDIES

University Committee on Research Involving Human Subjects (UCRIHS)

Michigan State University
232 Administration Building
East Lansing Michigan
48824-1046

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

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APPENDIX C

AGENDA FOR FOCUS GROUP WITH MICHIGAN DEPARTMENT OF NATURAL RESOURCES, WILDLIFE DIVISION PERSONNEL

Meeting with Select MDNR Biologists and Supervisors Regarding the Crop Damage Control Program

13 October 1994 Fall Meeting of TWS-MI Chapter
~7:30 to 9:00 p.m. Saginaw Field and Stream Club

AGENDA

1. Introductions

2. Status of Sociological Research on Deer Crop Damage

3. Discussion Items:

   - Strengths and Weaknesses of Current Crop Damage Control Program
   - Ideas on Improving the Program
   - Feasibility of Supplemental Management Options
   - MDNR and MSU-E Relationship Regarding Crop Damage Control Program

4. Points of Information for Future:

   - Publicity Regarding Crop Damage Issue
   - MDNR Information Needs from Hunter and Farmer Surveys
   - Follow-up Discussions with MDNR

Donna Minnis, Research Assistant, 2A Natural Resources Bldg., Department of Fisheries & Wildlife, Michigan State University, East Lansing, MI 48824-1222.
Phone: 517/353-0877; Fax: 517/432-1699; E-mail: minnisdo@student.msu.edu.

Peter Fritzell, Research Assistant, 336 Natural Resources Bldg., Department of Fisheries & Wildlife, Michigan State University, East Lansing, MI 48824-1222.
Phone: 517/353-7981; Fax: 517/432-1699.

Principal Investigator:
Dr. Ben Peyton, 11C Natural Resources Bldg., Department of Fisheries & Wildlife, Michigan State University, East Lansing, MI 48824-1222.
Phone: 517/353-3236; Fax: 517/432-1699; E-mail: 20570mgr@msu.edu.

APPENDIX D

DEER HUNTER FOCUS GROUP MATERIALS

Recruitment Postcards (Times Roman font; Script font; Handwritten) (page 290)

Screening Questionnaire (page 291-292)

Confirmation Sheet (Flint, Michigan, version shown here) (page 293)

Pre-Focus Group Letter to Confirmed Participants (page 294)

Pre-Focus Group Letter to Ineligible Participants (page 295)

Pre-Focus Group Letter to Unavailable Participants (page 296)

Pre-Focus Group Survey (Flint, Michigan, version shown here) (page 297)

Discussion Guide (pages 298-306)

Letter of Thanks to Participants (page 307)

Dear Steven:

I am conducting a study of deer hunting issues for Michigan State University. Your name was drawn at *random* from a list of 1993 licensed deer hunters.

As part of this study, I need to speak directly with a group of deer hunters. Would you be willing to meet with me to talk about deer hunting issues? You do not need to be an avid hunter; I need to talk with all types of deer hunters.

If you are interested in helping me out or learning more about the study, please call me toll free at 1-800-730-HUNT (i.e., 1-800-730-4868) *by* Monday, August 22, from 8 am-8 pm any day, including weekends. I will be waiting for your call, but if I am not able to answer it, please leave a message and I will get back with you.

I selected only a few names, so your cooperation is extremely important!

I look forward to hearing from you,
Donna Minnis, Research Assistant

Donna Minnis

Dear Matthew

I am conducting a study of deer hunting issues for Michigan State University. Your name was drawn at random from a list of 1993 licensed deer hunters.

As part of this study, I need to speak directly with a group of deer hunters. Would you be willing to meet with me to talk about deer hunting issues? You do not need to be an avid hunter; I need to talk with all types of deer hunters.

If you are interested in helping me out or learning more about the study, please call me toll free at 1-800-730-HUNT (i.e., 1-800-730-4868) by Monday, Aug. 22, from 8 am-8 pm any day, including weekends. I will be waiting for your call, but if I am not able to answer it, please leave a message and I will get back with you.

I selected only a few names, so your cooperation is extremely important!

I look forward to hearing from you,
Donna Minnis, Research Assistant

Donna Minnis

Dear Richard:
I am conducting a study of deer hunting issues for Michigan State University. Your name was drawn at random from a list of 1993 licensed deer hunters

As part of this study, I need to speak directly with a group of deer hunters. Would you be willing to meet with me to talk about deer hunting issues? You do not need to be an avid hunter, I need to talk with all types of deer hunters.

If you are interested in helping me out or learning more about the study, please call me TOLL FREE at 1-800-730-HUNT (i.e., 1-800-730-4868) by Monday, August 22, from 8am-8pm any day, including weekends. I will be waiting for your call, but if I am not able to answer it, please leave a message and I will get back with you. I selected only a few names, so your cooperation is extremely important! I look forward to hearing from you, Donna Minnis, Research Assistant

Deer Hunter Focus Groups Telephone Screening Questionnaire August 1994

DATE: _____ AUG 1994

TIME:_____ a.m. / p.m.

To whom am I speaking? **NAME:**_____

Thank you for calling. As the postcard mentioned, I am conducting a study for Michigan State University on deer hunting issues. Findings of this study will be used by the Michigan Department of Natural Resources Wildlife Division to to address some of the issues that deer hunters face and to improve deer hunting in Michigan.

- **Did you deer hunt in 1993?** NO YES
  ***If no*, in 1992?** NO (Terminate Call) YES

We would like to meet with you and a group of about 8 other deer hunters from your area of Michigan to discuss deer hunting issues. Your identity will remain confidential, and your name will not be used in any report of this study. To compensate you for your participation in this discussion group, we will pay you $25.

- **Are you willing to meet with me and a group of other deer hunters to discuss deer hunting issues some time in early-mid September?** NO YES

  If no, ask why not:_____

  then ask
  Could I call you later this fall and talk with you over the phone? NO(End Call) YES(complete phone section)

- **COUNTY OF RESIDENCE:**_____

- **The discussion group that you will be part of will be held in:**

  MARSHALL FLINT TRAVERSE CITY ESCANABA

Could I get some basic background information from you right now? If no, ask for their phone number and best time to call and terminate call.

- **PHONE NUMBER:** _____ **BEST TIME TO CALL:**

  HOME:_____ _____ a.m. / p.m.

  WORK:_____ _____ a.m. / p.m

- **MAILING ADDRESS:**

  _____

  _____

  _____

  _____

- **As you know, deer season is divided into four parts (list them). In which of these did you deer hunt during 1993?**

  EARLY ARCHERY NOV. GUN LATE ARCHERY MUZZLELOADER

- **In what counties in Michigan did you deer hunt in 1993?**

  _____ _____

  _____ _____

- **What is your age?**_____ • **GENDER:** MALE FEMALE

- **What percentage of your 1993 deer hunting activity was on:**

  PUBLIC LAND?_____ PRIVATE LAND?_____

- **Do you obtain any part of your income from farming?** NO YES: ____%

- **Are you currently a member of a deer hunting club or organization?**

  NO YES: WHICH ONE(s)?_____

  _____ _____

  if yes, **Have you been an officer of the club within the past 5 years?**
  NO YES

I am in the process of receiving phone calls from hunters who are interested in talking with me. I hope that I can include everyone who calls, but if the response is high, I may need to randomly choose participants. If that happens, you may or may not be one of those randomly selected. But, for right now let's plan on your participation.

There are just a few more questions that I need to ask you.

- We will be **voice recording** each group so that the information provided during the discussion can later be transcribed into a report form. Again, your identity will be confidential. Is it okay with you that your voice be recorded during the discussion? NO YES

- We may **videotape** some of the group discussions for use in training people about the use of discussion groups. The videos will not be distributed or used commercially. If your group is one of those chosen to be videotaped, would it be alright if you were videotaped during the discussion? NO YES

- **We would like to schedule a meeting during early-mid September.**

  From September 6-19, when would you be able to meet? refer to calendar

September

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Do you prefer to meet mornings, afternoons, or evenings?_____

Are there any times that you cannot meet? _____

- After I coordinate the meeting with the other deer hunters, I will call you back to confirm a time. You should hear back from me in the next week. Please try to keep the dates and times we discussed open

  Can I answer any questions at this time? Thank you for your cooperation. If you have any questions, please call me at this number

COMMENTS

Confirmation of Focus Group Participation: Flint, MI 6 Sept 94
Hunter Study

Date:____ August 1994

Name:_____

Phone Number:_____

Mailing Address:

_____

_____

The discussion group will be held on Tuesday, September 6th, from 7:00 to 9:00 p.m. at the Days Inn in Flint.

I will send you directions and information on the meeting time in the next week.

[Double check spelling of name and mailing address.]

As I mentioned when we talked earlier, you will receive $25 to cover your time and travel expenses. Please try to arrive at the Days Inn at 6:45 p.m. so that we can get the information we need to process your check. You will receive the check in the mail after our meeting.

To make sure that the conversation is manageable and that we hear from only the randomly selected deer hunters, I need to ask you not to bring along any family or friends to the discussion.

Because the discussion will involve only 10 or so deer hunters, it's very important that you show up for the discussion. Can I count on you to be at the discussion?

If something comes up, please call me at the toll-free number as soon as possible.

Thanks. I look forward to talking with you.

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
2A NATURAL RESOURCES BUILDING
EAST LANSING • MICHIGAN • 48824-1222

PHONE: 517/432-1491
FAX: 517/432-1699

23 August 1994

[ADDRESS]

Dear [FIRST NAME]:

Thanks so much for agreeing to meet with me and about 10 other deer hunters to talk about deer hunting issues. As a reminder, the discussion will begin promptly at [TIME] on [DAY], September [DATE], at the [FACILITY] in [CITY]. A map of the area with directions to the [FACILITY] is enclosed.

Please show up 15 minutes early so that I can get the information I need in order to process your $25 compensation check, which you will receive in the mail soon after the discussion.

As I mentioned to you over the phone, because our study requires that we talk only with randomly-selected hunters, please do not bring anyone with you to the discussion. Although we would like to accommodate all deer hunters who would like to talk about deer hunting issues, I'm sure that you understand that the scientific requirements of our study do not permit us to do so.

[FIRST NAME], the success of this study depends on your attendance at the group discussion. I hope that I can count on you to be there. If you have any questions or find that you must cancel your place in the discussion group, please call me as soon as possible at 1-800-730-HUNT (i.e., 1-800-730-4868).

I look forward to talking with you.

Sincerely,

Donna L. Minnis, Research Assistant

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MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
2A NATURAL RESOURCES BUILDING
EAST LANSING • MICHIGAN • 48824-1222

PHONE: 517/432-1491
FAX: 517/432-1699

24 August 1994

[ADDRESS]

Dear [FIRST NAME]:

Thanks so much for responding to the postcard I sent you. The cooperation I received from deer hunters across Michigan was outstanding. I am just sorry that we weren't able to include you in our study, but we had to limit the number of people in the discussion.

If there is ever a time when you want to share your perspectives on deer hunting or deer management, please feel free to call me. The toll-free number will be disconnected in October, but you can reach me at 517-432-1491.

Best of luck in this year's deer season.

Sincerely,

Donna L. Minnis, Research Assistant

Enclosure

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DEPARTMENT OF FISHERIES AND WILDLIFE
2A NATURAL RESOURCES BUILDING
EAST LANSING • MICHIGAN • 48824-1222

PHONE: 517/432-1491
FAX. 517/432-1699

1 September 1994

[ADDRESS]

Dear [FIRST NAME]:

Thanks so much for responding to the postcard I sent you. The cooperation I received from deer hunters across Michigan was outstanding. I am just sorry that we weren't able to accommodate your schedule.

If there is ever a time when you want to share your perspectives on deer hunting or deer management, please feel free to call me. The toll-free number will be disconnected in October, but you can reach me at 517-432-1491.

Best of luck in this year's deer season.

Sincerely,

Donna L. Minnis, Research Assistant

Enclosure

MSU is an Affirmative Action/Equal Opportunity Institution

Name_____ (Will Be Kept Confidential) **Date: 6 September 1994** **Discussion Location: Flint**

Answering the following questions will help us save time during tonight's discussion.

1. How important is deer hunting to you compared to other types of recreation that you participate in, such as fishing, camping, gardening, hiking, jogging, competitive sports, and other types of hunting? (Check Only One)
   _____ THE MOST IMPORTANT RECREATIONAL ACTIVITY THAT I PARTICIPATE IN
   _____ ONE OF THE MORE IMPORTANT RECREATIONAL ACTIVITIES THAT I PARTICIPATE IN
   _____ NO MORE IMPORTANT THAN ANY OTHER RECREATIONAL ACTIVITIES THAT I PARTICIPATE IN
   _____ LESS IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES THAT I PARTICIPATE IN
   _____ NOT AT ALL IMPORTANT TO ME

2. Are you a member of a deer hunting-related club or organization? NO YES

3. In which of the 4 deer-hunting periods do you typically participate? (Circle All that Apply)

   Early Archery November Gun Late Archery Muzzleloader

4. In the blanks on the left below, fill in the approximate number of days that you were in the field hunting during each period last year. In the blanks on the right, indicate the percent of your time spent during each period on public versus on private lands.

   # Days You Hunted *Fill in % of time spent on public vs. private land during each period*

   Early Archery_____ DAYS PUBLIC___% of the time PRIVATE___% of the time

   Nov. Gun _____ DAYS PUBLIC___% of the time PRIVATE___% of the time

   Late Archery _____ DAYS PUBLIC___% of the time PRIVATE___% of the time

   Muzzleloader _____ DAYS PUBLIC___% of the time PRIVATE___% of the time

5. About how many other hunters (not including those in your party) did you see during each period?

   Early Archery____ Nov. Gun____ Late Archery____ Muzzleloader____

6. Did you use bait to hunt deer last year? NO YES ☛In which period(s)?_____ _____

7. Have you ever applied for an antlerless deer permit? NO (Skip to #9) YES

8. Did you apply for an antlerless deer permit last year (1993)?

   NO YES ☛ Did you get the permit? NO (Skip to #10) YES ☛ Did you fill the permit? NO (Skip to #10) YES

9. Please select the reasons why you did not apply for an antlerless permit last year. (Check All that Apply)
   ____NEVER GOT ONE SO I QUIT APPLYING ____I PREFER NOT TO HUNT DOES OR FAWNS
   ____TOO MUCH TROUBLE TO APPLY ____ANTLERLESS PERMITS NOT AVAILABLE IN MY AREA
   ____DON'T KNOW HOW TO APPLY ____I WANT THE DEER POPULATION TO INCREASE
   ____OTHER: EXPLAIN_____

10. Where do you get your information about the deer population and deer management in Michigan? (List sources (e.g., magazines, radio, DNR personnel...) here)

11. Please list all the things that you think influence the number of deer you see during a day when you are hunting:

DEER HUNTER FOCUS GROUP DISCUSSION GUIDE

START TAPE RECORDER

I. INTRODUCTIONS

A. INTRODUCTION OF NON-PARTICIPANTS

1. Moderator
   a. name
   b. MSU Dept. FW
   c. role
2. Recorder
   a. name
   b. Will not participate
   c. Will record our thoughts in abbreviated form so that we have a group memory to refer to during our discussions. May need to help her/him capture your ideas. Not concerned with spelling.
3. Observers

B. ORIENTATION

1. Thanks for participating in this discussion group. This discussion group is one of four that we are doing with deer hunters in Michigan. The discussions will help us formulate our research hypotheses and create a questionnaire that will be sent out to hunters across the state next year.

2. From both the postcard and our discussions over the phone, you are aware that I am conducting this study for Michigan State University on issues related to deer hunting. The purpose of this study is to find out how deer hunters feel about some of the issues associated with deer hunting and deer management in Michigan. We will begin our discussion by talking about your deer hunting participation and then we will spend most of the time on deer hunting-related issues.

   The results of this study will be shared with the Wildlife Division of the Michigan Department of Natural Resources. Just so that it is clear, I work for MSU not for the DNR

3. As you can see, the discussion is being taped so that I do not have to take notes, although I may jot down a few things here and there. As I mentioned over the phone, your identity will be confidential. We will use only first names in our discussion tonight, and your names will not be included in the report of this study. Let's try to speak loud and clear so that the microphone will pick up what we are saying.

4. To help us get the most out of our discussion in the short time we have together, there are a few simple ground rules for us to follow.
   a. First and foremost, due to the small size of this group, it is vital that each of you share what is on your mind regarding the topics we discuss.
   b. I expect and hope that there will be differences of opinions in this group, and I am not looking for any particular responses to the questions I have for you tonight. There are no right or wrong answers. Share your views and respect the views of the others although you may disagree.

c. Any time that a question is unclear, please just ask for clarification.
d. As moderator, I may ask you to be brief and I may need to interrupt you or redirect the conversation. Please know up-front that I do not intend to be rude or discourteous.
e. Again, please speak one at a time and loud enough so that all of your comments can be clearly understood when I go back over the tape.
f. We will take a short break in about an hour so. There is no smoking in this building, but during the break you can smoke (**where???**).
g. Has everyone written down your social security number on this sheet? The accounting office at MSU will process your check and send it to you in the next week or so. Sometimes they can be a little slow, but it will get to you.
h. Finally, I am sure that each of you has a great deer hunting story to tell, and I would love to hear them, but we have only 2 hours here tonight to discuss a whole bunch of things that are central to this study. So, let's work together to stay on track. Try not to get into recounting a hunting expedition unless you feel it will help me to understand your opinions on a topic.
i. Does anyone have any questions about the ground rules?

C. I would like to begin the discussion by going around the table and having each of you share your first name, the county you currently live in, and the number of years that you have gone deer hunting in Michigan. *(Focus on hunting outside of resident county)*

1. PROBE: Do any of you live in an agricultural area?

II. PARTICIPATION IN DEER HUNTING

You have shared a little about how you deer hunt on the survey you just completed. For the next few minutes I would like to learn a little more about your involvement with deer hunting.

A. What hunting periods did you participate in during the 1993 deer season and in what counties did you hunt in for each period? By "hunting period", I mean early and late archery, November gun, and muzzleloader.
1. PROBE: Do you hunt in your resident county for some and travel out of your county to hunt in another?
2. PROBE: *For those who hunt outside where they live:* Would you describe the county in which you hunt as agricultural?

B. For each period, do you tend to hunt mostly on public or private land?
1. *If private land* PROBE:
a. Do you own the land? If not, whose is it?
(1) Probe: Is it land owned by a hunting club, private landowner, industry?
b. Do you manage the area where you hunt for deer? *(quality of area for deer rel to number of deer seen)*

2. *If public land* PROBE:

a. How would you describe the lands that surround the public land where you hunt?

C. How important is it for you to see deer during the hunting season?

1. During last year's deer season, on average, how many deer did you see during each of the hunting periods in which you hunted? *(How do they index deer seen?)*
   a. PROBE: Was the number of deer that you saw last year more, less, or about the same as you expected to see?

   If Less than expected:
   (1) What is your personal hunting style (in blind, on stand, walking)?
   (2) What is the hunting style of others in your hunting area?
   (3) Has there been any change in the hunting style of you or the other hunters in your area over the past years?
   (4) Has there been any noticeable change over the past years in the number of hunters in the area you hunt?
   (5) To what extent do you think that your and others' hunting style influences the number of deer you see?
2. How many deer do you expect to see during each day you are in the field?
   a. Why do you expect to see that many deer?
   b. What factors influence the number of deer you see on any day you are in the field hunting?
   c. Have your expectations about the number of deer you will see changed over the last 5 years or so? How?
   d. As compared to last year, do you expect to see more, fewer, or about the same number of deer/day during this year's deer season?

3. How many deer do you think you *should* be able to see? If you could have it your way, what is a reasonable number of deer that you would want to see/day afield?
   a. You would be satisfied if you were able to see __ number of deer per day?
   b. How about shooting opportunities? Do you need to have a certain number of times that you *could* shoot a deer in order to be satisfied?

D. Did you harvest any deer last year (1993)?
1. PROBE: how many in which season?
2. PROBE: buck or doe?
3. How important is it to you to get a deer?
   a. PROBE: Is it important to get a deer each year?
   b. PROBE: Is it important to get a buck?

4. How many deer did you realistically hope to harvest last year?
   a. Have your expectations about the number of deer you hope to harvest changed over the last 5 years?
      (1) PROBE: How often do you expect to get a deer, every year, every other year?

E. What are your expectations for this year's deer season?
1. How many deer do you hope to harvest? Is this the same as the number you expect to harvest?

F. My last question about your deer hunting participation deals with ways that you value deer. Do you like having deer around for any other reason besides for hunting?

1. PROBE: Aesthetics of seeing deer
   Bequest value -- have deer around for future
   Local economy

III. DEER POPULATION IN MICHIGAN

Now let's focus on the deer population in Michigan. Let's start off with the trends in the deer herd and then focus on the current population.

A. First let's talk about the past and future trends in deer population. **In your responses please indicate whether you are referring to the deer population statewide, in the area where you live, or in the area where you hunt.**

1. What has been the trend in deer numbers in Michigan over the past 5 or 10 years?
   a. Do you know of any peak years for deer numbers?
   b. *IF DECREASE:* Do you think that the decrease you have noticed has been a planned reduction by the MDNR?
2. What do you see as the trend in deer numbers over the next 5 years?
   a. Why do you think that that will be the trend?
3. How much fluctuation in deer numbers is normal over a 10 year period?
   a. What causes this variation over time?
   b. Do you think it would be possible for the Division of Wildlife to keep the deer numbers more stable over time?

B. Now let's focus on the here and now. How would you describe the current deer population in Michigan? *(do they refer to quantity and/or quality)*

1. Do you have an idea of how many deer there are currently? *[How do they express deer pop size (e.g., do they refer to their county, the county where they hunt, or the entire state; do they refer to deer per square mile or per what unit)?]*
2. Do you think the current population size is too high, too low, or just right?
   a. PROBE: *If too low:*
      - How do you know when there are too few deer? *(minimum demand)*
      - How many deer would be too few?
      - What do you think has caused the low deer numbers?
   b. What effect does the fall harvest of deer by hunters have on the deer population size?
   c. How do you decide if the size of the deer population is acceptable or not acceptable?
3. Generally, how would you describe your overall satisfaction with deer hunting and deer management in Michigan?

[☞NOTE THOSE WHO ARE DISSATISFIED for talking about intolerance]

   a. PROBE: How satisfied are you with the number of deer in Michigan?
   b. PROBE: How satisfied are you with the quality of the deer in Michigan?

4. How would you describe your ideal but realistic Michigan deer population? *(optimum)*
   a. What makes this population optimal?
   b. Do you think this is a reasonable deer population goal for the MDNR?

C. We have talked about the number of deer in Michigan. We can easily come up with the positive things associated with having lots of deer around. Now let's take a minute and jot down any negative things that are associated with high deer numbers.

Flip Chart Round Robin: Can you think of any negative impacts of high deer numbers? *(What negative impacts are most salient? Does crop damage come up?)*

1. PROBE:
   - Have any of you ever been in deer-car accident?
   - Are you concerned about the increased risk of drva as deer numbers increase?
   - Have any of you experienced deer damage to your garden or ornamental plants?
   - Any concern over Lyme disease transmission?
2. What are the worst problems that come from having lots of deer?
3. Is there such a thing as having too many deer?
   a. Is there a limit to the number of deer you would like to have in the county in which you live? *(WAC)*
      (1) Try to imagine that there are too many deer where you live. How would you describe the situation?
   b. Is there a limit to the number of deer you think we should have in the county where you hunt?
      (1) PROBE: *If there is a difference in the limits of deer for resident counties and hunt counties, ask why.*
   c. Is there a point at which these negative impacts of high deer numbers would outweigh the positive benefits of high deer numbers? *(threshold of tolerance)*
   d. Can you imagine a point of too many deer in Michigan?
      (1) PROBE: Do you think that you would ever feel that the deer herd should be decreased?

D. If deer numbers got intolerably low in Michigan, what would you do?
1. PROBE: What kinds of things can you do to influence deer management in Michigan?
2. PROBE: For those of you who are dissatisfied with the deer herd in Michigan, how have you dealt with your dissatisfaction?
3. PROBE: For those of you who are dissatisfied but have not aired your concerns to the agency, legislature, or courts, have you considered doing so?
   a. PROBE: What has prevented you from actually doing so?
4. Do you know of other hunters who have done something about deer management concerns?
   a. What have they done? Were they successful?

Ask the following only if there is a good number of people who have taken action:

5. Have any of you ever written letters or taken other actions to make your opinions about the deer herd known? *(Issue Activity)*

(If only one or two have done something, probe a little but then ask them after the discussion if you can contact them later.)
(Note if hunters who express satisfaction with current herd take action to make change)

6. Have you ever aired your concerns about the deer herd to the MDNR?
   a. PROBE: What was your purpose for contacting the agency?
      (1) Who did you contact specifically?
   b. PROBE: Do you feel that the state agency took your concerns seriously?
7. Have you ever contacted your senator or representative about deer herd concerns?
   a. PROBE: What was your purpose for contacting him/her?
   b. PROBE: What motivated you to go to your congressman?
   c. PROBE: Did you first contact the state agency?
8. Have any of you ever taken the DNR to court?
   a. PROBE: Why? Describe your actions before you made the decision to take the agency to court.
9. What made you decide to air your concerns?
   a. PROBE: too few deer? *(minimum demand)*
      (If there are enough deer, then what is the key issue(s) to deer hunters that make them intolerant of the current situation.)
   b. How did you decide what you were going to do?
   c. How effective have your efforts been?

IV. SALIENCE OF DEER HUNTING ISSUES

A. As I mentioned, this discussion is primarily about issues related to deer hunting and deer management. I would like you to take a few minutes and jot down what you think are the top issues facing deer hunting and deer management today. For instance, we have already talked about size of the deer population. Some of you think it is too low, so this might be an issue facing deer hunting and management. Try to prioritize them in terms of importance. Then we will go around the table and list your ideas on the flip chart.
   1. **Round Robin**
   2. Clarification
   3. Ranking

V. CROP DAMAGE ISSUE

Now that we have a record of what you think are the most important issues, we need to focus the rest of the time on one of the issues that is of central concern in this research. So for the rest of the time, we will discuss the issues associated with deer and crop damage in Michigan. [*if this issue is not a priority on their list*: I realize that you may or may not believe that the crop damage issue is the most important issue facing deer hunting, but I would appreciate it if you could focus on this subject because we really need to hear your opinions about it. I will help us stay on the track as much as possible.]

A. What comes to your mind when I say "deer crop damage"? *(how do hunters describe "loss" vs. "damage")*
   1. *If club members present:* For those who are club members, in terms of your club's agenda, how important is the crop damage issue? What makes you say that? *(does the club make the issue salient to the member)*

B. Do you think there is a problem with deer crop damage in the county in which you live?

1. PROBE: What makes you say there is a deer damage problem in your county?
2. What factors do you think contribute to high deer damage?
   a. PROBE: type of crop, deer numbers, size of field
3. PROBE: How long have you noticed a problem due to deer damage?
4. PROBE: Does anyone have any friends or relatives who farm? Does knowing a farmer personally impact the way you think about crop damage?
5. PROBE: *If crop damage is dismissed:* Do you think there are ever any legitimate cases of deer crop damage?

C. For those of you who hunt outside of the county where you live, are you aware of any crop damage problems in the counties where you hunt?
   1. PROBE: What makes you say there is a deer damage problem in the county where you hunt?
   2. PROBE: How long have you noticed a problem due to deer damage?

D. What are your opinions about farmers' loss of income due to deer damage? *(empathy)*
   1. Do you think farmers should tolerate deer damage?
      a. PROBE: What amount?
      b. PROBE: Why?
   2. *If access comes up:* Have you ever asked a farmer for access? What did he say?
      a. Why do you think a farmer might deny access?

E. **Round Robin:** Let's generate a list of ways that farmers can try to control deer damage? Take a minute and jot down some things that farmers can do to control deer damage. *(awareness of crop damage permitting).* LIST ON FLIP CHART THEN ASK:
   1. PROBE: How effective are these measures for reducing deer damage?
   2. PROBE: How affordable are these measures?
   3. PROBE: How easy are these measures able to be used?
   4. **Rank** hunters' most preferred control measure

F. Let's spend some time talking about the crop damage control program.
   1. Is anyone familiar with the current way that the MDNR gives out deer permits to farmers in order to control crop damage? Would you explain the crop damage control program to me? *(understanding of program: If they are aware of out-of-season kill permits and fall block permits then probe each of those separately. If they are not aware of the program at all, explain it (as in section G below) giving credit to DNR as source of information)*

I WANT TO KNOW, AT LEAST IN THIS EARLY SECTION, WHAT THEIR PERCEPTIONS ARE OF THE CROP DAMAGE PROGRAM BECAUSE THIS MAY HELP US IDENTIFY MISPERCEPTIONS THAT MAY BE TARGETED IN A COMMUNICATION CAMPAIGN. MAYBE FIRST EXPLORE THEIR PERCEPTIONS THEN INTRODUCE ACTUAL CURRENT PROGRAM AS AN EXAMPLE FOR THEM TO COMMENT ON (see I below).

2. From your experiences, what percentage of Michigan farmers would you guess apply for crop damage permits?
   a. Do you know of any areas of the state where more farmers apply for crop damage permits than in other areas?
3. What do you see as the major benefits of the permitting program?
4. What do you see as the major problems with the program? **(list and rank most severe)** *(Is it the program itself that hunters find intolerable or is it something else such as the perceived deer pop that is intolerable?)*

a. PROBE: What effect does the killing of deer as part of the crop damage control program have on the deer population size? *(is antlerless take mentioned; Is summer kill distinguished from fall block take?)*

b. PROBE: What percentage of farmers who get permits abuse them?

(1) What types of abuses are there?

c. PROBE: Is the program fair?

5. How might the current system be improved?

a. Do you think that with the appropriate number of licenses issued regular season harvest would be enough to reduce deer crop damage? *(do hunters think that the deer they kill in the fall are the same deer that are doing the damage in the summer?)*

b. What --if anything-- would have to be done to get you to support the crop damage permitting program?

(1) If hunters had greater use of the crop damage permits, would the crop damage control program be more acceptable?

(2) *If nothing is acceptable*: Should farmers tolerate all amounts of loss?

(a) *If no:* What should be done about the problem?

» G. FOR GROUPS THAT ARE NOT FAMILIAR WITH THE CURRENT PROGRAM OR HAVE MAJOR MISPERCEPTIONS ABOUT IT:

Let's say that the program was set up like this: There are two different permits that are issued to farmers to control deer damage. The first type of permit is the shooting or out-of-season crop damage control permit. Shooting permits are issued to farmers by DNR biologists to be used to kill antlerless deer at times outside of regular deer hunting season. The farmer can designate up to 3 shooters to use the tags, and the farmer can receive only 10 tags at any one time. The second type of permit is called "block permits." Farmers can buy a block permit for $3.00 each for use by licensed hunters in the regular hunting season on and immediately adjacent to lands where damage has occurred in 2 out of the past 5 years (current year and 1 of past 4 years). These block permits can be used only on private lands for only antlerless deer and do not count against the regular season licensed harvest of the hunter. The intent of the crop damage control permits is to control deer numbers on localized areas. What would your opinion of this program? (Ask them questions as in F3-5 above)

H. Now that we have discussed the deer crop damage control program, would any of you be willing to work together with farmers to try to improve the system?

1. PROBE: Would anyone be willing to work in a committee setting, like on a task force, to help try to improve the crop damage control program?

2. PROBE: Who do you think should be involved in the decisions about changes in the crop damage system? *[To get at who would be the acceptable decision maker(s)]*

VI. **MDNR Wildlife Division**: For the remainder of the discussion, I would like to hear from you about the MDNR, specifically the Wildlife Division.

A. What comes to your mind when I mention the Wildlife Division?

1. Do specific individuals come to mind? Who?

B. How would you describe the credibility of the Wildlife Division in managing Michigan's deer herd?

1. Are they trustworthy?
2. Do they have the expertise needed to manage the deer?
   a. PROBE: What types of information do you think that the DNR doesn't have available?
   b. PROBE: What types of information does the DNR have but could be better in terms of quality?
3. Have any of you had any positive experiences with Wildlife Division personnel?

C. How would you describe the Division's management of the crop damage control program?
   1. PROBE: Do you believe that the DNR tries to achieve a fair balance between farmer and hunter interests?
   2. PROBE: Does the DNR represent hunters interests to the extent that they should?
   3. PROBE: Have any of you ever heard a DNR employee talk in negative terms about the crop damage control program? (to get at the pervasiveness of perceived "anti-crop damage program sentiment" within the DNR)

D. Do you know of any other agencies or organizations that are involved with deer management or crop damage control?

VII. We have come to the end of the discussion. At this point, I'll open up the discussion to anything you would like to add about deer in Michigan.

A. PROBE: Has our discussion today sparked any thoughts in your mind about the crop damage control program that you hadn't already had? *(see if anything struck them as interesting or surprising maybe to use in future communications to hunters)*

B. What are the key points about the crop damage control program that I should emphasize based on this evening's discussion?

C. Summarize this evening's discussion for me.

D. Based on what we shared this evening, what actions should the Division of Wildlife take regarding the crop damage control program ?
   1. What should the DNR do about deer numbers in Michigan?

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
2A NATURAL RESOURCES BUILDING
EAST LANSING • MICHIGAN • 48824-1222

PHONE: 517/432-1491
FAX: 517/432-1699

19 September 1994

[ADDRESS]

Dear [FIRST NAME]:

Thank you for participating in our discussion group. I enjoyed talking with you and the other hunters, and I particularly enjoyed hearing your perspectives on things.

As I mentioned during the discussion, you should receive your compensation check in the next few weeks. If it doesn't arrive in a timely manner, please let me know. The toll-free number will be disconnected in October, but you can reach me at 517/432-1491.

Best of luck in this year's deer season!

Sincerely,

Donna L. Minnis, Research Assistant

MSU is an Affirmative Action/Equal Opportunity Institution

APPENDIX E

DEER HUNTER PILOT SURVEY MATERIALS

There were 3 versions of this survey tailored to three of the seven study counties (i.e., Calhoun, Leelanau, Presque Isle). The Leelanau version is shown here.

Pilot Survey Instrument (pages 308-323)

Cover Letter to Pilot Respondents (page 324)

Instructions to Pilot Respondents (page 325)

Cover Letter to Agency Reviewers (page 326)

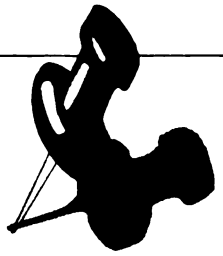
Cover Letter to Deer Hunter Reviewers (page 327)

Instructions to Reviewers (page 328)

1995 DEER HUNTER OPINION SURVEY

Conducted by the Department of Fisheries & Wildlife
at Michigan State University
East Lansing, Michigan

[PILOT SURVEY]



THANK YOU!

Since you have gotten this far,
we hope that you have decided
to complete this questionnaire.

We assure you that the time and
thought you put into this effort will be
well invested!

DEER HUNTERS' OPINIONS ON DEER MANAGEMENT IN MICHIGAN

PLEASE NOTE:

- Please mark the boxes clearly in ink: ☑
- **"DNR"** stands for the Michigan Department of Natural Resources.
- In this survey, a **"buck"** is a deer with antlers extending more than 3 inches above the skull. **"Antlerless"** deer are all other deer.
- Special instructions in the survey will be indicated by the following symbol: ☞

• THANKS IN ADVANCE FOR YOUR HELP!

1. In what year did you first go deer hunting in Michigan? ABOUT 19_____

2. Since then, how many years have you actually gone deer hunting in Michigan? ABOUT _____ YEARS

3. How would you describe yourself as a **deer** hunter? (Check ONLY One)

   IN A TYPICAL YEAR, I HUNT DEER USING... ☐ A BOW ONLY ☐ A FIREARM ONLY ☐ BOTH BOW AND FIREARM

4. How important is deer hunting to you compared to other types of recreation in which you participate, such as fishing, camping, jogging, bowling, competitive sports, other types of hunting, etc...? (Check ONLY One of the Following)

   DEER HUNTING IS...
   - ☐ THE MOST IMPORTANT RECREATIONAL ACTIVITY IN WHICH I PARTICIPATE
   - ☐ MORE IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
   - ☐ ABOUT AS IMPORTANT AS THE OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
   - ☐ LESS IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
   - ☐ NOT AT ALL IMPORTANT TO ME

5. How would you describe your level of satisfaction with your overall 1994 deer hunting experience? (Check ONLY One)

   ☐ I DID NOT DEER HUNT IN 1994 ☐ VERY SATISFIED ☐ SOMEWHAT SATISFIED ☐ NEITHER SATISFIED NOR DISSATISFIED ☐ VERY DISSATISFIED ☐ SOMEWHAT DISSATISFIED

6. Please check the **one** statement that best describes your opinion about the legal recreational harvest of antlerless deer:
   - ☐ I AM OPPOSED TO THE HARVEST OF ANTLERLESS DEER BY HUNTERS
   - ☐ I SUPPORT THE CHOICE OF OTHER HUNTERS TO HARVEST ANTLERLESS DEER, BUT I AM NOT WILLING TO HARVEST ANTLERLESS DEER MYSELF.
   - ☐ I AM WILLING TO HARVEST ANTLERLESS DEER MYSELF
   - ☐ NOT SURE

To what extent do you agree or disagree with the following statements about the Michigan Department of Natural Resources? (Select One Response for Each Statement)	STRONGLY AGREE	SOMEWHAT AGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE
7. THE DNR HAS THE EXPERTISE TO MANAGE THE STATE'S DEER HERD.	☐	☐	☐	☐	☐
8. I TRUST THE DNR TO FAIRLY CONSIDER THE INTERESTS OF DEER HUNTERS WHEN MAKING DECISIONS ABOUT HOW TO MANAGE THE STATE'S DEER HERD.	☐	☐	☐	☐	☐
9. THE DNR HAS ENOUGH INFORMATION ON THE DEER POPULATION TO ADEQUATELY DECIDE HOW MANY DEER TO HARVEST IN MICHIGAN EACH YEAR.	☐	☐	☐	☐	☐

☞ Your name was randomly selected from a list of deer hunters who responded to the 1993 Firearm Deer Survey conducted by the Michigan Department of Natural Resources. You were selected because you reported deer hunting in one of the counties that we are studying.

(REVIEWERS: WHENEVER YOU SEE "Leelanau" IN THIS SURVEY, PLEASE REFER TO A COUNTY IN MICHIGAN IN WHICH YOU ACTUALLY DEER HUNTED DURING 1993 OR 1994.)

10. Did you deer **hunt** in Leelanau county in **1993**? ☐ YES ☐ NO
(REVIEWER: INSERT YOUR DEER HUNTING COUNTY HERE: _____ COUNTY)

11. Did you deer hunt in Leelanau county in **1994**? ☐ YES ☐ NO ⇒

If both are checked "NO", skip to #35 on page 5. (REVIEWERS, PLEASE IGNORE THIS BOX)

12. **Over the past 10 years,** how many years have you actually gone deer hunting in **Leelanau** county during any deer season (archery or firearm)? _____ YEARS (IF ZERO, WRITE A "0" IN AND SKIP TO #35)

☞ For questions #13-19, please refer to your deer hunting experience in **Leelanau** county in the MOST RECENT YEAR that you deer hunted there.

13. How would you describe your **level of satisfaction** with your overall **deer hunting experience** in Leelanau county? (Check ONLY One)

☐ VERY SATISFIED ☐ NEITHER SATISFIED NOR DISSATISFIED ☐ VERY DISSATISFIED
☐ SOMEWHAT SATISFIED ☐ SOMEWHAT DISSATISFIED

14. Of your total time spent deer hunting in Leelanau county (most recent year), what percent of the time were you hunting on **public** land?

I DEER HUNTED ON PUBLIC LAND _____ % OF THE TIME IN LEELANAU COUNTY

15. **Were regular antlerless permits available for the area where you hunt in Leelanau county in the most recent year that you deer hunted in that county?** (Check One)

☐ YES ☐ NO ☐ I DON'T KNOW

16. **How many antlerless deer did you tag in Leelanau county in that year?** _____ ANTLERLESS DEER

17. How many bucks did you tag in Leelanau county in that year? _____ BUCKS

18. How would you describe your level of satisfaction with your **deer harvest** in Leelanau county? (Check One)

☐ VERY SATISFIED ☐ NEITHER SATISFIED NOR DISSATISFIED ☐ VERY DISSATISFIED

☐ SOMEWHAT SATISFIED ☐ SOMEWHAT DISSATISFIED

19. How would you describe your level of satisfaction with the **number of deer you saw** while actually deer hunting in Leelanau county? (Check One)

☐ VERY SATISFIED ☐ NEITHER SATISFIED NOR DISSATISFIED ☐ VERY DISSATISFIED

☐ SOMEWHAT SATISFIED ☐ SOMEWHAT DISSATISFIED

If you were asked whether there should be more, fewer or the same number of deer in Leelanau county, how important would each of the following be in forming your answer?

(Select One Response for each Statement)	VERY IMPORTANT	SOMEWHAT IMPORTANT	SLIGHTLY IMPORTANT	NOT AT ALL IMPORTANT	NOT SURE
20. CONCERN FOR THE NUMBER OF DEER-RELATED VEHICLE ACCIDENTS IN THE COUNTY	☐	☐	☐	☐	☐
21. CONCERN FOR YOUR PERSONAL BENEFITS FROM DEER (SUCH AS HUNTING, VIEWING, ECONOMIC GAIN, ETC...)	☐	☐	☐	☐	☐
22. CONCERN FOR BENEFITS OTHERS GET FROM HAVING DEER IN THE COUNTY	☐	☐	☐	☐	☐
23. CONCERN FOR FARMERS' CROP LOSSES DUE TO DEER	☐	☐	☐	☐	☐
24. OTHER (SPECIFY)	☐	☐	☐	☐	☐

25. In the most recent year that you deer hunted in Leelanau county, how many days did you hunt during the *November* ***firearm*** *season* in that county? _____ DAYS (IF ZERO, WRITE A "0" IN AND SKIP TO #35)

☞ **For the questions on this page and the next page, please refer to your deer hunting *only during the November firearm season* during the most recent year that you deer hunted in Leelanau county.**

26. On the map to the right, please circle the approximate location(s) in which you deer hunted during the *November firearm season* in the most recent year that you deer hunted in Leelanau county.

☐ IF YOU ARE UNABLE TO IDENTIFY WHERE YOU HUNTED, PLEASE CHECK HERE AND SKIP TO #28.

27. ☐ If you hunted in more than one location, please check here and write a "#1" next to the area where you spent **most** of your deer hunting time.

28. The estimate of the number of deer in this county of Michigan in **October 1993** was 33 deer per square mile. What is your opinion of the accuracy of this deer density estimate for that part of Leelanau county where you hunted most often during the *November **firearm** season*?

COMPARED TO THE DISTRICT ESTIMATE, I THINK THE NUMBER OF DEER PER SQUARE MILE DURING OCTOBER, 1993, IN THIS PART OF LEELANAU COUNTY WAS... (Check ONLY One)

☐ SIGNIFICANTLY HIGHER ☐ ABOUT THE SAME (SKIP TO #30) ☐ SIGNIFICANTLY LOWER ☐ I HAVE NO IDEA WHATSOEVER
☐ SOMEWHAT HIGHER ☐ SOMEWHAT LOWER

29. What is *your* best estimate of the density of deer in October, 1993, in the area where you hunted most often in Leelanau county?

I BELIEVE THAT THE DENSITY OF DEER WAS BETWEEN _____ AND _____ DEER PER SQUARE MILE
☐ I HAVE NO IDEA WHATSOEVER

30. **For that same hunting area, what would be the deer density that would be *most desirable* to you (not too many or too few, but just right)?**

THE MOST DESIRABLE DENSITY OF DEER TO ME WOULD BE BETWEEN _____ AND _____ DEER PER SQUARE MILE

☐ I HAVE NO IDEA WHATSOEVER

31. Considering the positive and negative impacts to yourself and others of having deer around, please indicate the range of deer densities that you would be willing to tolerate in this area of Leelanau county.

ALL THINGS CONSIDERED...

I WOULD BE WILLING TO TOLERATE NO FEWER THAN _____ BUT NO MORE THAN _____ DEER PER SQUARE MILE

☐ I HAVE NO IDEA WHATSOEVER

32. How would you describe the number of deer in the area where you hunted most often during the *November firearm season* in Leelanau county? (Check ONLY One)

☐ TOO FEW AND I INTEND TO TRY TO DO SOMETHING ABOUT IT

☐ TOO FEW BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT

☐ I AM SATISFIED WITH THE NUMBER OF DEER

☐ TOO MANY BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT

☐ TOO MANY AND I INTEND TO TRY TO DO SOMETHING ABOUT IT

33. What do you think is the trend in the deer population size in this area of Leelanau county? (Check One)

☐ SEEMS TO BE INCREASING ☐ SEEMS TO BE ABOUT THE SAME EACH YEAR ☐ SEEMS TO BE DECREASING ☐ I DON'T KNOW

34. Do you currently own or lease land where you can deer hunt? ☐ YES ☐ NO

35. To what extent do you approve or disapprove of the DNR's policy of intentionally reducing deer numbers in **certain areas** in order to decrease the **frequency of deer-related vehicle accidents**? (Check One)

☐ STRONGLY APPROVE ☐ NEITHER APPROVE NOR DISAPPROVE ☐ STRONGLY DISAPPROVE

☐ SOMEWHAT APPROVE ☐ SOMEWHAT DISAPPROVE

If you were making recommendations to the DNR, how much importance would you tell them to place on each of the following over the next year? (Select One Response per Statement)	VERY IMPORTANT TO ADDRESS	SOMEWHAT IMPORTANT TO ADDRESS	NOT IMPORTANT TO ADDRESS	NO OPINION
36. IMPROVING THE ACCURACY OF THE DNR ESTIMATE OF THE NUMBER OF DEER IN THE STATE.	☐	☐	☐	☐
37. CHANGING THE CURRENT DNR PROGRAM TO CONTROL CROP LOSSES CAUSED BY DEER, WHICH INVOLVES ISSUING PERMITS TO FARMERS FOR KILLING DEER.	☐	☐	☐	☐
38. CHANGING THE CURRENT NUMBER OF BUCKS COMPARED TO THE NUMBER OF DOES IN THE STATE'S DEER HERD.	☐	☐	☐	☐
39. CHANGING THE CURRENT STRUCTURE OF THE DEER HUNTING SEASONS.	☐	☐	☐	☐
40. CHANGING THE CURRENT DEER POPULATION SIZE IN THE STATE.	☐	☐	☐	☐
41. CHANGING THE CURRENT BAG LIMITS FOR DEER.	☐	☐	☐	☐
42. OTHER: (SPECIFY)	☐	☐	☐	☐

43. How important to you is the issue of deer numbers being reduced in certain areas to control crop losses compared to other issues facing deer management in Michigan, such as those in the table above? (Check ONLY One)

IN MY OPINION, THE CROP LOSS ISSUE IS...

- ☐ THE MOST IMPORTANT ISSUE FACING DEER MANAGEMENT IN MICHIGAN
- ☐ MORE IMPORTANT THAN MOST OTHER ISSUES FACING DEER MANAGEMENT IN MICHIGAN
- ☐ ABOUT AS IMPORTANT AS THE OTHER ISSUES FACING DEER MANAGEMENT IN MICHIGAN
- ☐ LESS IMPORTANT THAN MOST OTHER ISSUES FACING DEER MANAGEMENT IN MICHIGAN
- ☐ NOT AT ALL IMPORTANT TO ME

☞ We recognize that there may be other issues facing deer management in Michigan that you believe are more important than the crop loss issue.
However, we need to hear from **both** those who think it is important **and those who think it is not that important.**

44. To what extent do you approve or disapprove of the DNR's policy of intentionally reducing deer numbers in **certain areas** in order to **decrease the extent of deer damage to agricultural** crops? (Check One)

- ☐ STRONGLY APPROVE
- ☐ SOMEWHAT APPROVE
- ☐ NEITHER APPROVE NOR DISAPPROVE
- ☐ STRONGLY DISAPPROVE
- ☐ SOMEWHAT DISAPPROVE

45. To what extent do you approve or disapprove of the **current** DNR program to control crop losses caused by deer, which involves issuing permits to farmers for killing deer? (Check ONLY One)

☐ I AM UNAWARE OF THIS PROGRAM
☐ I AM AWARE OF THIS PROGRAM BUT UNDECIDED
☐ STRONGLY APPROVE
☐ SOMEWHAT APPROVE
☐ NEITHER APPROVE NOR DISAPPROVE
☐ STRONGLY DISAPPROVE
☐ SOMEWHAT DISAPPROVE

☞ (REVIEWERS, PLEASE CONTINUE WITH #46 BUT REFER TO THE COUNTY IN WHICH YOU ACTUALLY DEER HUNTED)

How would you describe your level of agreement with each of the following statements as it applies to **Leelanau** county?

(Select One Response for Each Statement) ***In Leelanau county...***	STRONGLY AGREE	SOMEWHAT AGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE
46. In general, farmers have cost-effective choices other than killing deer to satisfactorily reduce their crop losses to deer.	☐	☐	☐	☐	☐
47. In general, farmers should not receive permits to kill deer unless they have made reasonable attempts to control loss in other ways (such as fencing, using repellents, etc...).	☐	☐	☐	☐	☐
48. In general,. I am satisfied with the number of farmers who allow access to their land to hunters other than their relatives or friends.	☐	☐	☐	☐	☐
49. It may be necessary to kill deer each year on a farm in order to control crop loss due to deer.	☐	☐	☐	☐	☐
50. Deer hunting seasons could be designed to reduce deer numbers so that special permits to control crop losses are not necessary.	☐	☐	☐	☐	☐
51. If regular antlerless permits are not available in the area, then permits to kill deer to control crop losses due to deer should not be available in that area either.	☐	☐	☐	☐	☐
52. Killing deer on farms to protect crops noticeably decreases the deer available in the areas where I hunt	☐	☐	☐	☐	☐
53. In general, the local DNR biologists can adequately determine whether or not a farmer has significant crop loss due to deer.	☐	☐	☐	☐	☐
54. Too many people who do not farm as their primary occupation receive permits to kill deer to control crop loss.	☐	☐	☐	☐	☐
55. In general, the local DNR biologists give permits to kill deer only to farmers who actually have significant crop loss caused by deer.	☐	☐	☐	☐	☐
56. In general, practically every farmer in Leelanau county who applies for permits to kill deer to control loss receives some permits, regardless of the amount of crop loss.	☐	☐	☐	☐	☐

57. **Please distribute 100 points within each of the following two columns to indicate how much importance you think the DNR currently places and should place on each of the following interest groups when the agency sets deer population goals in Leelanau county.**

> - For example, if you think that the DNR currently places importance only on hunters' interests in setting deer population goals in Leelanau county, place 100 points next to hunters and 0 points next to farmers in the column on the left below. Or, if you think that hunter and farmer interests currently are equally important to the DNR, give each group 50 points. If another interest group is important to the DNR, write in the group and weight them accordingly. Follow this same procedure for the column on the right to show us where you feel the DNR *should be* placing importance.

CURRENTLY PLACES IMPORTANCE ON:	*SHOULD PLACE IMPORTANCE ON:*
_____ FARMERS	_____ FARMERS
_____ HUNTERS	_____ HUNTERS
_____ OTHER (SPECIFY):_____	_____ OTHER (SPECIFY):_ _____
TOTAL = 100 POINTS	TOTAL = 100 POINTS

58. Considering all of the **corn** farming operations in Leelanau county, what is your best estimate of the percent of the corn crop lost due to deer in **1994**?

AT LEAST _____% AND AT MOST _____ % OF THE CORN CROP WERE LOST TO DEER IN 1994

☐ I HAVE NO IDEA WHATSOEVER

59. What **should** the DNR policy be in Leelanau county regarding how much loss a farmer should experience before being eligible to receive permits to kill deer?

☐ I HAVE NO IDEA WHATSOEVER (SKIP TO PAGE 9)

☐ NEVER GIVE PERMITS, REGARDLESS OF LOSS (SKIP TO PAGE 9)

AT LEAST _____ % OF THE FARMER'S CROP SHOULD BE LOST TO DEER BEFORE BEING ELIGIBLE TO RECEIVE PERMITS

↘

60. What is your best estimate of the percent of farmers who grow corns in Leelanau county that experienced this amount of loss in 1994 because of deer?

ABOUT _____ % OF THE FARMERS EXPERIENCED THIS AMOUNT OF LOSS IN 1994

☐ I HAVE NO IDEA WHATSOEVER

☞ Before proceeding, it is critical that you read the following description of the "Crop Damage Control Program." This program involves two types of permits as described in these two columns:

▸ SHOOTING PERMITS:	▸ BLOCK PERMITS:
In 1983, the Natural Resources Commission in Michigan adopted regulations to control deer damage to agricultural crops by issuing permits to fall deer. These "Deer Damage Shooting Permits" are sometimes referred to as "Out-of-Season Shooting Permits" and will be called "Shooting Permits" in this survey.	In 1990, another type of permit was introduced to*reduce* the number of Shooting Permits issued and to use licensed deer hunters to control crop losses. These "Crop Depredation Bonus Deer Hunting Licenses" are referred to as "Deer Crop Damage Block Permits" and will be called "Block Permits" in this survey.
Shooting Permit Guidelines:	Block Permit Guidelines:
• The DNR issues the permits to farmers. • Valid *only* outside the regular fall deer hunting seasons (Jan. 2 - Sept. 25). • Valid *only* for taking antlerless deer, except when bucks cause damage to orchards. • There is no fee to the farmer for Shooting Permits. • The farmer can designate up to 3 authorized shooters. • Valid on only the farmer's land.	• The DNR issues the permits to farmers. • Valid *only* during the regular fall deer hunting seasons. • Valid *only* for taking antlerless deer. • A $3.00 fee is collected from the farmer for each Block Permit. • Valid for use only by individuals who have purchased a regular season deer hunting license. • All regular deer hunting rules apply to Block Permits, except that unfilled Block Permits can be transferred to another hunter. • Valid on the farmer's land and adjacent private land with permission

61. Before reading this description of **Shooting Permits**, how much did you already know about the regulations listed on the left above? (Check ONLY One)

- ☐ I ALREADY KNEW MOST OF THE REGULATIONS ABOUT SHOOTING PERMITS LISTED ABOVE
- ☐ I ALREADY KNEW SOME OF THE REGULATIONS ABOUT SHOOTING PERMITS LISTED ABOVE
- ☐ I WAS AWARE OF THIS PROGRAM BUT KNEW VERY FEW OF THE REGULATIONS ABOUT SHOOTING PERMITS
- ☐ I WAS UNAWARE THAT SHOOTING PERMITS EXISTED

62. Before reading this description of **Block Permits**, how much did you already know about the regulations listed on the right above? (Check ONLY One)

- ☐ I ALREADY KNEW MOST OF THE REGULATIONS ABOUT BLOCK PERMITS LISTED ABOVE
- ☐ I ALREADY KNEW SOME OF THE REGULATIONS ABOUT BLOCK PERMITS LISTED ABOVE
- ☐ I WAS AWARE OF THIS PROGRAM BUT KNEW VERY FEW OF THE REGULATIONS ABOUT BLOCK PERMITS
- ☐ I WAS UNAWARE THAT BLOCK PERMITS EXISTED

63. To what extent do you approve or disapprove of the current **Shooting Permit** system? (Check ONE)

☐ STRONGLY APPROVE	☐ NEITHER APPROVE NOR DISAPPROVE	☐ STRONGLY DISAPPROVE
☐ SOMEWHAT APPROVE		☐ SOMEWHAT DISAPPROVE

64. To what extent do you approve or disapprove of the current **Block Permit** system? (Check ONE)

☐ STRONGLY APPROVE	☐ NEITHER APPROVE NOR DISAPPROVE	☐ STRONGLY DISAPPROVE
☐ SOMEWHAT APPROVE		☐ SOMEWHAT DISAPPROVE

To what extent do you agree or disagree with each of the following statements about **Shooting Permits** as it applies to **Leelanau** county?					
(Select One Response per Statement) ***In Leelanau county...***	STRONGLY AGREE	SOMEWHAT AGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE
65. Overall, the Shooting Permit system is fair to both farmers and hunters.	☐	☐	☐	☐	☐
66. In general, farmers should be allowed to keep the deer that are killed on Shooting Permits.	☐	☐	☐	☐	☐
67. Too many bucks are killed on Shooting Permits.	☐	☐	☐	☐	☐
68. Too many of the deer killed on Shooting Permits are not utilized.	☐	☐	☐	☐	☐

69. If you were a DNR policy maker responsible for implementing the **Shooting Permit** system, what changes would you recommend to improve the current system?

☐ I HAVE NO CHANGES TO RECOMMEND

☐ I WOULD ELIMINATE SHOOTING PERMITS

☐ I WOULD MODIFY THE SHOOTING PERMIT SYSTEM IN THIS WAY

(PLEASE DESCRIBE YOUR SPECIFIC SUGGESTIONS IN THE SPACE BELOW. ATTACH EXTRA SHEETS AS NEEDED):

70. Have you ever been designated by a farmer to use a **Shooting Permit**? ☐ YES ☐ NO

71. What is your best estimate of the percent of farmers in Leelanau county who received **Shooting Permits in 1994**?

BETWEEN _____ AND _____ % OF FARMERS IN LEELANAU COUNTY RECEIVED SHOOTING PERMITS IN 1994

☐ I HAVE NO IDEA WHATSOEVER

To what extent do you agree or disagree with each of the following statements about Block Permits as it applies to Leelanau county?

(Select One Response per Statement) *In Leelanau county...*	STRONGLY AGREE	SOMEWHAT AGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE
72. Too many farmers try to get Block permits for the reasons other than controlling crop losses.	☐	☐	☐	☐	☐
73. Overall, the Block Permit system is fair to both farmers and hunters.	☐	☐	☐	☐	☐
74. Too many antlerless deer were harvested on Block Permits in Leelanau county in 1994.	☐	☐	☐	☐	☐
75. The farmer to whom the Block Permit is issued should be allowed to decide which licensed hunter gets to use the Block Permit.	☐	☐	☐	☐	☐
76. In general, I am satisfied with the number of farmers in Leelanau county who allow hunters other than their relatives or friends to use their Block Permits.	☐	☐	☐	☐	☐
77. A farmer who receives Block Permits should be required to allow a certain number of hunters who are not their friends or relatives to use the permits.	☐	☐	☐	☐	☐

78. If you were a DNR policy maker responsible for implementing the Block Permit system, what changes would you recommend to improve the current system?

☐ I HAVE NO CHANGES TO RECOMMEND

☐ I WOULD ELIMINATE BLOCK PERMITS

☐ I WOULD MODIFY THE BLOCK PERMIT SYSTEM IN THIS WAY:

(PLEASE DESCRIBE YOUR SPECIFIC SUGGESTIONS IN THE SPACE BELOW. ATTACH EXTRA SHEETS AS NEEDED)

79. Have you ever hunted with a **Block Permit** that was issued to a farmer (other than yourself)?

☐ YES ☐ NO

80. What is your best estimate of the percent of farmers in Leelanau county who received **Block Permits** in 1994?

BETWEEN _____ AND _____ % OF FARMERS IN LEELANAU COUNTY RECEIVED BLOCK PERMITS IN 1994

☐ I HAVE NO IDEA WHATSOEVER

81. **Approximately what percent of the total number of ANTLERLESS deer harvested by hunters in Michigan in 1994 were killed on Block Permits?**

BETWEEN _____ % AND _____ % OF THE TOTAL NUMBER OF ANTLERLESS DEER HARVESTED BY HUNTERS IN MICHIGAN IN 1994 WERE KILLED ON BLOCK PERMITS

☐ I HAVE NO IDEA WHATSOEVER

82. Block Permits were designed to reduce crop losses to deer by increased harvest of antlerless deer on and immediately adjacent to lands where crop losses occur.

To what extent do you agree or disagree that deer can be removed from designated areas without reducing the deer herd in an area of several hundred square miles? (Check One)

☐ STRONGLY AGREE
☐ SOMEWHAT AGREE
☐ NEITHER AGREE NOR DISAGREE
☐ STRONGLY DISAGREE
☐ SOMEWHAT DISAGREE

83. To what extent do you believe that the Crop Damage Control Program is being abused by the farmers who participate in the Program in Leelanau county? (Check ONLY One)

OF THE FARMERS IN LEELANAU COUNTY WHO PARTICIPATE IN THE CROP DAMAGE CONTROL PROGRAM...

☐ MOST FARMERS ABUSE THE PROGRAM
☐ ONLY A FEW FARMERS ABUSE THE PROGRAM
☐ NO FARMERS ABUSE THE PROGRAM
☐ NOT SURE

How would you describe the effectiveness of each of the following at significantly reducing corn crop loss caused by deer in Leelanau county during 1994?

(Select One Response for Each)	EXTREMELY EFFECTIVE	SOMEWHAT EFFECTIVE	NOT SURE	SOMEWHAT INEFFECTIVE	EXTREMELY INEFFECTIVE
84. REGULAR FALL SEASON DEER HUNTING	☐	☐	☐	☐	☐
85. SHOOTING PERMITS	☐	☐	☐	☐	☐
86 BLOCK PERMITS	☐	☐	☐	☐	☐

87. Where have you heard about the topic of Shooting Permits or Block Permits? (Check All that Apply)

☐ DNR MATERIALS
☐ DNR EMPLOYEE
☐ FRIENDS OR RELATIVES
☐ RADIO PROGRAM
☐ OTHER SOURCE(S) _____
☐ MICHIGAN DEER-HUNTING-RELATED ORGANIZATIONAL NEWSLETTERS
☐ TELEVISION PROGRAM (_____)
☐ MAGAZINE (_____)
☐ NEWSPAPER (_____)

Throughout this survey, you have shared some of your opinions on the number of deer and deer management in Michigan. Which of the following actions have you taken or do you intend to take in direct response to your opinion of the deer population size in Leelanau county or the management of deer by the DNR?

(Select All that Apply to Each Statement)	DID IN 1994	INTEND TO DO IN 1995	WOULD PROBABLY NEVER DO	UNDECIDED
88. PERSONALLY COMMUNICATE ABOUT THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT TO A REPRESENTATIVE OF THE DNR.	☐	☐	☐	☐
89. PERSONALLY COMMUNICATE ABOUT THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT TO A LEGISLATOR.	☐	☐	☐	☐
90. ATTEND A MEETING HELD SPECIFICALLY FOR THE PURPOSE OF DISCUSSING THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT.	☐	☐	☐	☐
91. ORGANIZE A MEETING SPECIFICALLY FOR THE PURPOSE OF DISCUSSING THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT.	☐	☐	☐	☐
92. HIRE AN ATTORNEY SPECIFICALLY FOR PURPOSES ASSOCIATED WITH INFLUENCING THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT.	☐	☐	☐	☐
93. STOP DEER HUNTING IN AN AREA BECAUSE OF A DECLINE IN DEER NUMBERS.	☐	☐	☐	☐
94. OTHER: (PLEASE SPECIFY)	☐	☐	☐	☐

95. Please Check All that Apply:

☐ FARMING IS CURRENTLY MY PRIMARY OCCUPATION
☐ FARMING USED TO BE MY PRIMARY OCCUPATION
☐ MY CURRENT OCCUPATION IS DEPENDENT ON FARMING
☐ I HAVE FARMED OR DO FARM, BUT NOT AS A PRIMARY OCCUPATION
☐ I PERSONALLY HAVE NEVER FARMED
☐ I GREW UP IN A RURAL FARMING AREA
☐ I HAVE FRIENDS OR FAMILY WHOSE PRIMARY OCCUPATION IS FARMING
☐ DURING MY YOUTH, MY FAMILY DEPENDED ON FARMING
☐ NONE OF THESE APPLY TO ME

96. Please indicate the Michigan-based deer-hunting-related or conservation organizations in which you are currently a member. (Check All that Apply) ☐ I DO NOT BELONG TO ANY (SKIP TO #98)

☐ MICHIGAN BOWHUNTERS ASSOCIATION
☐ MICHIGAN UNITED CONSERVATION CLUBS
☐ LOCAL DEER HUNTING CLUB. (SPECIFY) _____
☐ OTHER (SPECIFY)_____
☐ SAFARI CLUB INTERNATIONAL
☐ WHITETAILS UNLIMITED
☐ U P WHITETAILS

97. Within the past 5 years, have you been an officer (e.g., President, Vice-President, Other Officer Positions) in a Michigan-based deer-hunting-related or conservation organization?

☐ YES ☐ NO

☞ **We need the following information to compare deer hunters with other hunting groups.**
This information will also remain confidential.
None of your answers on this survey will be associated with your name or address.

98. In what county do you currently reside (where you live and sleep most of the time)?

_____ COUNTY

99. How would you describe the area in which you currently reside? (Check ONLY One)

- ☐ RURAL - FARM
- ☐ RURAL - NON-FARM (AREA OF < 2,500 PEOPLE)
- ☐ SMALL TOWN (AREA OF 2,500 TO 50,000 PEOPLE)
- ☐ URBANIZED AREA (CITY OR SUBURBAN AREA OF > 50,000 PEOPLE)

100. In what county did you reside during most of 1993? _____ COUNTY

101. How long did you live in that county? _____ YEARS

102. In what year were you born? 19_____

103. What is your gender? (Check One) ☐ MALE ☐ FEMALE

104. How much school have you completed? **(Check the one box for the highest level completed or degree received)**

- ☐ NO SCHOOL COMPLETED
- ☐ 8TH GRADE
- ☐ SOME HIGH SCHOOL
- ☐ HIGH SCHOOL DIPLOMA OR EQUIVALENT
- ☐ SOME COLLEGE
- ☐ ASSOCIATE DEGREE
- ☐ BACHELOR'S DEGREE
- ☐ MASTER'S DEGREE
- ☐ DOCTORATE DEGREE
- ☐ PROFESSIONAL SCHOOL DEGREE

105. What was your total **gross** household income in 1994 (**before deductions for taxes**, bonds, dues or other items)? (Check ONLY One)

- ☐ LESS THAN $9,999
- ☐ $10,000 - $14,999
- ☐ $15,000 - $24,999
- ☐ $25,000 - $34,999
- ☐ $35,000 - $49,999
- ☐ $50,000 - $74,999
- ☐ GREATER THAN $75,000
- ☐ NO OPINION

PLEASE WRITE ANY ADDITIONAL COMMENTS IN THIS SPACE (ATTACH EXTRA SHEETS AS NEEDED):

REVIEWERS: How long did it take you to complete this survey? _____ MINUTES

Thank you for completing this survey!

PLEASE RETURN THE SURVEY IN THE STAMPED ENVELOPE PROVIDED TO:

Donna Minnis, Research Assistant 13 Natural Resources Building
Department of Fisheries & Wildlife, MSU East Lansing, MI 48824-1222

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
13 NATURAL RESOURCES BUILDING
(517) 355-4477
FAX (517) 432-1699

EAST LANSING • MICHIGAN • 48824-1222

3 February 1995

MEMORANDUM

TO: Deer Hunters who Called about the Discussion Groups

FROM: Donna Minnis, Research Assistant, 1-800-433-3741

RE: Pilot Testing the Survey that was Developed from the Discussion Groups

Hello, again. The four discussion groups I held across Michigan with deer hunters in September were a great success. For whatever reason, you were unable to participate in the discussions, but I do appreciate your interest in them.

Because you showed some interest in talking about deer hunting issues, I was wondering if you would be willing to complete the survey that was developed based on the discussion groups. Before I mail the survey to the several thousand randomly selected hunters, I need your assistance to make sure that the questionnaire is a good one.

What I am asking you to do is to answer the questions on the survey and return it to me just like any other survey (a stamped, addressed envelope is enclosed). I will then enter the data I collect from you and the others and do some statistics to see which questions might be in need of improvement.

In addition, unlike other surveys, I would like to you freely note on the enclosed blank pages any comments or suggestions you have for the survey. Did you find any part confusing? Was a question unclear? Did the survey questions "flow?" How long did it take you to complete it? *I would welcome any recommendations you might have for any part of the survey or mailing!*

We had hoped to have done this pilot survey in mid-December, but we are behind schedule. What this means is that we need this survey from you AS SOON AS POSSIBLE. **If you could get it in the mail by February 13, I would be especially grateful.**

Thank you in advance for helping us develop a survey to get the highest quality responses from our sample of Michigan's deer hunter population.

Enclosures

MSU is an Affirmative Action Equal Opportunity Institution

PILOT TEST

PLEASE READ THIS PAGE BEFORE COMPLETING THE SURVEY

DESCRIPTION OF THE RESEARCH DESIGN:

In order to control important variables associated with the deer crop damage issue in Michigan, seven counties were selected as the study area for this research: Benzie, Calhoun, Leelanau, Menominee, Montcalm, Oceana, and Presque Isle. These counties represent a range of crop damage issues based on several characteristics we have examined.

There will be seven different versions of the survey; one for each of the study counties. You have received one of the seven different versions to complete.

Starting on page two of the survey, the specific county is referred to repeatedly. Most of you will not have hunted in one of our study counties during 1993 or 1994. **However, we still need you to answer the questions that refer to the specific county.**

☞ PLEASE ANSWER THESE QUESTIONS FOR THE COUNTY IN WHICH YOU DEER HUNTED IN THE MOST RECENT YEAR.

Skip over questions #26 and #27 on page 4 that ask you to circle where you hunted on a county map.

For example, let's say that the survey asks you about your deer hunting experiences in **Leelanau** county, but you did not deer hunt in Leelanau in 1993 or 1994. Instead of answering the questions based on Leelanau county, answer them based on a county in which you did deer hunt in 1993 or 1994.

We have spent several months deciding which variables are important for us to measure with this survey. If you have any questions as to why an item is included, please call Donna Minnis at 1-800-433-3741.

Again, thank you for your help.

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
13 NATURAL RESOURCES BUILDING
(517) 355-4477
FAX: (517) 336-1699
Effective July 23, 1994 our new FAX number is (517) 432-1699

EAST LANSING • MICHIGAN • 48824-1222

2 February 1995

MEMORANDUM

TO: MSUE, MDNR and MAES Personnel Involved in MSU Research on the Deer Crop Depredation Issue

FROM: Donna Minnis, Research Assistant
Peter Fritzell, Research Assistant

RE: Review of Surveys

Enclosed are two surveys on the deer crop damage issue: one addresses farmers' attitudes and the other addresses deer hunters' attitudes. These are drafts which we are currently pilot testing with 75 hunters and 100 farmers. The hunters are those who expressed an interest in participating in focus groups last fall, and the farmers were randomly selected from MSUE lists for Isabella county.

We would greatly appreciate your review of these two surveys so that we can make adjustments to the instruments before mailing the final drafts later this month. Unfortunately, we have a very short turn-around time, and **we will need your comments mailed to us no later than Friday, February 10, 1995.** Your insights are very important, so please feel free to comment liberally directly on both surveys and attach additional comment sheets as needed.

Thank you for your help, and please feel free to call either of us at 1-800-433-3471 if you have any questions.

Enclosures

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MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
2A NATURAL RESOURCES BUILDING
EAST LANSING • MICHIGAN • 48824-1222

PHONE: 517/353-0877
FAX: 517/432-1699
INTERNET: MINNISDO@PILOT.MSU.EDU

15 January 1995

MEMORANDUM

TO: Deer Hunters who Participated in the Discussion Groups

FROM: Donna Minnis, Research Assistant, 517-353-0877

RE: Reviewing the Survey that was Developed from the Discussion Groups

Hello, again. The four discussion groups I held across Michigan with deer hunters in September were a great success. Thanks again for your cooperation!

Based on the discussions, we have developed a questionnaire. Before I mail the survey to the several thousand hunters who were randomly selected as survey recipients, I need to make sure that the questionnaire is a good one. To do this, I need to have deer hunters review the survey.

What I am asking you to do is to evaluate the survey and return your comments and suggestions to me (a stamped enveloped is included for you to return the survey in). I am more interested in your opinions on the question wording and survey presentation than in your specific answers to the questions (i.e., You do NOT need to answer the questions).

I would like you to freely note on the enclosed blank pages any comments or suggestions you have for the survey. Did you find any part confusing? Is a question unclear? Do the survey questions "flow?" *I would welcome any recommendations you might have for any part of the survey or mailing!* (Feel free to make comments right on the survey if you would like.) I will then consider the input from you and the other reviewers to see how the survey might be improved.

Your input will be completely confidential unless you sign your name to it.

We had hoped to have done this review in mid-December, but we are behind schedule. What this means is that we need your feedback AS SOON AS POSSIBLE. **If you could get your input in the mail by January --, I would be especially grateful.**

Thank you in advance for helping us develop a survey to get the highest quality responses from our sample of Michigan's deer hunter population.

MSU is an Affirmative Action/Equal Opportunity Institution

REVIEWERS

PLEASE READ THIS PAGE BEFORE REVIEWING THE SURVEY

DESCRIPTION OF THE RESEARCH DESIGN:

In order to control important variables associated with the deer crop damage issue in Michigan, seven counties were selected as the study area for this research: Benzie, Calhoun, Leelanau, Menominee, Montcalm, Oceana, and Presque Isle. These counties represent a range of crop damage issues based on several characteristics we have examined.

There will be seven different versions of the survey; one for each of the study counties. You have received one of the seven different versions to complete.

Starting on page two of the survey, the specific county is referred to repeatedly. Most of you will not have hunted in one of our study counties during 1993 or 1994. **However, we still need you to review the questions that refer to the specific county.**

☞ PLEASE REVIEW THESE QUESTIONS CONSIDERING THE COUNTY IN WHICH YOU DEER HUNTED IN THE MOST RECENT YEAR.

For example, let's say that the survey asks you about your deer hunting experiences in **Presque Isle** county, but you did not deer hunt in Presque Isle in 1993 or 1994. Instead of reviewing the questions based on Presque Isle county, review them based on a county in which you did deer hunt in 1993 or 1994.

We have spent several months deciding which variables are important for us to measure with this survey. If you have any questions as to why an item is included, please call Donna Minnis at 1-800-433-3741.

Again, thank you for your help.

APPENDIX F

1995 DEER HUNTER OPINION SURVEY MATERIALS

Survey instruments were tailored to each study county. Thus, a total of 7 different versions of the 1995 Deer Hunter Opinion Survey instrument were created. The items that varied among the survey versions included the following:

Questions 7 and 8: map of Michigan with appropriate county highlighted

Question 20: appropriate county map inserted

Questions 7-20; 22-23; 25-27; skip box after Q32; 33-46;51;54;56;59-67: The appropriate county name was inserted.

Deer Hunter Survey Mailing Schedule (page 329)

Memorandum to MDNR Wildlife Division Personnel in study counties announcing mailing of 1995 Deer Hunter Opinion Survey (page 330)

Cover Letter to Deer Hunter Sample (page 331)

Raffle Flyer Included in Initial Survey Mailing (page 332)

1995 Deer Hunter Opinion Survey (generic version) with Descriptive Statistics (pages 333- 349)

Reminder Postcard (page 350)

Cover Letter for Second Survey Mailing: Certified Mailings (page 351)

Cover Letter for Second Survey Mailing: First-Class Mailings (page 352)

Deer Hunter Survey Mailing Schedule

First Survey Mailing (Bulk Rate)

24 April 1995	Benzie (N=32) Live Ins
	Calhoun (N=186) Live Ins
27 April 1995	Leelanau (N=32) Live Ins
	Menominee (N=80) Live Ins
	Montcalm (N=225) Live Ins
	Oceana (N=94) Live Ins
	Presque Isle (N=85) Live Ins
3 May 1995	Benzie (N=37) Live Outs
	Calhoun (N=86) Live Outs
	Leelanau (N=28) Live Outs
	Menominee (N=41) Live Outs
4 May 1995	Montcalm (N=118) Live Outs
	Oceana (N=113) Live Outs
	Presque Isle (N=100) Live Outs

Postcard Reminder (First Class)

9 May 1995	Benzie, Calhoun, Montcalm Live Ins
17 May 1995	Leelanau, Menominee, Oceana, Presque Isle Live Ins
18 May 1995	Benzie and Menominee Live Outs
19 May 1995	Calhoun and Leelanau Live Outs
22 May 1995	Montcalm, Oceana, and Presque Isle Live Outs

Second Survey Mailing (First Class, unless otherwise indicated where N<20)

23 May 1995	Benzie (N=16) Live Ins (Certified Mail)
30 May 1995	Calhoun (N=95) Live Ins
	Leelanau (N=13) Live Ins (Certified Mail)
2 June 1995	Montcalm (N=126) Live Ins
5 June 1995	Menominee (N=44) Live Ins
	Oceana (N=38) Live Ins
	Presque Isle (N=43) Live Ins
7 June 1995	Benzie (N=19) Live Outs (Certified Mail)
	Leelanau (N=14) Live Outs (Certified Mail)
	Menominee (N=14) Live Outs (Certified Mail)
12 June 1995	Calhoun (N=41) Live Outs
	Montcalm (N=60) Live Outs
	Oceana (N=55) Live Outs
	Presque Isle (N=43) Live Outs

8 May 1995

MEMORANDUM

TO: MDNR Wildlife Division Personnel

FROM: Donna Minnis, Research Assistant, 517/353-0877

RE: Final Version of the Deer Hunter Survey on the Crop Damage Issue

Thank you for your interest and input into our research on the deer crop damage issue. Enclosed you will find a copy of the survey that went to deer hunters in your area.

Both the farmer and the hunter surveys have been mailed, and we are receiving returns daily. We appreciate your help with improving the survey instruments.

Some time in the next few months, we would like to ask your opinions regarding certain aspects of the deer crop damage issue. Until then, please don't hesitate to contact me with any questions or concerns.

Also, as before, we are still eager to receive any information that you or the media in your area may disseminate regarding the crop damage issue. This will help us as we interpret the results.

Hope all is well with you.

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
13 NATURAL RESOURCES BUILDING

EAST LANSING • MICHIGAN • 48824-1222
SURVEY HOT LINE: 1-800-433-3741

14 April 1995

Dear Michigan Deer Hunter:

Enclosed is a survey that Michigan State University is sending to a small number of persons who purchased a Michigan deer hunting license in the last few years. As a deer hunter, you have likely received other surveys regarding your hunting involvement and success. However, this survey seeks your opinion about certain issues concerning deer management in Michigan. The information collected by this study will be used to help guide deer management policies in our state.

Your participation in this survey is entirely voluntary. However, because we have contacted a relatively small number of deer hunters, *your* response is extremely important to the success of our study. Please be assured that your responses will be completely confidential.

As a token of our appreciation, those who complete and return this questionnaire will be entered in a drawing for a great pair of binoculars (see the enclosed flyer for details). To be eligible, please return (in the enclosed stamped envelope) your completed survey and the tear-off form from the yellow flyer. Your survey and entry form will be separated immediately upon receipt so that your name remains confidential.

☎ If you have any questions about this survey, please call our toll-free survey hot line: 1-800-433-3741.

A prompt return of your completed questionnaire *is* important and will ensure that your name goes into the drawing for the binoculars.

Thank you for your valuable assistance.

Sincerely,

Donna L. Minnis, Research Assistant

Enclosures: Survey, Flyer, Envelope

MSU is an Affirmative Action/Equal Opportunity Institution

ATTENTION DEER HUNTERS...

EVERYONE WHO RETURNS A *COMPLETED* SURVEY WILL BE ENTERED INTO A DRAWING FOR A GREAT PAIR OF BINOCULARS:

SIMMONS® LITEVIEW™ BINOCULARS
With body construction of sturdy, rubber-covered, high-impact resin, **LITEVIEW™** binoculars can be carried and used for hours without fatigue. When every ounce counts, **LITEVIEW™** binoculars go anywhere with style. Gold-toned lenses are fully coated. These binoculars come complete with fanny-pack carrying case.
SIMMONS® Model No. 24153 7x25.

TO BE ENTERED IN THE DRAWING:

1. Complete the enclosed survey.
2. Fill out the tear-off sheet below.
3. Return **both** the completed survey and the tear-off sheet **as soon as possible** in the enclosed stamped envelope to:

Donna L. Minnis, Research Assistant
Department of Fisheries and Wildlife
13 Natural Resources Building
Michigan State University
East Lansing, MI 48824

WINNERS WILL BE NOTIFIED IN AUGUST 1995,
JUST IN TIME FOR HUNTING SEASON!

(Detach this portion and return it in the enclosed stamped envelope *along with your survey.*
This stub will be immediately separated from your survey upon receipt.)

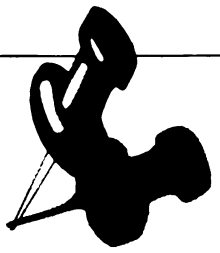
- Your Name: _____
- Your Address: _____
  _____
- Your Telephone Number: _____

Binocular Drawing Entry Form

1995 DEER HUNTER OPINION SURVEY

Conducted by Michigan State University

Department of Fisheries and Wildlife
13 Natural Resources Building
Michigan State University
East Lansing, MI 48824
Survey Hot Line: 1-800-433-3741



THANK YOU!

Since you have gotten this far,
we hope that you have decided
to complete this questionnaire.

We assure you that the time and
thought you put into this effort will be
well invested!

☞ Don't forget to turn in the drawing
entry form (see yellow sheet) along with
your completed questionnaire...
You could be the winner of
a new pair of binoculars!

DEER HUNTERS' OPINIONS ON DEER MANAGEMENT IN MICHIGAN

OVERALL RESULTS

- A version of this survey was sent in April and May, 1995. to deer hunters who hunted in one of the 7 agricultural study counties.
- Of the 1,257 surveys sent, 792 usable surveys were returned, and 42 were non-delieverable (response rate = 65.2%).
- The number of people who responded to each question (n) is given at the end of the question.
- The percent of the respondents to each question who selected each response option is presented next to the response category.

I. Your Deer Hunting Experience

1. In what year did you **first go** deer hunting in Michigan? **(n=785)** ABOUT 1910 TO 1994 median = 1969

2. Since then, how many years have you **actually** gone deer hunting in Michigan? **(n=787)**
   ABOUT AVG. 23.6 (STD.DEV. 13.7) YEARS

3. How would you describe yourself as a **deer** hunter? (Check ONLY One) **(n=791)**

   IN A TYPICAL YEAR, I HUNT DEER USING... **1%** A BOW ONLY **50%** A FIREARM ONLY **49%** BUTH BOW AND FIREARM

4. How important is deer hunting to you compared to other types of recreation in which you participate, such as fishing, camping, jogging, bowling, competitive sports, other types of hunting, etc...? **(n=789)**
   (Check ONLY One of the Following)

   DEER HUNTING IS...
   - **27%** THE MOST IMPORTANT RECREATIONAL ACTIVITY IN WHICH I PARTICIPATE
   - **33%** MORE IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
   - **33%** ABOUT AS IMPORTANT AS THE OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
   - **6%** LESS IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
   - **1%** NOT AT ALL IMPORTANT TO ME

5. How would you describe your level of satisfaction with your **overall** 1994 deer hunting experience? **(n=791)**
   (Check ONLY One)
   - **6%** I DID NOT DEER HUNT IN 1994
   - **18%** VERY SATISFIED
   - **37%** SATISFIED
   - **15%** NEITHER SATISFIED NOR DISSATISFIED
   - **16%** DISSATISFIED
   - **7%** VERY DISSATISFIED

6. Please check the **ONE** statement that best describes your opinion about the legal recreational harvest of antlerless deer: **(n=788)**
   - **8%** I AM OPPOSED TO THE HARVEST OF ANTLERLESS DEER BY HUNTERS.
   - **17%** I SUPPORT THE CHOICE OF OTHER HUNTERS TO HARVEST ANTLERLESS, BUT I AM NOT WILLING TO HARVEST ANTLERLESS DEER MYSELF.
   - **72%** I AM WILLING TO HARVEST ANTLERLESS DEER MYSELF.
   - **4%** NOT SURE

II. Your Deer Hunting Experience in [county name]County

☞ Your name was randomly selected from a list of deer hunters who responded to the 1993 Firearm Deer Survey conducted by the Michigan Department of Natural Resources. You were selected because you reported deer hunting in one of the counties that we are studying.

7. Did you deer hunt in [county name] county in 1993? (n=787) **94%** YES **6%** NO

8. Did you deer hunt in [county name] county in 1994? (n=781) **85%** YES **15%** NO ➜

If BOTH #7 and #8 are checked "NO", SKIP to #28 on page 5.

9. **Over the past 10 years,** how many years have you **actually** gone deer hunting in [county name] county during **any** deer season (archery and/or firearm)? (n=718) AVG. 7.8 (STD. DEV. 2.9) YEARS

10. When you form your opinion on whether the **deer population size** in [county name] county is acceptable, how important is each of the following considerations to you?

(Select One Response for each Statement)	VERY IMPORTANT	SOMEWHAT IMPORTANT	SLIGHTLY IMPORTANT	NOT IMPORTANT	UNSURE
THE NUMBER OF DEER-RELATED VEHICLE ACCIDENTS IN THE COUNTY (n=737)	31%	33%	19%	13%	5%
YOUR PERSONAL BENEFITS FROM DEER (SUCH AS HUNTING, VIEWING, ECONOMIC GAIN, ETC...) (n=739)	62%	28%	6%	2%	1%
BENEFITS OTHERS GET FROM HAVING DEER IN THE COUNTY (n=731)	38%	35%	15%	7%	5%
FARMERS' CROP LOSSES DUE TO DEER (n=736)	25%	30%	23%	16%	5%

☞ For questions #11-19, please refer to your deer hunting experience in [county name] county in the **most recent year** that you deer hunted there.

11. How would you describe your level of satisfaction with your **overall deer hunting experience** in [county name] county in the most recent year that you deer hunted there? (Check ONLY One)(n=746)

18% VERY SATISFIED
39% SATISFIED
18% NEITHER SATISFIED NOR DISSATISFIED
17% DISSATISFIED
7% VERY DISSATISFIED

12. Of your total time spent deer hunting in [county name] county (most recent year), what percent of the time were you hunting on **public** land? I DEER HUNTED ON PUBLIC LAND AVG. 26 (STD. DEV. 39) % OF THE TIME IN [COUNTY NAME] COUNTY

13. **Were regular antlerless permits (lottery drawing) available for the area in which you hunted in [county name] county (most recent year hunted there)? (Check One) (n=746)**

65% YES **24%** NO **11%** I DON'T KNOW

14. How many **antlerless** deer did you tag in [county name] county during **all** of the fall deer hunting seasons (most recent year hunted there)? **(n=739) 68% 0 22% 1 4% 2 3% 3 3% >3** ANTLERLESS DEER

15. How many **bucks** did you tag in [county name] county during **all** of the fall deer hunting seasons (most recent year hunted there)? **(n=743) 54% 0 28% 1 9% 2 3% 3 6% >3** BUCKS

16. How would you describe your level of satisfaction with your **deer harvest** in [county name] county in the most recent year that you deer hunted in that county? (Check One) **(n=748)**

14% VERY SATISFIED
32% SATISFIED
20% NEITHER SATISFIED NOR DISSATISFIED
24% DISSATISFIED
11% VERY DISSATISFIED

17. How would you describe your level of satisfaction with the **number of BUCKS you saw** while actually deer hunting in [county name] county (most recent year)? (Check One) **(n=749)**

8% VERY SATISFIED
23% SATISFIED
16% NEITHER SATISFIED NOR DISSATISFIED
31% DISSATISFIED
22% VERY DISSATISFIED

18. How would you describe your level of satisfaction with the **number of DEER (both bucks and antlerless) you saw** while actually deer hunting in [county name] county (most recent year)? (Check One) **(n=749)**

15% VERY SATISFIED
31% SATISFIED
18% NEITHER SATISFIED NOR DISSATISFIED
26% DISSATISFIED
10% VERY DISSATISFIED

19. In the most recent year that you deer hunted in [county name] county, how many days did you hunt during the **November firearm** season in that county? **(n=727)** AVG. 7.9 (STD. DEV. 3.9) DAYS RANGE 1 TO 15 DAYS

(F ZERO, WRITE A "0" IN AND SKIP TO #28 ON PAGE 5)

☞ For questions on this page and the next page, please refer to your deer hunting **only** during the **November firearm season** in the **most recent year** that you deer hunted in [county name] county.

20. On the map to the right, please circle the approximate location(s) in which you deer hunted during the **November firearm season** in the most recent year that you deer hunted in [county name] county. **(n=721)**

[MAP OF THE COUNTY]

87% identified at least 1 hunting area on the map

13% IF YOU ARE UNABLE TO IDENTIFY WHERE YOU HUNTED, PLEASE CHECK HERE AND SKIP TO #22.

21. If you deer hunted in more than one location, please check here and write a "#1" next to the area where you spent **most** of your deer hunting time during the November firearm season. **(n=631)**

Number of Areas Identified:

81% 1 **13%** 2 **4%** 3 **2%** >3

22. In the area where you deer hunted most often in [county name] county during the **November firearm season**, what is *your* best estimate of what the **average number of deer per square mile** was in October of **1994**? **(n=732)**

I BELIEVE THAT THERE WERE BETWEEN AVG. 17 (STD. DEV 20) AND AVG. 26 (STD. DEV 28) DEER PER SQUARE MILE IN THIS AREA IN OCTOBER OF 1994

46% I HAVE NO IDEA WHATSOEVER

23. Considering both the positive and negative impacts of deer to **yourself** and the **local community** in [county name] county, how would you describe your reaction to the **number of deer per square mile** that you indicated in the above question (#22)? (Check ONLY One) **(n=701)**

24% TOO FEW, AND I INTEND TO TRY TO DO SOMETHING ABOUT IT

28% TOO FEW, BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT

43% I AM SATISFIED WITH THE NUMBER OF DEER

2% TOO MANY, BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT

3% TOO MANY, AND I INTEND TO TRY TO DO SOMETHING ABOUT IT

24. **For that same hunting area, what number of deer per square mile would be most desirable to you (not too many or too few, but just right)? (n=709)**

THE MOST DESIRABLE NUMBER OF DEER TO ME WOULD BE AVG. 32* (STD. DEV. 59) DEER PER SQUARE MILE

50% I HAVE NO IDEA WHATSOEVER

25. Considering both the positive and negative impacts of deer to **yourself and the local community** in [county name] county, please indicate the **MINIMUM** number of deer per square mile that you would be **willing to tolerate in that area of [county name] county. (n=725)**

ALL THINGS CONSIDERED, I WOULD NOT BE WILLING TO TOLERATE ANY FEWER THAN AVG. 22 (STD. DEV. 56) DEER PER SQUARE MILE

48% I HAVE NO IDEA WHATSOEVER

26. Considering both the positive and negative impacts of deer to **yourself and the local community** in [county name] county, please indicate the **MAXIMUM** number of deer per square mile that you would be **willing to tolerate in that area of [county name] county. (n=722)**

ALL THINGS CONSIDERED, I WOULD NOT BE WILLING TO TOLERATE ANY MORE THAN AVG. 111 (STD. DEV. 757) DEER PER SQUARE MILE

52% I HAVE NO IDEA WHATSOEVER

27. How would you describe the trend in deer numbers **over the past 5 years** in the area in [county name] county where you hunted most often during the **November firearm season**? (Check ONLY One) **(n=731)**

10% INCREASING **31%** ABOUT THE SAME EACH YEAR **55%** DECREASING **4%** I DON'T KNOW

III. Opinions regarding the Michigan Department of Natural Resources

28. To what extent do you agree or disagree with the following statements about the Michigan Department of Natural Resources (DNR)?

(Select One Response for Each Statement)	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
THE DNR HAS THE EXPERTISE TO MANAGE THE STATE'S DEER HERD. (n=776)	9%	35%	30%	19%	7%
I TRUST THE DNR TO FAIRLY CONSIDER THE INTERESTS OF DEER HUNTERS WHEN MAKING DECISIONS ABOUT HOW TO MANAGE THE STATE'S DEER HERD. (n=774)	8%	35%	24%	24%	9%
THE DNR HAS ENOUGH INFORMATION ON THE DEER POPULATION TO ADEQUATELY DECIDE HOW MANY DEER TO HARVEST IN MICHIGAN EACH YEAR. (n=776)	6%	25%	29%	28%	13%

IV. Opinions on Deer Management in Michigan

29. If you were making recommendations to the DNR, how much importance would you tell them to place on each of the following over the next year?

(Select One Response per Statement)	VERY IMPORTANT TO ADDRESS	SOMEWHAT IMPORTANT TO ADDRESS	NOT IMPORTANT TO ADDRESS	NO OPINION
IMPROVING THE ACCURACY OF THE DNR ESTIMATE OF THE NUMBER OF DEER IN THE STATE. (n=768)	59%	33%	5%	3%
CHANGING THE CURRENT DNR PROGRAM TO CONTROL CROP LOSSES CAUSED BY DEER, WHICH IN PART INVOLVES ISSUING DEER CONTROL PERMITS FOR USE ON FARMS. (n=773)	47%	32%	16%	5%
CHANGING THE CURRENT NUMBER OF BUCKS COMPARED TO THE NUMBER OF DOES IN THE STATE'S DEER HERD. (n=764)	41%	37%	17%	6%
CHANGING THE CURRENT STRUCTURE OF THE DEER HUNTING SEASONS. (n=768)	26%	21%	45%	8%
CHANGING THE CURRENT DEER POPULATION SIZE IN THE STATE. (n=754)	32%	40%	21%	7%
CHANGING THE CURRENT BAG LIMITS FOR DEER. (n=762)	33%	28%	33%	5%
OTHER: (SPECIFY) (n=246)	76%	8%	4%	12%

V. Opinions on the Crop Loss Issue in Michigan

30. How important to you is the issue of deer numbers being reduced in certain areas to control crop losses compared to other issues facing deer management in Michigan, such as those in the table above? (Check ONLY One)

IN MY OPINION, THE CROP LOSS ISSUE IS... **(n=776)**

11% THE MOST IMPORTANT ISSUE FACING DEER MANAGEMENT IN MICHIGAN
16% MORE IMPORTANT THAN MOST OTHER ISSUES FACING DEER MANAGEMENT IN MICHIGAN
40% ABOUT AS IMPORTANT AS THE OTHER ISSUES FACING DEER MANAGEMENT IN MICHIGAN
23% LESS IMPORTANT THAN MOST OTHER ISSUES FACING DEER MANAGEMENT IN MICHIGAN
10% NOT AT ALL IMPORTANT TO ME

☞ We recognize that there may be other issues facing deer management in Michigan that you believe are more important than the crop loss issue.
However, we need to hear from both those who think that the crop loss issue is important
and those who think it is not that important.
Whatever your opinion on the issue, please continue.

---

31. To what extent do you approve or disapprove of the DNR's policy of intentionally reducing deer numbers in **certain areas** in order to **decrease the extent of deer damage to agricultural crops**? (Check One) **(n=778)**

6% STRONGLY APPROVE
31% APPROVE
17% UNDECIDED
26% DISAPPROVE
19% STRONGLY DISAPPROVE

32. To what extent do you approve or disapprove of the current DNR program to control crop losses caused by deer (e.g., regular antlerless permits (lottery) for hunters; deer control permits for use on farms)? (n=769)

(Check ONLY One)

5% I AM UNAWARE OF THIS PROGRAM
10% STRONGLY APPROVE
31% APPROVE
16% UNDECIDED
22% DISAPPROVE
16% STRONGLY DISAPPROVE

☞ 6% If you did not deer hunt in [county name] county in 1993 or 1994, please check here and skip to Section XII on page 13. (n=780)

VI. Opinions on the Crop Loss Issue in [county name] County

➤To what extent to agree or disagree with each of the following statements as it applies to [county name] county?

(Select One Response for Each Statement) *In [county name] county...*	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
33. In general, farmers have cost-effective choices other than killing deer to satisfactorily reduce their crop losses to deer. (n=726)	21%	29%	26%	19%	5%
34. In general, farmers should not receive permits to kill deer unless they have made reasonable attempts to control loss in other ways (such as fencing, using repellents, etc...). (n=728)	35%	33%	10%	17%	5%
35. In general, I am satisfied with the number of farmers who allow access to their land to hunters other than their relatives or friends. (n=726)	7%	27%	21%	25%	20%
36. It may be necessary to kill deer each year on a farm in order to control crop loss due to deer. (n=727)	9%	42%	16%	24%	9%
37. Deer hunting seasons should be designed to reduce deer numbers so that special kill permits to control crop losses are not necessary. (n=726)	27%	39%	17%	14%	3%
38. If regular antlerless permits (lottery) are not available in the area, then permits to kill deer to control crop losses due to deer should not be available in that area either. (n=728)	51%	28%	8%	10%	2%
39. Killing deer on farms to protect crops noticeably decreases the deer available in the areas where I hunt. (n=731)	33%	28%	24%	14%	2%
40. In general, the local DNR biologists can adequately determine whether or not a farmer has significant crop loss due to deer. (n=727)	11%	38%	26%	17%	8%
41. Too many people who do not farm as their primary occupation receive permits to kill deer to control crop loss. (n=728)	31%	26%	31%	9%	2%
42. In general, the local DNR biologists give permits to kill deer only to farmers who actually have significant crop loss caused by deer. (n=728)	6%	19%	36%	26%	12%
43. In general, practically every farmer in [county name] county who applies for permits to kill deer to control loss receives some permits, regardless of the amount of crop loss. (n=728)	16%	30%	42%	8%	4%

44. **Please distribute 100 points within each of the following two columns to indicate how much importance you think the DNR currently places and should place on each of the following interest groups when the agency sets deer population goals for [county name] county.**

> For example, if you think that the DNR currently places importance only on hunters' interests in setting deer population goals for [county name] county, place 100 points next to hunters and 0 points next to farmers in the column on the left below. Or, if you think that hunter and farmer interests currently are **equally** important to the DNR, give each group 50 points. If another interest group is important to the DNR, write in the group and weight them accordingly. Follow this same procedure for the column on the right to show us where you feel the DNR ***should be*** placing importance.

THE DNR CURRENTLY PLACES IMPORTANCE ON:	*THE DNR SHOULD PLACE IMPORTANCE ON:*
MEAN(STD. DEV.)	MEAN(STD. DEV.)
54(23) FARMERS (n=687)	38(19) FARMERS (n=701)
39(21) HUNTERS (n=688)	58(21) HUNTERS (n=700)
7(18) OTHER (n=686)	3(11) OTHER (n=699)
TOTAL: 100 POINTS	TOTAL: 100 POINTS

PERCEIVED CURRENT "FAVORITISM" OF FARMERS VS. HUNTERS BY DNR WILDLIFE DIVISION * (n=687)

- 32% NO FAVOR
- 49% FAVOR FARMERS
- 19% FAVOR HUNTERS

*CALCULATED AS FARMER POINTS MINUS HUNTER POINTS:
IF POSITIVE, THEN CURRENTLY FAVOR FARMERS
IF NEGATIVE, THEN CURRENTLY FAVOR HUNTERS

BELIEFS REGARDING WHO SHOULD BE FAVORED (FARMERS VS. HUNTERS) BY DNR WILDLIFE DIVISION † (n=700)

- 42% NO FAVOR
- 10% FAVOR FARMERS
- 48% FAVOR HUNTERS

† CALCULATED AS FARMER POINTS MINUS HUNTER POINTS:
IF POSITIVE, THEN CURRENTLY FAVOR FARMERS
IF NEGATIVE, THEN CURRENTLY FAVOR HUNTERS

45. Considering all of the **corn** farming operations in [county name] county, what is your best estimate of the percent of the corn crop lost due to deer in 1994? **(n=726)**

AT LEAST AVG. 6.4 (STD. DEV. 6.9) % AND AT MOST AVG. 12.3 (STD. DEV. 10.0) % OF THE CORN CROP WERE LOST TO DEER IN 1994

57% I HAVE NO IDEA WHATSOEVER

46. What **should** the DNR policy be in [county name] county regarding how much loss a farmer should experience before being eligible to receive permits to have deer killed? **(n=729)**

AT LEAST AVG. 17.2 (STD. DEV. 12.8) % OF THE FARMER'S CROP SHOULD BE LOST TO DEER BEFORE BEING ELIGIBLE TO RECEIVE PERMITS

28% I HAVE NO IDEA WHATSOEVER

17% NEVER GIVE PERMITS, REGARDLESS OF LOSS

VII. Knowledge of the Crop Damage Control Permit Systems

☞ **Before proceeding, it is critical that you read the following description of the two permit systems which are part of the Crop Damage Control Program in Michigan.**

▸ **SHOOTING PERMITS:**	▸ **BLOCK PERMITS:**
In 1983, the Natural Resources Commission in Michigan adopted regulations to control deer damage to agricultural crops by issuing permits to kill deer. These "Deer Damage Shooting Permits" are sometimes referred to as "Out-of-Season Shooting Permits" and will be called "Shooting Permits " in this survey.	In 1990, another type of permit was introduced to *reduce* the number of Shooting Permits issued and to use licensed deer hunters to control crop losses. These "Crop Depredation Bonus Deer Hunting Licenses" are referred to as "Deer Crop Damage Block Permits" and will be called "Block Permits" in this survey.
Shooting Permit Guidelines:	Block Permit Guidelines:
• The DNR issues the permits to farmers.	• The DNR issues the permits to farmers.
• Valid *only* outside the regular fall deer hunting seasons (Jan. 2 - Sept. 25).	• Valid *only* during the regular fall deer hunting seasons.
• Valid *only* for taking antlerless deer, except when bucks cause damage to orchards.	• Valid *only* for taking antlerless deer.
• There is no fee to the farmer for Shooting Permits.	• A $3.00 fee is collected from the farmer for each Block Permit.
• The farmer can designate up to 3 authorized shooters.	• Valid for use only by individuals who have purchased a regular season deer hunting license.
• Valid only on the farmer's land.	• All regular deer hunting rules apply to Block Permits, except that unfilled Block Permits can be transferred to another hunter.
• The DNR specifies the number of deer to be killed.	• Valid on the farmer's land and adjacent private land with permission
	• The DNR specifies the number of deer to be killed.

47. Before reading this description of the **Shooting Permit** system, how much did you already know of the guidelines listed on the **left** above? (Check ONLY One) **(n=734)**

21% I ALREADY KNEW **MOST** OF THE GUIDELINES FOR SHOOTING PERMITS LISTED ABOVE

28% I ALREADY KNEW **SOME** OF THE GUIDELINES FOR SHOOTING PERMITS LISTED ABOVE

37% I WAS AWARE OF THE SHOOTING PERMIT SYSTEM BUT KNEW VERY FEW OF THE GUIDELINES FOR SHOOTING PERMITS

14% I WAS UNAWARE THAT SHOOTING PERMITS EXISTED

48. Before reading this description for the **Block Permit** system, how much did you already know of the guidelines listed on the **right** above? (Check ONLY One) **(n=734)**

32% I ALREADY KNEW **MOST** OF THE GUIDELINES FOR BLOCK PERMITS LISTED ABOVE

28% I ALREADY KNEW **SOME** OF THE GUIDELINES FOR BLOCK PERMITS LISTED ABOVE

31% I WAS AWARE OF THE BLOCK PERMIT SYSTEM BUT KNEW VERY FEW OF THE GUIDELINES FOR BLOCK PERMITS

9% I WAS UNAWARE THAT BLOCK PERMITS EXISTED

49. Of the total number of **antlerless** deer harvested by hunters in **Michigan** in **1994**, what is your best estimate of the percent that were harvested on **Block Permits**? **(n=736)**

BETWEEN AVG. 22 (STD. DEV. 20) % AND AVG. 31 (STD. DEV. 23) % OF THE TOTAL NUMBER OF ANTLERLESS DEER HARVESTED BY HUNTERS IN MICHIGAN 1994 WERE HARVESTED ON BLOCK PERMITS

70% I HAVE NO IDEA WHATSOEVER

VIII. Opinions About Shooting Permits (Please Refer to the Description of Shooting Permits on Page 9)

50. To what extent do you approve or disapprove of the current **Shooting Permit** system? (Check ONE) **(n=718)**

3% STRONGLY APPROVE
15% APPROVE
21% UNDECIDED
31% DISAPPROVE
29% STRONGLY DISAPPROVE

51. To what extent do you agree or disagree with each of the following statements about **Shooting Permits** as it applies to [county name] county?

(Select One Response per Statement) *In [county name] county...*	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
Overall, the Shooting Permit system is fair to both farmers and hunters. (n=724)	3%	16%	18%	40%	24%
In general, farmers should be allowed to keep the deer that are killed on Shooting Permits. (n=722)	9%	35%	23%	21%	13%
Too many male deer are killed on Shooting Permits. (n=726)	28%	29%	35%	7%	2%
Too many of the deer killed on Shooting Permits are not utilized. (n=724)	35%	26%	32%	5%	2%

52. If you were a DNR policy maker responsible for implementing the **Shooting Permit** system, what changes would you recommend to improve the current system? (n=700)

29% I HAVE NO CHANGES TO RECOMMEND
41% I WOULD ELIMINATE SHOOTING PERMITS
30% I WOULD MODIFY THE SHOOTING PERMIT SYSTEM IN THIS WAY:

53. Have you ever been designated by a farmer to use a **Shooting Permit**? (n=731) **6%** YES **94%** NO

54. What is your best estimate of the **percent** of farmers in [county name] county who received **Shooting Permits** in **1994**? **(n=733)**

BETWEEN AVG. 31 (STD. DEV. 27) AND AVG. 43 (STD. DEV. 31) % OF FARMERS IN [COUNTY NAME] COUNTY RECEIVED SHOOTING PERMITS IN 1994
74% I HAVE NO IDEA WHATSOEVER

IX. Opinions About Block Permits (Please Refer to the Description of Block Permits on Page 9)

55. To what extent do you approve or disapprove of the current **Block Permit** system? (Check ONE) **(n=701)**

6% STRONGLY APPROVE
27% APPROVE
22% UNDECIDED
26% DISAPPROVE
19% STRONGLY DISAPPROVE

56. To what extent do you agree or disagree with each of the following statements about **Block Permits** as it applies to [county name] county?

(Select One Response per Statement) *In [county name] county...*	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
Too many farmers try to get Block Permits for reasons other than controlling crop losses. **(n=726)**	30%	36%	25%	8%	1%
Overall, the Block Permit system is fair to both farmers and hunters. **(n=725)**	3%	25%	22%	34%	16%
Too many antlerless deer were harvested on Block Permits in [county name] county in 1994. **(n=727)**	18%	26%	42%	11%	2%
The farmer to whom the Block Permit is issued should be allowed to decide which licensed hunter gets to use the Block Permit. **(n=729)**	11%	40%	16%	19%	15%
In general, I am satisfied with the number of farmers in [county name] county who allow hunters other than their relatives or friends to use their Block Permits. **(n=729)**	3%	16%	42%	23%	16%
A farmer who receives Block Permits should be required to allow a certain number of hunters who are not their friends or relatives to use the permits. **(n=726)**	25%	30%	21%	18%	7%

57. If you were a DNR policy maker responsible for implementing the Block Permit system, what changes would you recommend to improve the current system? **(n=704)**

38% I HAVE NO CHANGES TO RECOMMEND
32% I WOULD ELIMINATE BLOCK PERMITS
30% I WOULD MODIFY THE BLOCK PERMIT SYSTEM IN THIS WAY:

58. Have you ever hunted with a **Block Permit** that was issued to a farmer (other than yourself)? **(n=725)**

14% YES **86%** NO

59. What is your best estimate of the percent of farmers in [county name] county who received **Block Permits** in 1994? (n=726)

BETWEEN AVG. 33 (STD. DEV. 26) AND AVG. 45 (STD. DEV. 28) % OF FARMERS IN [COUNTY NAME] COUNTY RECEIVED BLOCK PERMITS IN 1994

75% I HAVE NO IDEA WHATSOEVER

60. To what extent do you believe that the Crop Damage Control Permit Systems are abused by the farmers who participate in the systems in [county name] county?

PART ONE ➤ *OF THE FARMERS IN [COUNTY NAME] COUNTY WHO PARTICIPATE IN THE SHOOTING PERMIT SYSTEM...* (Check ONLY One) (n=724)

33% MOST FARMERS ABUSE THE SYSTEM
33% ONLY A FEW FARMERS ABUSE THE SYSTEM
2% NO FARMERS ABUSE THE SYSTEM
31% NOT SURE

PART TWO ➤ *OF THE FARMERS IN [COUNTY NAME] COUNTY WHO PARTICIPATE IN THE BLOCK PERMIT SYSTEM...* (Check ONLY One) (n=722)

31% MOST FARMERS ABUSE THE SYSTEM
34% ONLY A FEW FARMERS ABUSE THE SYSTEM
2% NO FARMERS ABUSE THE SYSTEM
33% NOT SURE

X. Effectiveness of Measures to Control Crop Losses in [county name] County

61. How would you describe the effectiveness of each of the following at significantly reducing corn crop loss caused by deer in [county name] county during 1994?

(Select One Response for Each Statement)	VERY EFFECTIVE	SOMEWHAT EFFECTIVE	SLIGHTLY EFFECTIVE	NOT EFFECTIVE	UNSURE
REGULAR FALL SEASON DEER HUNTING (n=714)	34%	36%	14%	4%	12%
SHOOTING PERMITS (n=698)	17%	24%	18%	11%	30%
BLOCK PERMITS (n=695)	18%	26%	15%	13%	29%

XI. Actions

Throughout this survey, you have shared some of your opinions on the number of deer in [county name] county and deer management in Michigan.

Which of the following actions have you taken, or do you intend to take, in direct response to your opinion of the deer population size in [county name] county OR the management of deer by the DNR?

(Select **All that Apply** to Each Statement)	DID IN 1994	DID OR INTEND TO DO IN 1995	WOULD PROBABLY NEVER DO	UNDECIDED
62. PERSONALLY COMMUNICATE ABOUT THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT TO A REPRESENTATIVE OF THE DNR. **(n=715)**	15%	21%	40%	30%
63. PERSONALLY COMMUNICATE ABOUT THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT TO AN ELECTED OFFICIAL. **(n=712)**	7%	15%	47%	32%
64. ATTEND A MEETING HELD SPECIFICALLY FOR THE PURPOSE OF DISCUSSING THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT. **(n=710)**	5%	30%	32%	35%
65. HELP ORGANIZE A MEETING SPECIFICALLY FOR THE PURPOSE OF DISCUSSING THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT. **(n=710)**	1%	7%	62%	32%
66. PERSONALLY OR JOINTLY CONSULT AN ATTORNEY SPECIFICALLY FOR PURPOSES ASSOCIATED WITH INFLUENCING THE DEER POPULATION SIZE OR DNR DEER MANAGEMENT. **(n=710)**	0%	2%	77%	21%
67. STOP MY DEER HUNTING IN AN AREA BECAUSE OF A DECLINE IN DEER NUMBERS. **(n=715)**	10%	15%	40%	37%

XII. Background Information

We need the following information to compare our deer hunter sample with the entire population of deer hunters in Michigan. This information will also remain **confidential**.

None of your answers on this survey will be associated with your name or address.

68. Do you **currently** own or lease land where you can deer hunt? **(n=780)** **48%** YES **52%** NO

69. Please **Check All that Apply:** **(n=779 for each statement)**

4% FARMING IS CURRENTLY MY PRIMARY OCCUPATION

6% FARMING USED TO BE MY PRIMARY OCCUPATION

4% MY CURRENT OCCUPATION IS DEPENDENT ON FARMING

25% I HAVE FARMED OR DO FARM, BUT NOT AS A PRIMARY OCCUPATION

58% I GREW UP IN A RURAL FARMING AREA

61% I HAVE FRIENDS OR FAMILY WHOSE PRIMARY OCCUPATION IS FARMING

29% DURING MY YOUTH, MY FAMILY DEPENDED ON FARMING

50% I PERSONALLY HAVE NEVER FARMED

70. **Please indicate the Michigan-based deer-hunting-related or conservation organizations in which you are currently a member. (Check All that Apply) (n=742)**

70% I DO NOT BELONG TO ANY (SKIP TO #72)

6% MICHIGAN BOWHUNTERS ASSOCIATION

19% MICHIGAN UNITED CONSERVATION CLUBS

5% LOCAL DEER HUNTING CLUB: (SPECIFY) _____

8% OTHER: (SPECIFY) _____

1% SAFARI CLUB INTERNATIONAL

3% WHITETAILS UNLIMITED

0% U.P. WHITETAILS

71. Within the past 5 years, have you been an officer (e.g., President, Vice-President, Other Officer Positions) in a Michigan-based deer-hunting-related or conservation organization? **(n=388) 4%** YES **96%** NO

72. In what county do you **currently** reside? 42 MICHIGAN COUNTIES WERE REPORTED **(n=778)**

DNR ADMINISTRATIVE REGIONS:

6% REGION 1 (UP) **15%** REGION 2 (UPPER LOWER) **79%** REGION 3 (LOWER)

73. How would you describe the area in which you **currently** reside? (Check ONLY One) **(n=774)**

47% RURAL - FARM

11% RURAL - NON-FARM (AREA OF < 2,500 PEOPLE)

22% SMALL TOWN (AREA OF 2,500 TO 50,000 PEOPLE)

20% URBANIZED AREA (CITY OR SUBURBAN AREA OF > 50,000 PEOPLE)

74. In what county did you reside during most of 1993? 42 MICHIGAN COUNTIES WERE REPORTED **(n=783)**

DNR ADMINISTRATIVE REGIONS:

6% REGION 1 (UP) **15%** REGION 2 (UPPER LOWER) **79%** REGION 3 (LOWER)

75. In what year were you born? 1904 to 1979 **AVG. AGE = 46.2 YEARS (STD. DEV. 15.4 YEARS)**

76. What is your gender? **(n=785) 94%** MALE **6%** FEMALE

77. How much school have you completed? (Check ONLY ONE box for the highest level completed or degree received) **(n=779)**

0% NO SCHOOL COMPLETED
4% LESS THAN 9TH GRADE
10% SOME HIGH SCHOOL
35% HIGH SCHOOL DIPLOMA OR EQUIVALENT
28% SOME COLLEGE OR TECHNICAL SCHOOL
7% ASSOCIATE DEGREE
11% BACHELOR'S DEGREE
4% MASTER'S DEGREE
0% DOCTORATE DEGREE
1% PROFESSIONAL SCHOOL DEGREE

78. What was your total **gross** household income in 1994 **(before deductions for taxes,** bonds, dues or other items)? (Check ONLY One) **(n=750)**

6% LESS THAN $9,999
5% $10,000 - $14,999
14% $15,000 - $24,999
17% $25,000 - $34,999
22% $35,000 - $49,999
18% $50,000 - $74,999
9% GREATER THAN $75,000
10% NO OPINION

We welcome any additional comments you may have that will help us better understand how hunters view deer-caused crop damage and deer management in Michigan.

Feel Free to Add Your Comments Here.

Dear Michigan Deer Hunter:

By now, you should have received a survey from Michigan State University regarding deer management issues in Michigan. If you have already received and returned this survey, thank you for your cooperation. *If you have not yet returned it, I want to stress to you that your participation is very important to the success of this study and to the management of our deer herd. Please try to complete and return it as soon as possible*

☞ When you return the completed survey and the drawing entry form, you will be eligible to win a pair of binoculars just in time for this year's hunting season!

If you have not received the survey or if you have any questions about the survey, please call our toll-free survey hot line: 1-800-433-3741.

Thank you,
Donna L. Minnis
Donna L. Minnis, Research Assistant

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
13 NATURAL RESOURCES BUILDING

EAST LANSING • MICHIGAN • 48824-1222
SURVEY HOT LINE: 1-800-433-3741

7 June 1995

Dear Mr. [LAST NAME]:

Recently I sent you a survey about your deer hunting experience and deer management issues in Michigan. If you have already completed and returned the questionnaire, thank you for your assistance and please disregard this letter. If you have not returned it, please reconsider taking the time to share your opinions.

Because of the importance of your opinions, I am sending this letter by certified mail to make sure you receive it. In case you did not receive my earlier letter, I am enclosing another survey and a postage-paid envelope in which to return your survey. I have also enclosed a flyer that tells you about the binoculars you could win when you return a completed survey.

[To be eligible to win the binoculars, please return (in the enclosed stamped envelope) your completed survey and the tear-off form from the yellow flyer. Your survey and entry form will be separated immediately upon receipt so that your name remains confidential.]

- **Even if you did not hunt or were not successful,** please complete and return the survey as soon as possible.

- Your participation in this survey is entirely voluntary, but *your* response is extremely important to the success of our study. Please be assured that your responses will be completely confidential.

☎ I will be happy to answer any questions you might have about this survey; just call our toll-free survey hot line: 1-800-433-3741.

Please help by completing this questionnaire.

Sincerely,

Donna L. Minnis, Research Assistant

P.S. *The only way that deer hunters like yourself can be represented is if you voice your opinion. Please complete and return the enclosed survey soon!*

Enclosures: Survey, Flyer, Envelope

MSU is an Affirmative Action/Equal Opportunity Institution

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE
13 NATURAL RESOURCES BUILDING

EAST LANSING • MICHIGAN • 48824-1222
SURVEY HOT LINE: 1-800-433-3741

16 June 1995

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Because of the importance of your opinions, I am sending this letter first class. In case you did not receive my earlier letter, I am enclosing another survey and a postage-paid envelope in which to return your survey. I have also enclosed a flyer that tells you about the binoculars you could win when you return a completed survey.

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APPENDIX G

1995 OPINION SURVEY OF MICHIGAN PRODUCERS ABOUT DEER AND DEER MANAGEMENT

Survey instruments were tailored to each study county. Thus, a total of 7 different versions of the 1995 Opinion Survey of Michigan Producers about Deer and Deer Management instrument were created. The items that varied among the survey versions included those which involved a map or the name of the county.

Survey Instrument as Sent (Benzie county version shown here) (pages 353-367)

Survey Instrument with Select Descriptive Statistics (pages 368-381)

1995 OPINION SURVEY OF MICHIGAN PRODUCERS ABOUT DEER AND DEER MANAGEMENT

CONDUCTED BY

THANK YOU!

Since you have gotten this far we hope that you have decided to complete this questionnaire.

We assure you that the time and thought you put into this effort are well invested!

1995 OPINION SURVEY OF MICHIGAN FARMERS ABOUT DEER AND DEER MANAGEMENT

INSTRUCTIONS FOR COMPLETING THIS SURVEY:
Please mark boxes clearly, as shown here: ☒ ☑

A farmer is anyone who attempted to produce a crop (apples, cherries, corn, beans, Christmas trees, etc.) or an animal product (beef, pork, poultry, milk, etc.) for profit during 1994.
An "antlerless" deer is a deer without antlers or with antlers less than 3 inches in length.
"DNR" means the Michigan Department of Natural Resources.
"Shooting Permits" are permits issued by the DNR for shooting deer outside of the regular deer hunting seasons.
"Block Permits" are special licenses sold to farmers in blocks of 5 or more by the DNR for shooting antlerless deer during the regular deer hunting seasons.

I. YOUR FARMING OPERATION

1. Please check one of the following that best describes you

☐ FULL-TIME FARMER (FARMING IS MY PRIMARY OCCUPATION; I SPEND OVER 50% OF MY WORKING TIME FARMING.)
☐ PART-TIME FARMER (FARMING IS NOT MY PRIMARY OCCUPATION. I SPEND LESS THAN 50 % OF MY WORKING TIME FARMING.)
☐ RETIRED FARMER / NOT A FARMER ⇒ ⇒ **(Thank you for your cooperation, please place the questionnaire in the enclosed envelope and return.)**

2. In 1994 about how many total acres (including homesteads, feedlots, woodlots, fields, buildings, etc.) of your farming operation were:

A) OWNED?_____ ACRES

B) RENTED FROM SOMEONE ELSE?_____ ACRES

3. Please indicate the percentage of your annual farm sales represented by each crop or product.

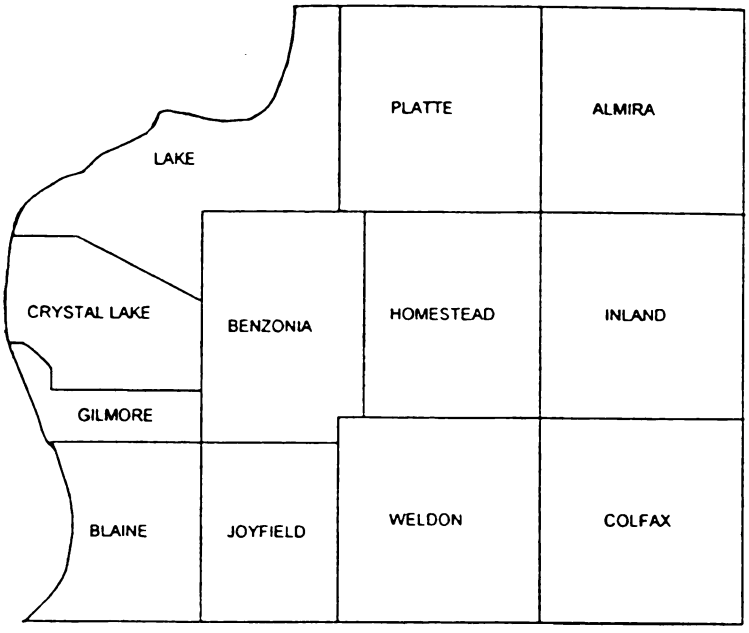
Crop or Product	% of Farm Sales
LIVESTOCK, DAIRY OR POULTRY PRODUCTS	
CASH CROPS (e.g., vegetables, field crops)	
TREES OR TREE PRODUCTS (e.g., Christmas trees, orchards, etc)	

4. How many acres did you farm in 1994 in Benzie county. Please add other counties and acreages you farmed in 1994.

County	Acres
BENZIE COUNTY	
OTHER COUNTIES (Please specify)	

For the remainder of this questionnaire please refer only to that portion of your farm that falls within the borders of BENZIE county.

5. **We need an approximate location of your primary farming operation so we can analyze surrounding land use and deer distributions. On this map please circle that portion of Benzie county in which you do the <u>majority</u> of your farming.**



6. **Did you grow row/field crops for sale or feed (e.g., corn, soybeans, vegetables, alfalfa, etc.) <u>in 1994 in Benzie county</u>?**

☐YES ☐ NO ⇒ GO TO # 9

II. ROW / FIELD CROP LOSSES TO DEER IN BENZIE COUNTY

7. If you grew row / field crops in 1994, please provide your best estimate of the following information.
***If you don't know or aren't sure how much you lost to deer place a question mark "?" in the box.**

Crop Type	1994 Acres	1994 Ave. yield per acre. Please include the type of unit (bu./ac, tons/ac, cwts/ac, etc.)	Lost to deer in 1994.* (Estimated Bushels, Tons, Cwts...)	The level of my 1994 losses to deer was... 1=Not a problem. 2=A problem but tolerable 3=A problem and I intend to increase my efforts to reduce the losses below 1994 levels. (Circle only one response per crop)		
CORN				1	2	3
SOYBEANS				1	2	3
DRY BEANS - Table				1	2	3
DRY BEANS - Certified				1	2	3
ALFALFA / HAY				1	2	3
SMALL GRAINS				1	2	3
VEGETABLES (Please List)				1	2	3
				1	2	3
OTHER-				1	2	3

8. Please complete the following sentence by providing the characteristics that describe your worst case field loss in 1994

(For example: "In 1994, my worst losses to deer on a single field were on a *100* acre field of *corn* where deer reduced my yield from that field by *30* %.")

IN 1994, MY WORST LOSSES TO DEER ON A SINGLE FIELD WERE ON A (size) _____ ACRE FIELD OF (crop) _____
WHERE DEER REDUCED MY YIELD FROM THAT FIELD BY (amount) _____ %

9. Did you grow fruit trees, nursery products or Christmas trees commercially in Benzie county in 1994?

☐ YES ☐ NO ⇒ GO TO # 12

III. FRUIT AND CHRISTMAS TREE LOSSES TO DEER IN BENZIE COUNTY

10. If you grew fruit, Christmas or other trees in 1994, please provide your best estimate of the following information
***If you don't know or aren't sure how much you lost to deer place a question mark "?" in the box.**

Type of Trees	Acres	Trees per acre	Estimated # of Trees damaged by deer in 1994.*	1994 Farm Ave. yield in total lbs.	Estimated total lbs. lost due to deer browsing in 1994.*	The level of my 1994 losses to deer was... 1=Not a problem. 2=A problem but tolerable 3=A problem and I intend to increase my efforts to reduce the losses below 1994 levels. (Circle only one for each crop.)		
APPLE NON-BEARING						1	2	3
BEARING						1	2	3
CHERRY NON-BEARING						1	2	3
BEARING						1	2	3
OTHER –						1	2	3
						1	2	3
CHRISTMAS TREES						1	2	3
NURSERY PRODUCTS						1	2	3

If you intend to increase your deer damage control efforts in 1995, please ⇒ GO TO # 12

If not, please ⇒ GO TO # 11

11 If your 1994 losses to deer were tolerable, please give your best estimate of the level of loss that would be intolerable; that is, cause you to take (further) action to reduce losses.

Type of Trees	Intolerable # of damaged trees	Intolerable loss in lbs.
APPLE NON-BEARING		
BEARING		
CHERRY NON-BEARING		
BEARING		
OTHER –		
CHRISTMAS TREES		
NURSERY PRODUCTS		

12. In addition to total yield lost, how significantly does deer damage reduce the quality of your harvested crops?
The value lost in crop quality due to deer is... (Check ONLY one)

- ☐ GREATER THAN THE VALUE OF THE YIELD LOST TO DEER.
- ☐ EQUAL TO THE VALUE OF THE YIELD LOST TO DEER.
- ☐ LESS THAN THE VALUE OF THE YIELD LOST TO DEER.
- ☐ THE LOST VALUE IN CROP QUALITY IS NEGLIGIBLE
- ☐ I'M NOT SURE.

13. Considering ALL crops (row, field, fruits, trees, etc.) how do you rate 1994's total losses to deer?
The level of my 1994 losses to deer was... (Check ONLY one)

- ☐ NOT A PROBLEM.
- ☐ A PROBLEM BUT I DO NOT INTEND TO INCREASE MY EFFORTS TO REDUCE THE LOSSES
- ☐ A PROBLEM AND I INTEND TO INCREASE MY EFFORTS TO REDUCE THE LOSSES BELOW 1994 LEVELS

14 Compared to deer, how would you describe the crop losses you incurred to all other wildlife such as beaver, raccoons, geese, blackbirds, mice, etc. in 1994? (Check ONLY one)

- ☐ LOSSES TO DEER ARE MORE SIGNIFICANT THAN LOSSES TO OTHER WILDLIFE
- ☐ LOSSES TO DEER ARE ABOUT THE SAME AS LOSSES TO OTHER WILDLIFE
- ☐ LOSSES TO DEER ARE LESS SIGNIFICANT THAN LOSSES TO OTHER WILDLIFE
- ☐ I AM NOT INCURRING ANY CROP LOSSES TO OTHER WILDLIFE
- ☐ I'M NOT SURE

15 On what have you based your estimates of 1994 crop losses to deer? (Check ALL that apply)

- ☐ I HAVE NO IDEA WHAT MY LOSSES WERE
- ☐ THE NUMBER OF DEER SEEN IN FIELDS
- ☐ THE VISIBLE DAMAGE TO CROPS
- ☐ REPORTED LOSSES BY OTHER FARMERS IN THE AREA
- ☐ COMPARISONS OF HARVEST RECEIPTS AND PERSONAL RECORDS
- ESTIMATES MADE BY OTHER PERSONS
  - ☐ DNR PERSONNEL
  - ☐ MSU-EXTENSION AGENT
  - ☐ CROP INSPECTOR
- ☐ OTHER: (PLEASE DESCRIBE) _____

16. Of the years listed below, which year was your loss to deer the highest in Benzie county? (Check ONLY one)

☐1986 ☐1987 ☐1988 ☐1989 ☐1990 ☐1991 ☐1992 ☐1993 ☐1994 ⇒ GO TO # 19

☐Undecided ⇒ GO TO # 19

17. Compared to your 1994 losses to deer in Benzie county, how much more was the loss for the year you indicated above? (Please specify)

☐ ABOUT THE SAME AS I LOST IN 1994

☐ ABOUT _____ % MORE THAN I LOST IN 1994

☐ NOT SURE

18. How would you rate the level of loss you indicated in the above question?

The level of my losses to deer during the year checked above in #16 was . (Check ONLY one)

☐ NOT A PROBLEM.

☐ A PROBLEM BUT I DID NOT INCREASE MY EFFORTS TO REDUCE THE LOSSES

☐ A PROBLEM AND I INCREASED MY EFFORTS TO REDUCE THE LOSSES

19. In the following table, indicate whether you have done and/or are likely to do any of the following in direct response to deer damage in Benzie county.

PLEASE RESPOND TO ALL 3 COLUMNS ⇒ ⇒ ⇒ (Check ALL that apply)	DID PRIOR TO 1994	DID IN 1994 OR STILL IN EFFECT IN 1994	I WILL LIKELY DO IF FUTURE LOSSES ARE INTOLERABLE
INSTALL FENCING TO KEEP DEER OUT OF AN AREA	☐	☐	☐
USE REPELLENTS TO DISCOURAGE DEER FROM EATING A CROP	☐	☐	☐
USE HARASSMENT DEVICES TO FRIGHTEN DEER AWAY	☐	☐	☐
USE SHOOTING PERMITS	☐	☐	☐
USE BLOCK PERMITS	☐	☐	☐
ENCOURAGE OR PROMOTE HUNTING ON YOUR PROPERTY (OTHER THAN THE USE OF BLOCK PERMITS)	☐	☐	☐
SEEK INFORMATION OR ADVICE FROM THE DNR, MSU-EXTENSION OR OTHER SOURCE ON HOW TO GO ABOUT REDUCING CROP LOSSES	☐	☐	☐
CHANGE OR SWITCH CROPS TO THOSE LESS PREFERRED BY DEER	☐	☐	☐
PLANT BUFFER CROPS BETWEEN DEER HABITAT AND MORE VALUABLE CROPS	☐	☐	☐
START PURCHASING FEED INSTEAD OF OR IN ADDITION TO GROWING YOUR OWN	☐	☐	☐
ABANDON A FIELD BECAUSE OF HIGH DEER LOSSES	☐	☐	☐
COMMUNICATE WITH OR SEEK ACTION FROM:			
AN ELECTED OFFICIAL	☐	☐	☐
A REPRESENTATIVE OF THE DNR	☐	☐	☐
A REPRESENTATIVE OF THE MEDIA	☐	☐	☐
A REPRESENTATIVE OF MSU-EXTENSION	☐	☐	☐
HELP ORGANIZE MEETINGS TO DISCUSS AND ADDRESS DEER CROP DAMAGE	☐	☐	☐
ATTEND MEETINGS TO DISCUSS AND ADDRESS DEER CROP DAMAGE	☐	☐	☐
PERSONALLY OR JOINTLY CONSULT AN ATTORNEY REGARDING LEGAL OPTIONS TO REDUCE LOSSES TO DEER	☐	☐	☐

IV. COSTS OF DAMAGE CONTROL TREATMENTS / NON-TREATMENTS

20. Which crop generated the most revenue for your farm in 1994? _____

21. What was the price per unit (e.g. $/bushel, $/ton, $/Cwt) for this crop in 1994? $_____ per _____

22. For this crop, please indicate in the table below the damage control techniques you used by field in 1994 **including fields receiving no protection**, your estimate of the costs (if any) of the techniques used, and the effects on yields. If you have more than 3 fields in this crop, please provide information for the 3 fields receiving the most control.

		Costs of Damage Control Techniques Used on Fields (if any)					
Field or Block size	**Techniques used in 1994 specifically to reduce crop losses caused by deer.** (Check ALL that apply)	**Installation cost (if any)**	**Year installed**	**1994 Non-labor Maintenance or Operating cost**	**1994 Labor hours**	**Yield Information** Please provide both the yield and the units (e.g., bu/acre, tons/acre, Cwt/acre, $, etc.)	
Field or Block 1 ACRES: _____	☐ NO CONTROLS ☐ HIGH TENSILE ELECTRIC FENCE (7 OR MORE WIRES) ☐ WOVEN WIRE (8+ FEET) ☐ REPELLENTS (SOAP, ETC.) ☐ HARASSMENT DEVICES ☐ SHOOTING PERMITS ☐ BLOCK PERMITS ☐ OTHER : (please describe)					1994 Ave. yield per acre: _____	Without damage controls, how much yield would you or did you lose? _____
Field or Block 2 ACRES: _____	☐ NO CONTROLS ☐ HIGH TENSILE ELECTRIC FENCE (7 OR MORE WIRES) ☐ WOVEN WIRE (8+ FEET) ☐ REPELLENTS ☐ HARASSMENT DEVICES ☐ SHOOTING PERMITS ☐ BLOCK PERMITS ☐ OTHER : (please describe)					1994 Ave. yield per acre: _____	Without damage controls, how much yield would you or did you lose? _____
Field or Block 3 ACRES: _____	☐ NO CONTROLS ☐ HIGH TENSILE ELECTRIC FENCE (7 OR MORE WIRES) ☐ WOVEN WIRE (8+ FEET) ☐ REPELLENTS ☐ HARASSMENT DEVICES ☐ SHOOTING PERMITS ☐ BLOCK PERMITS ☐ OTHER : (please describe)					1994 Ave yield per acre: _____	Without damage controls, how much yield would you or did you lose? _____

23. Are there other costs or losses associated with these fields that are not reflected in the preceding table? (Please specify)

V. DEER HUNTING INVOLVEMENT, ATTITUDES ABOUT HUNTING AND ACCESS

24. Please indicate to what extent you agree or disagree with the following statements by circling the appropriate response

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree (Circle ONLY one response for each statement)					
I cannot control my crop losses because not enough deer are harvested during the hunting season on lands adjacent to my farm.	SA	A	U	D	SD
Hunting seasons should be designed to reduce deer numbers so that special kill permits to control crop losses are not necessary.	SA	A	U	D	SD

25. Do you hunt deer yourself? ☐ YES ☐ NO ⇒ **GO TO # 27**

26. How important is deer hunting to you compared to other types of recreation in which you participate, such as other types of hunting, fishing, camping, jogging, bowling, competitive sports, etc ?

DEER HUNTING IS... (Check ONLY one)

- ☐ THE MOST IMPORTANT RECREATIONAL ACTIVITY IN WHICH I PARTICIPATE
- ☐ MORE IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
- ☐ ABOUT AS IMPORTANT AS THE OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
- ☐ LESS IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
- ☐ NOT AT ALL IMPORTANT TO ME

27. Please check ALL who are allowed to hunt deer on your farm in Benzie county.

- ☐ NO ONE (INCLUDING MYSELF) ⇒ **GO TO # 34**
- ☐ ME AND/OR MY IMMEDIATE FAMILY
- ☐ FRIENDS AND NEIGHBORS
- ☐ NON-ACQUAINTANCES WHO REQUEST PERMISSION
- ☐ MY LAND IS OPEN TO ANYONE WHO WANTS TO HUNT, THEY NEED NOT ASK PERMISSION
- ☐ FRIENDS AND NEIGHBORS WHO PAY A FEE OR LEASE MY LAND*
- ☐ NON-ACQUAINTANCES WHO PAY A FEE OR LEASE MY LAND*

*** If no hunters paid you for the privilege of deer hunting your farm in 1994 ⇒ GO TO # 30**

28. If hunters paid you for the privilege of deer hunting on your farm in 1994, how much did you receive in total from deer hunters using your Benzie county farm in 1994? $_____ or Other payment _____

29. On what basis were you paid by hunters? (e.g., annually, daily, etc.)

Please explain: _____

30. About how many hunters hunted deer on lands you farm in Benzie county on the opening day of the firearms deer season in 1994?

_____ HUNTERS ☐ I DON'T KNOW

31. About how many deer hunters do you think the lands you farm in Benzie county can safely support on opening day of the firearms deer season?

_____ HUNTERS ☐ I'M NOT SURE

32. Did you do any of the following to encourage those who hunted your lands to harvest antlerless deer in 1994? (Check ALL that apply)

- ☐ I DID NOT ENCOURAGE THE HARVEST OF ANTLERLESS DEER IN 1994
- ☐ I DISTRIBUTED BLOCK PERMITS
- ☐ I REQUESTED THAT ANTLERLESS DEER BE SHOT BEFORE BUCKS
- ☐ OTHER: (please describe) _____

33. Approximately how many deer were taken on your farmlands in Benzie county during ALL of the 1994 deer hunting seasons?

_____ ANTLERED BUCKS _____ ANTLERLESS DEER ☐ I DON'T KNOW

34. Please indicate how many acres of the lands you farmed in 1994 in Benzie county were in each of the following non-crop cover types.

Non-Crop cover types in Benzie county in 1994	Acres
PASTURES	
UNCULTIVATED, FALLOW FIELDS, OR C.R.P.	
WETLANDS (MARSHES, POTHOLES, SLOUGHS, ETC.)	
ALL WOODED COVER (UPLAND FORESTS, CEDAR SWAMPS)	

VI. ATTITUDES AND USE OF SHOOTING AND BLOCK PERMITS IN BENZIE COUNTY

SHOOTING PERMITS are permits issued by the DNR for shooting deer outside of the regular deer hunting seasons.
BLOCK PERMITS are special permits sold to farmers in blocks of 5 or more by the DNR for shooting antlerless deer during the regular deer hunting seasons.

35. Have you ever requested Shooting and/or Block permits from the DNR for lands which you farm in Benzie county?
☐YES ☐ NO ⇒ **GO TO # 50**

36. Have you ever requested Shooting permits from the DNR?
☐YES ☐NO ⇒ **GO TO # 43**
37. About how many years did you request shooting permits? _____ YEARS
38. About how many years did you receive shooting permits? _____ YEARS

39. Did you request Shooting permits in 1994?
☐YES ☐ NO ⇒ **GO TO # 43**
40. How many Shooting permits did you receive in 1994? _____ PERMITS
41. Did you receive as many as you thought you needed? ☐YES ☐NO
42. How many of those Shooting permits were filled in 1994? _____ PERMITS WERE FILLED

43. Have you ever requested Block permits from the DNR?
☐YES ☐ NO ⇒ **GO TO # 50**
44. About how many years did you request Block permits? _____ YEARS
45. About how many years did you receive Block permits? _____ YEARS

46. Did you request Block permits in 1994?
☐YES ☐ NO ⇒ **GO TO # 50**
47. How many Block permits did you receive in 1994? _____ BLOCK PERMITS
48. Did you receive as many as you thought you needed? ☐YES ☐ NO
49. How many of those Block permits were filled in 1994? _____ BLOCK PERMITS WERE FILLED

50. Please indicate in the following tables whether you agree or disagree with the following statements about **Shooting** permits and/or **Block** permits **in Benzie county** by circling the appropriate response.

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree					
Shooting Permits:	**(Circle ONLY one for each statement)**				
In this county, shooting permits are distributed fairly to growers who need them regardless of the value of the crops grown.	SA	A	U	D	SD
Shooting permits are successfully used to reduce crop losses in this county.	SA	A	U	D	SD
In this county, shooting permits should be given more readily to growers of high value crops than to growers of lesser value crops.	SA	A	U	D	SD
Regardless of whether shooting permits actually reduce crop losses, they are still important to farmers because they at least make farmers feel in control of the situation.	SA	A	U	D	SD
My neighbors' objections to the use of shooting permits influences my decision to use them.	SA	A	U	D	SD
Too many male deer are killed on shooting permits.	SA	A	U	D	SD
The venison and/or recreation I get by using shooting permits is important to me.	SA	A	U	D	SD
Too many of the deer killed on shooting permits are not utilized.	SA	A	U	D	SD

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree					
Block Permits:	**(Circle ONLY one for each statement)**				
In this county, block permits are distributed fairly to growers who need them regardless of the value of the crops grown.	SA	A	U	D	SD
Block permits are successfully used to reduce crop losses in this county.	SA	A	U	D	SD
In this county, block permits should be given more readily to growers of high value crops than to growers of lesser value crops.	SA	A	U	D	SD
Regardless of whether block permits actually reduce crop losses, they are still important to farmers because they at least make farmers feel in control of the situation.	SA	A	U	D	SD
My neighbors' objections to the use of block permits influences my decision to use them.	SA	A	U	D	SD
The venison and/or recreation I get by using block permits is important to me.	SA	A	U	D	SD

51. Please indicate whether any of the following **should be** considered by the DNR when issuing permits to a farmer for killing deer to control crop losses caused by deer. (Check ALL that apply)

- ☐ THE FINANCIAL DEPENDENCE OF THE FARMER ON THE CROP
- ☐ THE EXTENT TO WHICH THE FARMER HAS TRIED TO CONTROL LOSSES THROUGH NON-LETHAL MEANS
- ☐ THE FARMER'S WILLINGNESS TO ALLOW HUNTERS TO HUNT ON HIS/HER LAND
- ☐ THE WILLINGNESS AND ABILITY OF THE FARMER TO AVOID PLANTING HIGH VALUE CROPS NEAR DEER HABITAT
- ☐ OTHER: _____

52. Please describe any changes you would like to see made in the **Shooting permit** system in Benzie county.

53. Please describe any changes you would like to see made in the **Block permit** system in Benzie county.

VII. ATTITUDES ABOUT THE DEER POPULATION SIZE IN BENZIE COUNTY

54. When you form your opinion on whether the deer population size in BENZIE county is acceptable, how important is each of the following considerations to you?

Circle ONLY one answer for each row. ⇒ ⇒ ⇒	VERY IMPORTANT	SOMEWHAT IMPORTANT	SLIGHTLY IMPORTANT	NOT IMPORTANT	UNSURE
Personal recreational benefits from deer (e.g., viewing, hunting, feeding, etc.)	VERY	SOME	SLIGHT	NOT	U
Recreational benefits from deer provided to others in the county.	VERY	SOME	SLIGHT	NOT	U
Personal economic benefits from the presence of deer (e.g., hunting leases, goods and services provided to hunters and tourists.)	VERY	SOME	SLIGHT	NOT	U
Economic benefits to the county from the presence of deer.	VERY	SOME	SLIGHT	NOT	U
Personal crop losses to deer.	VERY	SOME	SLIGHT	NOT	U
Other farmers' crop losses to deer.	VERY	SOME	SLIGHT	NOT	U
The number of deer-related vehicle accidents in the county.	VERY	SOME	SLIGHT	NOT	U

55. For the portion of Benzie county where you do the majority of your farming, what is your best estimate of what the average number of deer per square mile was in October of 1994?

I BELIEVE THERE WERE BETWEEN _____ AND _____ DEER PER SQUARE MILE IN THIS AREA IN OCTOBER OF 1994.

☐ I HAVE NO IDEA WHATSOEVER

56. Considering both the positive and negative impacts of deer to yourself and the local community, how would you describe your reaction to the number of deer per square mile that you indicated in question 55 above? (Check ONLY one)

☐ TOO FEW, AND I INTEND TO TRY TO DO SOMETHING ABOUT IT.
☐ TOO FEW, BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT.
☐ I AM SATISFIED WITH THE NUMBER OF DEER
☐ TOO MANY, BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT
☐ TOO MANY, AND I INTEND TO TRY TO DO SOMETHING ABOUT IT.

57. In the portion of Benzie county where you do the majority of your farming, what number of deer per square mile would be most desirable to you (not too many or too few, but just right)?

THE MOST DESIRABLE NUMBER TO ME WOULD BE _____ DEER PER SQUARE MILE.

☐ I HAVE NO IDEA WHATSOEVER

58. Considering both the positive and negative impacts to yourself and the local community, please indicate the minimum and maximum number of deer per square mile that you would tolerate in that portion of Benzie county where you do the majority of your farming. (Answer BOTH A and B below)

PART A> ⇒ I WOULD NOT BE WILLING TO TOLERATE ANY FEWER THAN _____ DEER PER SQUARE MILE.

☐ I HAVE NO IDEA WHATSOEVER

PART B> ⇒ I WOULD NOT BE WILLING TO TOLERATE ANY MORE THAN _____ DEER PER SQUARE MILE.

☐ I HAVE NO IDEA WHATSOEVER

59. How would you describe the trend in deer numbers over the past five years in that portion of Benzie county where you do the majority of your farming? (Check ONLY one)

☐ INCREASING ☐ ABOUT THE SAME EACH YEAR ☐ DECREASING ☐ I DON'T KNOW

VIII. ATTITUDES ABOUT AGENCIES IN BENZIE COUNTY

60. In any given year, how often do you typically have contact with local DNR biologist(s)? (Check ONLY one)

- ☐ NEVER
- ☐ LESS THAN ONCE PER YEAR
- ☐ A FEW TIMES PER YEAR
- ☐ MORE THAN ONCE PER MONTH

61. Please indicate to what extent you agree or disagree with the following statements by circling the appropriate response.

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree (Circle ONLY one response for each statement)					
Crop losses are imposed on farmers by the DNR and hunters.	SA	A	U	D	SD
The DNR has the expertise to manage the state's deer herd.	SA	A	U	D	SD
The DNR has enough information on the deer population to adequately decide how many deer to harvest in Michigan each year.	SA	A	U	D	SD
DNR biologists treat farmers in this county professionally and with respect.	SA	A	U	D	SD
Our local DNR biologists can adequately determine the amount of loss a farmer is incurring to deer.	SA	A	U	D	SD
Our local DNR biologists understand the significance of crop losses to the economic well-being of the farmer.	SA	A	U	D	SD

62. Please distribute 100 points within each of the following two columns to indicate how much importance you think the DNR ***currently places*** and ***should place*** on each of the following interest groups when the agency sets deer population goals for Benzie county.

For example, if you think that the DNR currently places importance only on hunters' interests in setting deer population goals in BENZIE county, place 100 points next to hunters and 0 points next to farmers in the column on the left below. Or, if you think that hunter and farmer interests are equally important to the DNR, give each group 50 points. If another interest group is important to the DNR, write in the group and weight them accordingly. Follow this same procedure for the column on the right to show us where you feel the DNR should be placing importance.

THE DNR CURRENTLY PLACES IMPORTANCE ON:	THE DNR SHOULD PLACE IMPORTANCE ON:
_____ HUNTERS	_____ HUNTERS
_____ FARMERS	_____ FARMERS
_____ OTHER: _____	_____ OTHER: _____
= 100	= 100

63. In any given year, how frequently do you typically have contact with Benzie county MSU-Extension representatives? (Check ONLY one)

- ☐ NEVER
- ☐ LESS THAN ONCE PER YEAR
- ☐ A FEW TIMES PER YEAR
- ☐ MORE THAN ONCE PER MONTH

64 Please indicate to what extent you agree or disagree with the following statements by circling the appropriate response.

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree (Circle ONLY one response for each statement)					
The Benzie county extension agent(s) treat farmers professionally and with respect.	SA	A	U	D	SD
The Benzie county extension agent(s) are knowledgeable about farming.	SA	A	U	D	SD
The Benzie county extension agent(s) are helpful for locating information about farming problems.	SA	A	U	D	SD

IX. BACKGROUND INFORMATION

We need the following information to compare our sample of farmers with the statewide population of farmers. As with the other information you have provided, this information will also remain **confidential**.

65. About what percent of your household gross income was generated by farming in 1994? _____%

66. What was your total gross household income in 1994 (before deductions for taxes, bonds, dues or other items)? (Check ONLY one)

☐ LESS THAN $9,999 ☐ $15,000 - $24,999 ☐ $35,000 - $49,999 ☐ $75,000 - $99,999
☐ $10,000 - $14,999 ☐ $25,000 - $34,999 ☐ $50,000 - $74,999 ☐ GREATER THAN $100,000

67. What is your age? _____ YEARS

68. How long have you been farming in Benzie county? _____ YEARS

69. What was your highest level of schooling completed or degree received? (Check ONLY one)

☐ NO SCHOOL
☐ LESS THAN 9TH. GRADE
☐ SOME HIGH SCHOOL
☐ HIGH SCHOOL DIPLOMA OR EQUIVALENT (GED)
☐ SOME COLLEGE OR TECHNICAL SCHOOL
☐ COLLEGE OR TECHNICAL SCHOOL DEGREE (BA, BS, AB, etc.)
☐ GRADUATE OR PROFESSIONAL SCHOOL DEGREE (MA, MS, Ph.D., M.Ed., etc.)

70 Would you be willing to participate in a follow-up survey about the effectiveness and methods of the damage control you have used? (Check ONLY one)

☐ YES ☐ NO ☐ I HAVE NOT USED ANY CONTROLS

71. Please indicate if you currently belong to any of the following organizations. (Check ALL that apply)

☐ FARM BUREAU
☐ OTHER FARMING ORGANIZATIONS: _____, _____
☐ LOCAL ORGANIZATIONS CONCERNED WITH CROP DAMAGE (e.g., Upward, Responsible Wildlife Management, etc.)

PLEASE SPECIFY: _____, _____, _____

☐ CONSERVATION ORGANIZATIONS (e.g., MUCC, Pheasants Forever, National Wildlife Federation)

PLEASE SPECIFY: _____, _____, _____

We welcome any additional comments you may have that will help us better understand how farmers view deer and deer-caused crop damage. Feel free to add your comments here.

THANK YOU FOR YOUR PARTICIPATION!

Please place the questionnaire in the stamped envelope provided and mail

Peter A. Fritzell -- Research Assistant
13 Natural Resources Building
Department of Fisheries and Wildlife
Michigan State University

Special Note: The handwritten number on the back cover of this survey will not be associated with your responses; the number is being used solely for identifying who has already responded to our mailings so that we do not repeat mailings .

1995 OPINION SURVEY OF MICHIGAN PRODUCERS ABOUT DEER AND DEER MANAGEMENT

OVERALL RESULTS

•A version of this survey was sent in April and May, 1995, to agricultural producers who farmed in one of the seven agricultural study counties.
•Of the 2,134 surveys sent, 596 eligible surveys were returned, 93 were non-deliverable, and 463 were returned by ineligible respondents (i.e., not active farmers).
•Note – Not all frequencies are given because reporting the data in summary form as constrained by the survey format was not appropriate or meaningful in all instances. For a detailed report see Fritzell (1996).

Organization of this Summary

1. The Farming Operation
2. Row And Field Crop Losses In 1994
3. Fruit And Christmas Tree Losses In 1994
4. Current And Past Loss Attitudes
5. Past, Current, And Future Behaviors Associated With Crop Losses
6. Deer Hunting Involvement, Attitudes About Hunting And Access
7. Attitudes And Use Of Shooting And Block Permits
8. Attitudes About The Deer Population Size In 1994
9. Attitudes About The MDNR
10. Attitudes About MSU-Extension
11. Background Information And Demographics Of Farmer Survey Respondents

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The Farming Operation –

Producers were asked to provide some background information on their farming operation such as the following: the total number of acres owned and rented; the percent of their farm sales that was represented by livestock, dairy or poultry products, cash crops, and trees or tree products; the number of acres farmed within the study county; and whether they considered themselves a full-, part-time, retired, or non-farmer. The farmer status question was used as filter so that we could be sure we were considering only "active" farmers in our subsequent analysis. The question about the number of acres farmed in the study county made sure that the analysis was in fact of farmer attitudes for the county of interest. An additional question (#5) asked farmers to identify the approximate location of their farming operation.

1. Please check one of the following that best describes you. **(n=982)**

47.2% FULL-TIME FARMER (FARMING IS MY PRIMARY OCCUPATION; I SPEND OVER 50% OF MY WORKING TIME FARMING.)

21.7% PART-TIME FARMER (FARMING IS NOT MY PRIMARY OCCUPATION; I SPEND LESS THAN 50 % OF MY WORKING TIME FARMING.)

31.2% RETIRED FARMER / NOT A FARMER

There were 1,059 respondents who returned a survey with at least one question answered. Of these 463 were full-time farmers, 213 were part-time farmers, 306 were retired or non-farmers, and 77 skipped the first question. Retirees, non-farmers, and those missing cases were excluded from subsequent analyses.

4. How many acres did you farm in 1994 in [county name] county. Please add other counties and acreages you farmed in 1994.

Question #4 was used as a screening question to eliminate those who did not farm in a study county. Of the 676 full- and part-time farmers who responded to the survey, 80 did not farm any acres in a study county during 1994, and 1 farmed ≤1 acre in a study county. These farmers were also excluded from analysis. ***All results reported from this point on are drawn from the pool of 595 full- and part-time farmers who reported farming >1 acre in a study county in 1994.***

COUNTYRE County of survey Pooled

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Calhoun	1.00	133	22.4	22.4	22.4
Montcalm	2.00	104	17.5	17.5	39.8
Oceana	3.00	115	19.3	19.3	59.2
Benzie/Leelanau	4.00	128	21.5	21.5	80.7
Presque Isle	6.00	52	8.7	8.7	89.4
Menominee	7.00	63	10.6	10.6	100.0
	Total	595	100.0	100.0	

2. In 1994 about how many total acres (including homesteads, feedlots, woodlots, fields, buildings, etc.) of your farming operation were:

A) OWNED? _____ ACRES

B) RENTED FROM SOMEONE ELSE?_____ ACRES

Total farm sizes were calculated by adding the acres owned and rented. A one-way analysis of variance indicated that mean farm size differed by county. Farm sizes in fruit counties (i.e., Benzie, Leelanau, Oceana) were smaller than farm sizes in all other counties. Presque Isle county had the smallest mean farm size (420 acres) of the non-fruit counties, whereas Montcalm county had the largest mean size (702 acres). Similar patterns were seen with acres owned and rented.

3. Please indicate the percentage of your annual farm sales represented by each crop or product.

Crop or Product	**% of Farm Sales**
LIVESTOCK, DAIRY OR POULTRY PRODUCTS	
CASH CROPS (e.g., vegetables, field crops)	
TREES OR TREE PRODUCTS (e.g., Christmas trees, orchards, etc.)	

Farms were classified as being primarily livestock, cash crops, or trees if they indicated that ≥75% of their farm sales were of one of these categories. Farms were designated as mixed if a second category was responsible for >25% of their farm sales. Twenty farms were not categorized by this scheme; however, these farms for the most part did not indicate sales that totaled 100%.

FARMTYPE Primary % of farm sales

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Livestock, dairy, po	1.00	118	19.8	21.4	21.4
Cash crops	2.00	136	22.9	24.6	46.0
Trees or tree produc	3.00	101	17.0	18.3	64.3
Livestock mixed	4.00	24	4.0	4.3	68.7
Cash crops mixed	5.00	92	15.5	16.7	85.3
Trees/Fruit mixed	6.00	81	13.6	14.7	100.0
	.	43	7.2	Missing	
	Total	595	100.0	100.0	

Valid cases 552 Missing cases 43

Row And Field Crop Losses In 1994 --

A table was included in the questionnaire (Question #7) which asked that producers report the number of acres they had planted in a variety of crop types during 1994 and the losses they believed they had incurred due to deer during that year.

6. Did you grow row/field crops for sale or feed (e.g., corn, soybeans, vegetables, alfalfa, etc.) in 1994 in [county name] county?

☐ **YES** ☐ **NO ⇒ GO TO # 9**

ROWCRP94 Row Crops Grown in 1994

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	0	147	24.7	25.0	25.0
yes	1	442	74.3	75.0	100.0
	.	6	1.0	Missing	
	Total	595	100.0	100.0	

Valid cases 589 Missing cases 6

7. If you grew row / field crops in 1994, please provide your best estimate of the following information.
***If you don't know or aren't sure how much you lost to deer place a question mark "?" in the box.**

Crop Type	1994 Acres	1994 Ave. yield per acre. Please include the type of unit (bu./ac, tons/ac, cwts/ac, etc.)	Lost to deer in 1994.* (Estimated Bushels, Tons, Cwts...)	The level of my 1994 losses to deer was... 1=Not a problem. 2=A problem but tolerable 3=A problem and I intend to increase my efforts to reduce the losses below 1994 levels.		
				1	2	3
CORN n=309				23.3%	45.3%	31.4%
SOYBEANS n=102				26.5%	43.1%	30.4%
DRY BEANS - Table n=48				20.8%	27.1%	52.1%
DRY BEANS - Certified n=11				9.1%	36.4%	54.5%
ALFALFA / HAY n=249				34.5%	41.0%	24.5%
SMALL GRAINS n=182				40.1%	40.1%	19.8%
VEGETABLES (Please List) n=79				53.2%	26.6%	20.3%
n=29				27.6%	44.8%	27.6%
OTHER- n=21				38.1%	23.8%	38.1%

8. Please complete the following sentence by providing the characteristics that describe your worst case field loss in 1994.

IN 1994, MY WORST LOSSES TO DEER ON A SINGLE FIELD WERE ON A (size) _____ ACRE FIELD OF (crop) _____ WHERE DEER REDUCED MY YIELD FROM THAT FIELD BY (amount) _____ %.

Fruit And Christmas Tree Losses In 1994 --

Because three of our surveyed counties were primarily fruit production counties, we provided a similar table so that fruit growers could indicate how many acres of different tree types they had and how much loss those trees were suffering because of deer. Again, they were asked to indicate their tolerance of the losses occurring to each tree type.

9. Did you grow fruit trees, nursery products or Christmas trees commercially in [county name] county in 1994?

☐ YES ☐ NO ⇒ GO TO # 12

TREES94 Trees or Tree products in 1994

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	0	377	63.4	64.8	64.8
yes	1	205	34.5	35.2	100.0
	.	13	2.2	Missing	
	Total	595	100.0	100.0	

Valid cases 582 Missing cases 13

10. If you grew fruit, Christmas or other trees in 1994, please provide your best estimate of the following information.

***If you don't know or aren't sure how much you lost to deer place a question mark "?" in the box.**

Type of Trees	Acres	Trees per acre	Estimated # of Trees damaged by deer in 1994.*	1994 Farm Ave. yield in total lbs.	Estimated total lbs. lost due to deer browsing in 1994.*	The level of my 1994 losses to deer was... 1=Not a problem. 2=A problem but tolerable 3=A problem and I intend to increase my efforts to reduce the losses below 1994 levels.		
						1	2	3
APPLE NON-BEARING n=66						15.2%	25.8%	59.1%
BEARING n=70						28.6%	41.4%	30.0%
CHERRY NON-BEARING n=103						9.7%	22.3%	68.0%
BEARING n=100						34.0%	40.0%	26.0%
OTHER – n=47						21.4%	33.3%	45.2%
n=18						38.9%	44.4%	16.7%
CHRISTMAS TREES n=53						58.5%	28.3%	13.2%
NURSERY PRODUCTS n=3						33.3%	0.0%	66.7%

11. If your 1994 losses to deer were tolerable, please give your best estimate of the level of loss that would be intolerable; that is, cause you to take (further) action to reduce losses.

Type of Trees	Intolerable # of damaged trees	Intolerable loss in lbs.
APPLE NON-BEARING n=11	Mean= 52, SD=60	
BEARING n=8		Mean= 3509, SD=6691
CHERRY NON-BEARING n=13	Mean= 126, SD=150	
BEARING n=9		Mean= 3782, SD=3795
OTHER – n=7	Mean= 33, SD=16	
n=2		Mean= 1499, SD=707
CHRISTMAS TREES n=16	Mean= 504, SD=843	
NURSERY PRODUCTS n=0		

Current And Past Loss Attitudes –

12. In addition to total yield lost, how significantly does deer damage reduce the quality of your harvested crops?
The value lost in crop quality due to deer is... (Check ONLY one) **(n=540)**

8.0% GREATER THAN THE VALUE OF THE YIELD LOST TO DEER.
14.6% EQUAL TO THE VALUE OF THE YIELD LOST TO DEER.
13.9% LESS THAN THE VALUE OF THE YIELD LOST TO DEER.
33.5% THE LOST VALUE IN CROP QUALITY IS NEGLIGIBLE.
30.0% I'M NOT SURE.

13. Considering ALL crops (row, field, fruits, trees, etc.) how do you rate 1994's total losses to deer?
The level of my 1994 losses to deer was... (Check ONLY one) **(n=571)**

26.6% NOT A PROBLEM.
31.3% A PROBLEM BUT I DO NOT INTEND TO INCREASE MY EFFORTS TO REDUCE THE LOSSES.
42.0% A PROBLEM AND I INTEND TO INCREASE MY EFFORTS TO REDUCE THE LOSSES BELOW 1994 LEVELS.

14. Compared to deer, how would you describe the crop losses you incurred to all other wildlife such as beaver, raccoons, geese, blackbirds, mice, etc. in 1994? (Check ONLY one) **(n=579)**

53.0% LOSSES TO DEER ARE MORE SIGNIFICANT THAN LOSSES TO OTHER WILDLIFE
19.9% LOSSES TO DEER ARE ABOUT THE SAME AS LOSSES TO OTHER WILDLIFE
11.7% LOSSES TO DEER ARE LESS SIGNIFICANT THAN LOSSES TO OTHER WILDLIFE
9.5% I AM NOT INCURRING ANY CROP LOSSES TO OTHER WILDLIFE
5.9% I'M NOT SURE

15. On what have you based your estimates of 1994 crop losses to deer? (Check ALL that apply) **(n=595)**

12.3% I HAVE NO IDEA WHAT MY LOSSES WERE
41.5% THE NUMBER OF DEER SEEN IN FIELDS
79.7% THE VISIBLE DAMAGE TO CROPS
8.6% REPORTED LOSSES BY OTHER FARMERS IN THE AREA
12.9% COMPARISONS OF HARVEST RECEIPTS AND PERSONAL RECORDS
ESTIMATES MADE BY OTHER PERSONS
5.9% DNR PERSONNEL
0.8% MSU-EXTENSION AGENT
5.2% CROP INSPECTOR
0.8% OTHER: (PLEASE DESCRIBE) _____

16. Of the years listed below, which year was your loss to deer the highest in [county name] county? (Check ONLY one)
(n=551)

2.4% 1986 **1.6%** 1987 **5.4%** 1988 **4.9%** 1989 **4.7%** 1990 **5.6%** 1991
8.9% 1992 **8.5%** 1993 **23.0%** 1994 ⇒ GO TO # 19 **34.8%** Undecided ⇒ GO TO # 19

17. Compared to your 1994 losses to deer in [county name] county, how much more was the loss for the year you indicated above? (Please specify) **(n=221)**

15.8% ABOUT THE SAME AS I LOST IN 1994
70.1% ABOUT _____ % MORE THAN I LOST IN 1994 ⇒ ⇒ **Mean= 52%, SD=124, n=153**
14.0% NOT SURE

18. How would you rate the level of loss you indicated in the above question?

The level of my losses to deer during the year checked above in #16 was... (Check ONLY one)
(n=223)

7.6% NOT A PROBLEM.

26.0% A PROBLEM BUT I DID NOT INCREASE MY EFFORTS TO REDUCE THE LOSSES.

66.4% A PROBLEM AND I INCREASED MY EFFORTS TO REDUCE THE LOSSES.

Past, Current, And Future Behaviors Associated With Crop Losses –

19. In the following table, indicate whether you have done and/or are likely to do any of the following in **direct response** to deer damage in [county name] county.

PLEASE RESPOND TO ALL 3 COLUMNS ⇒ ⇒ ⇒ (Check ALL that apply) (n=595)	DID PRIOR TO 1994	DID IN 1994 OR STILL IN EFFECT IN 1994	I WILL LIKELY DO IF FUTURE LOSSES ARE INTOLERABLE
INSTALL FENCING TO KEEP DEER OUT OF AN AREA % of total respondents % of those w/intolerable 94 losses	4.9% 9.2	3.2% 4.6	11.8% 18.3
USE REPELLENTS TO DISCOURAGE DEER FROM EATING A CROP	23.0% 34.2	20.3% 34.6	22.0% 32.5
USE HARASSMENT DEVICES TO FRIGHTEN DEER AWAY	11.9% 17.9	8.7% 17.5	14.8% 23.8
USE SHOOTING PERMITS	24.2% 42.9	10.4% 21.7	28.7% 42.9
USE BLOCK PERMITS	28.9% 47.5	15.8% 30	34.8% 51.7
ENCOURAGE OR PROMOTE HUNTING ON YOUR PROPERTY (OTHER THAN THE USE OF BLOCK PERMITS)	43.9% 56.7	38.5% 55	35.6% 46.3
SEEK INFORMATION OR ADVICE FROM THE DNR, MSU-EXTENSION OR OTHER SOURCE ON HOW TO GO ABOUT REDUCING CROP LOSSES	16.5% 27.5	10.8% 21.3	20.8% 30.8
CHANGE OR SWITCH CROPS TO THOSE LESS PREFERRED BY DEER	8.7% 12.9	6.4% 9.2	10.4% 15
PLANT BUFFER CROPS BETWEEN DEER HABITAT AND MORE VALUABLE CROPS	6.2% 8.8	4.0% 6.3	8.6% 8.8
START PURCHASING FEED INSTEAD OF OR IN ADDITION TO GROWING YOUR OWN	7.2% 12.1	4.9% 8.3	6.1% 10.8
ABANDON A FIELD BECAUSE OF HIGH DEER LOSSES	9.4% 16.3	6.1% 10	9.7% 17.1
COMMUNICATE WITH OR SEEK ACTION FROM:			
AN ELECTED OFFICIAL	5.2% 10.8	3.4% 7.1	9.1% 17.1
A REPRESENTATIVE OF THE DNR	18.3% 31.7	12.3% 24.6	24.2% 40
A REPRESENTATIVE OF THE MEDIA	2.2% 5	0.5% 0.8	5.7% 9.6
A REPRESENTATIVE OF MSU-EXTENSION	7.9% 15.4	5.5% 12.1	13.8% 20
HELP ORGANIZE MEETINGS TO DISCUSS AND ADDRESS DEER CROP DAMAGE	3.7% 7.1	2.0% 4.2	6.4% 10
ATTEND MEETINGS TO DISCUSS AND ADDRESS DEER CROP DAMAGE	17.3% 29.6	10.1% 22.1	21.8% 35.4
PERSONALLY OR JOINTLY CONSULT AN ATTORNEY REGARDING LEGAL OPTIONS TO REDUCE LOSSES TO DEER	2.4% 5.4	0.5% 1.3	8.7% 15.4

Deer Hunting Involvement, Attitudes About Hunting and Access --

24. Please indicate to what extent you agree or disagree with the following statements by circling the appropriate response.

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree (Circle ONLY one response for each statement)	SA	A	U	D	SD
I cannot control my crop losses because not enough deer are harvested during the hunting season on lands adjacent to my farm. n=522	28.2%	23.9%	16.7%	15.7%	15.5%
Hunting seasons should be designed to reduce deer numbers so that special kill permits to control crop losses are not necessary. n=519	31.6%	30.1%	16.4%	12.3%	9.6%

25. Do you hunt deer yourself? **69.8%** YES **30.2%** NO ⇒ GO TO # 27 **(n=569)**

26. How important is deer hunting to you compared to other types of recreation in which you participate, such as other types of hunting, fishing, camping, jogging, bowling, competitive sports, etc.?

DEER HUNTING IS... (Check ONLY one) **(n=339)**

25.4% THE MOST IMPORTANT RECREATIONAL ACTIVITY IN WHICH I PARTICIPATE
24.5% MORE IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
32.7% ABOUT AS IMPORTANT AS THE OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
12.4% LESS IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES IN WHICH I PARTICIPATE
5.0% NOT AT ALL IMPORTANT TO ME

27. Please check <u>ALL</u> who are allowed to hunt deer on your farm in [county name] county.

2.7% NO ONE (INCLUDING MYSELF) ⇒ GO TO # 34 **(n=595)**

72.0% ME AND/OR MY IMMEDIATE FAMILY **(n=579)**
78.1% FRIENDS AND NEIGHBORS
32.6% NON-ACQUAINTANCES WHO REQUEST PERMISSION
7.3% MY LAND IS OPEN TO ANYONE WHO WANTS TO HUNT, THEY NEED NOT ASK PERMISSION
5.4% FRIENDS AND NEIGHBORS WHO PAY A FEE OR LEASE MY LAND*
6.6% NON-ACQUAINTANCES WHO PAY A FEE OR LEASE MY LAND*

30. About how many hunters hunted deer on lands you farm in [county name] county on the opening day of the firearms deer season in 1994?

Mean= 9.0, SD=13.4 HUNTERS **19.3%** I DON'T KNOW **(n=548)**

31. About how many deer hunters do you think the lands you farm in [county name] county can safely support on opening day of the firearms deer season?

Mean= 12.0, SD=42.0 HUNTERS **26.6%** I'M NOT SURE **(n=545)**

32. Did you do any of the following to encourage those who hunted your lands to harvest antlerless deer in 1994? (Check ALL that apply) (n=450)

49.1% I DID NOT ENCOURAGE THE HARVEST OF ANTLERLESS DEER IN 1994.

23.3% I DISTRIBUTED BLOCK PERMITS

30.7% I REQUESTED THAT ANTLERLESS DEER BE SHOT BEFORE BUCKS

15.1% OTHER: (please describe) _____

33. Approximately how many deer were taken on your farmlands in [county name] county during ALL of the 1994 deer hunting seasons?

Mean=4.1, SD=5.1, n=355 ANTLERED BUCKS **Mean=7.9, SD=13.2, n=278** ANTLERLESS DEER

30.1%, n=579 I DON'T KNOW

34. Please indicate how many acres of the lands you farmed in 1994 in [county name] county were in each of the following non-crop cover types.

Non-Crop cover types in [county name] county in 1994	Acres
PASTURES	**Mean=17, SD=36, n=595**
UNCULTIVATED, FALLOW FIELDS, OR C.R.P.	**Mean=43, SD=48, n=235**
WETLANDS (MARSHES, POTHOLES, SLOUGHS, ETC.)	**Mean=32, SD=40, n=274**
ALL WOODED COVER (UPLAND FORESTS, CEDAR SWAMPS)	**Mean=82, SD=104, n=458**

Attitudes And Use Of Shooting And Block Permits --

35. Have you ever requested **Shooting** and/or **Block** permits from the DNR for lands which you farm in [county name] county?

40.9% YES **59.1%** NO ⇒ GO TO # 50 (n=579)

36. Have you ever requested **Shooting permits** from the DNR?

75.2% YES **24.8%** NO ⇒ GO TO # 43 **(n=226)**

37. About how many years did you request shooting permits? **Mean=4.1 YEARS, SD=3.1, n=150**

38. About how many years did you receive shooting permits? **Mean=3.6 YEARS, SD=3.3, n=141**

39. Did you request **Shooting permits** in 1994?

38.5% YES **61.5%** NO ⇒ GO TO # 43 **(n=161)**

40. How many Shooting permits did you receive in 1994? **9.5 PERMITS, SD=11.1, n=59**

41. Did you receive as many as you thought you needed? **51.7% YES 48.3% NO n=60**

42. How many of those Shooting permits were filled in 1994? **9.1 PERMITS WERE FILLED, SD=11.7, n=53**

43. Have you ever requested **Block permits** from the DNR?

85.8% YES **14.2%** NO ⇒ GO TO # 50 **(n=226)**

44. About how many years did you request Block permits? **3.4 YEARS, SD=1.9, n=178**

45. About how many years did you receive Block permits? **3.0 YEARS, SD=1.9, n=168**

46. Did you request **Block permits** in 1994?

66.3% YES **33.7%** NO ⇒ GO TO # 50 **(n=184)**

47. How many Block permits did you receive in 1994? **15.4 BLOCK PERMITS, SD=16.1, n=117**

48. Did you receive as many as you thought you needed? **69.2% YES 30.8% NO n=117**

49. How many of those Block permits were filled in 1994? **15.2 PERMITS WERE FILLED, SD=14.0, n=95**

50. Please indicate in the following tables whether you agree or disagree with the following statements about **Shooting** permits and/or **Block** permits **in [county name] county** by circling the appropriate response.

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree					
Shooting Permits: (Circle ONLY one for each statement)	**SA**	**A**	**U**	**D**	**SD**
In this county, shooting permits are distributed fairly to growers who need them regardless of the value of the crops grown. n=538	5.6%	22.5%	41.8%	14.1%	16.0%
Shooting permits are successfully used to reduce crop losses in this county. n=532	10.2%	30.3%	33.6%	15.0%	10.9%
In this county, shooting permits should be given more readily to growers of high value crops than to growers of lesser value crops. n=534	6.4%	18.0%	20.6%	34.1%	21.0%
Regardless of whether shooting permits actually reduce crop losses, they are still important to farmers because they at least make farmers feel in control of the situation. n=534	10.5%	33.5%	20.8%	22.5%	12.7%
My neighbors' objections to the use of shooting permits influences my decision to use them. n=523	4.0%	14.0%	22.2%	41.7%	18.2%
Too many male deer are killed on shooting permits. n=536	11.0%	17.0%	33.4%	25.9%	12.7%
The venison and/or recreation I get by using shooting permits is important to me n=509	5.7%	10.0%	23.4%	31.4%	29.5%
Too many of the deer killed on shooting permits are not utilized. n=533	18.4%	21.2%	28.7%	18.8%	12.9%

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree					
Block Permits: (Circle ONLY one for each statement)	**SA**	**A**	**U**	**D**	**SD**
In this county, block permits are distributed fairly to growers who need them regardless of the value of the crops grown. n=524	7.8%	26.7%	40.6%	11.3%	13.5%
Block permits are successfully used to reduce crop losses in this county. n=527	14.2%	33.6%	31.1%	10.8%	10.2%
In this county, block permits should be given more readily to growers of high value crops than to growers of lesser value crops. n=530	4.9%	14.7%	23.0%	35.6%	21.9%
Regardless of whether block permits actually reduce crop losses, they are still important to farmers because they at least make farmers feel in control of the situation. n=526	9.3%	33.1%	23.2%	20.5%	13.9%
My neighbors' objections to the use of block permits influences my decision to use them. n=517	2.9%	8.1%	21.9%	44.1%	23.0%
The venison and/or recreation I get by using block permits is important to me. n=514	7.0%	14.8%	24.9%	31.3%	22.0%

51. Please indicate whether any of the following **should be** considered by the DNR when issuing permits to a farmer for killing deer to control crop losses caused by deer. (Check ALL that apply)

Consideration	All Respondents
THE FINANCIAL DEPENDENCE OF THE FARMER ON THE CROP	**67.2%**
THE EXTENT TO WHICH THE FARMER HAS TRIED TO CONTROL LOSSES THROUGH NON-LETHAL MEANS	**53.7%**
THE FARMER'S WILLINGNESS TO ALLOW HUNTERS TO HUNT ON HIS/HER LAND	**64.1%**
THE WILLINGNESS AND ABILITY OF THE FARMER TO AVOID PLANTING HIGH VALUE CROPS NEAR DEER HABITAT	**16.2%**
OTHER _____	**3.5%**

The other factors which farmers reported should be considered when issuing permits to kill deer were the following: "If 'deer' damage exists, 10; the farmer's motive for requesting permits, 1; the amount of time and money the farmer has invested, 1; if the deer herd is healthy, 3; number of permits used in the past, 1; if the farmer has used the permits properly, 1.

52. Please describe any changes you would like to see made in the **Shooting permit** system in [county name] county.

53. Please describe any changes you would like to see made in the **Block permit** system in [county name] county.

Attitudes About The Deer Population Size In 1994 –

54. When you form your opinion on whether the deer population size in [county name] county is acceptable, how important is each of the following considerations to you?

Circle ONLY one answer for each row. ⇒ ⇒ ⇒	Very Important	Somewhat Important	Slightly Important	Not Important	Unsure
Personal recreational benefits from deer (e g., viewing, hunting, feeding, etc.) n=552	32.1%	32.4%	15.2%	18.1%	2.2%
Recreational benefits from deer provided to others in the county. n=548	23.9%	35.9%	20.6%	16.8%	2.7%
Personal economic benefits from the presence of deer (e.g., hunting leases, goods and services provided to hunters and tourists.) n=546	8.6%	16.8%	16.8%	53.8%	3.8%
Economic benefits to the county from the presence of deer. n=542	13.7%	31.4%	20.7%	29.7%	4.6%
Personal crop losses to deer. n=552	54.7%	22.6%	13.2%	7.2%	2.2%
Other farmers' crop losses to deer. n=551	49.7%	32.8%	10.0%	3.4%	4.0%
The number of deer-related vehicle accidents in the county. n=556	51.6%	30.8%	9.0%	5.8%	2.9%

55. For the portion of [county name] county where you do the majority of your farming, what is your best estimate of what the average number of deer per square mile was in October of 1994?

I BELIEVE THERE WERE BETWEEN _____ AND _____ DEER PER SQUARE MILE IN THIS AREA IN OCTOBER OF 1994.

☐ I HAVE NO IDEA WHATSOEVER

County	Minimum estimated density	Maximum estimated density
Calhoun	Mean= 30 (SD=33, n=82)	Mean= 44 (SD=44, n=81)
Montcalm	Mean= 30 (SD=32, n=60)	Mean= 48 (SD=58, n=60)
Oceana	Mean= 26 (SD=50, n=61)	Mean= 42 (SD=68, n=61)
Benzie/Leelanau	Mean= 16 (SD=23, n=58)	Mean= 27 (SD=39, n=59)
Presque Isle	Mean= 42 (SD=55, n=29)	Mean= 63 (SD=90, n=29)
Menominee	Mean= 78 (SD=45, n=43)	Mean= 108 (SD=69, n=41)

56. Considering both the positive and negative impacts of deer to yourself and the local community, how would you describe your reaction to the number of deer per square mile that you indicated in question 55 above? (Check ONLY one) **(n=551)**

5.4% TOO FEW, AND I INTEND TO TRY TO DO SOMETHING ABOUT IT.

5.1% TOO FEW, BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT.

31.2% I AM SATISFIED WITH THE NUMBER OF DEER.

18.0% TOO MANY, BUT I DO NOT INTEND TO DO ANYTHING ABOUT IT.

40.3% TOO MANY, AND I INTEND TO TRY TO DO SOMETHING ABOUT IT.

57. In the portion of [county name] county where you do the majority of your farming, what number of deer per square mile would be most desirable to you (not too many or too few, but just right)?

THE MOST DESIRABLE NUMBER TO ME WOULD BE _____ DEER PER SQUARE MILE.

☐ I HAVE NO IDEA WHATSOEVER

58. Considering both the positive and negative impacts to yourself and the local community, please indicate the minimum and maximum number of deer per square mile that you would tolerate in that portion of [county name] county where you do the majority of your farming. (Answer BOTH A and B below)

PART A> ⇒ I WOULD NOT BE WILLING TO TOLERATE ANY FEWER THAN _____ DEER PER SQUARE MILE

☐ I HAVE NO IDEA WHATSOEVER

PART B> ⇒ I WOULD NOT BE WILLING TO TOLERATE ANY MORE THAN _____ DEER PER SQUARE MILE.

☐ I HAVE NO IDEA WHATSOEVER

County	Minimum Demand Q#58, Part A	Most Desirable Density Q#57	Wildlife Acceptance Capacity Q#58, Part B
Calhoun	Mean= 8 (SD= 9, n=60)	Mean= 15 (SD=18, n=76)	Mean= 24 (SD=23, n=66)
Montcalm	Mean= 11 (SD=10, n=51)	Mean= 16 (SD=14, n=52)	Mean= 23 (SD=18, n=50)
Oceana	Mean= 10 (SD=23, n=42)	Mean= 16 (SD=30, n=56)	Mean= 24 (SD=43, n=44)
Benzie/Leelanau	Mean= 7 (SD=14, n=48)	Mean= 9 (SD=16, n=51)	Mean= 16 (SD=22, n=51)
Presque Isle	Mean= 13 (SD=11, n=19)	Mean= 23 (SD=29, n=23)	Mean= 28 (SD=16, n=20)
Menominee	Mean= 14 (SD=17, n=44)	Mean= 23 (SD=22, n=48)	Mean= 35 (SD=37, n=47)

59. How would you describe the trend in deer numbers over the past five years in that portion of [county name] county where you do the majority of your farming? (Check ONLY one) **(n=562)**

44.7% INCREASING **32.6%** ABOUT THE SAME EACH YEAR **21.4%** DECREASING **1.4%** I DON'T KNOW

Attitudes About The DNR --

60. In any given year, how often do you typically have contact with local DNR biologist(s)? (Check ONLY one)

PERCENT OF RESPONDENTS

47.6% NEVER

27.2% LESS THAN ONCE PER YEAR

21.0% A FEW TIMES PER YEAR

0.5% MORE THAN ONCE PER MONTH

3.7% (Missing)

61. Please indicate to what extent you agree or disagree with the following statements by circling the appropriate response.

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree (Circle ONLY one response for each statement)	SA	A	U	D	SD
Crop losses are imposed on farmers by the DNR and hunters. n=539	16.5%	28.6%	22.4%	24.5%	8.0%
The DNR has the expertise to manage the state's deer herd. n=547	6.6%	34.2%	26.1%	18.6%	14.4%
The DNR has enough information on the deer population to adequately decide how many deer to harvest in Michigan each year. n=554	7.4%	31.4%	25.5%	22.7%	13.0%
DNR biologists treat farmers in this county professionally and with respect. n=547	9.7%	32.7%	43.7%	8.6%	5.3%
Our local DNR biologists can adequately determine the amount of loss a farmer is incurring to deer. n=545	4.8%	28.8%	38.5%	19.3%	8.6%
Our local DNR biologists understand the significance of crop losses to the economic well-being of the farmer. n=545	7.2%	32.1%	34.3%	18.0%	8.4%

62. Please distribute 100 points within each of the following two columns to indicate how much importance you think the DNR ***currently places*** and ***should place*** on each of the following interest groups when the agency sets deer population goals for [county name] county.

The mean current perceived importance assigned to hunters was 63.1 (SD=23.7, n=504)
The mean current perceived importance assigned to farmers was 31.4 (SD=20.3, n=477)
The mean current perceived importance assigned to others was 32.1 (SD=26.0, n=136)

The mean importance that should be given to hunters is 41.0 (SD=17.4, n=484)
The mean importance that should be given to farmers is 58.2 (SD=20.2, n=512)
The mean importance that should be given to others is 15.8 (SD=13.8, n=112)

Attitudes About MSU-Extension --

63. In any given year, how frequently do you typically have contact with [county name] county MSU-Extension representatives? (Check ONLY one)

Percent of Respondents

11.1% NEVER
16.0% LESS THAN ONCE PER YEAR
54.8% A FEW TIMES PER YEAR
14.5% MORE THAN ONCE PER MONTH
3.7% (Missing)

64. Please indicate to what extent you agree or disagree with the following statements by circling the appropriate response.

SA=Strongly Agree A=Agree U=Undecided D=Disagree SD=Strongly Disagree (Circle ONLY one response for each statement)	SA	A	U	D	SD
The [county name] county extension agent(s) treat farmers professionally and with respect. n=562	41.5%	48.4%	8.2%	0.9%	1.1%
The [county name] county extension agent(s) are knowledgeable about farming. n=561	37.3%	51.5%	7.7%	2.5%	1.1%
The [county name] county extension agent(s) are helpful for locating information about farming problems. n=563	37.8%	49.2%	10.5%	2.0%	0.5%

Background Information And Demographics Of Farmer Survey Respondents --

65. About what percent of your household **gross** income was generated by farming in 1994? **63.9% (SD=35.6) (n=517)**

66. What was your total **gross** household income in 1994 (**before deductions for taxes**, bonds, dues or other items)? (Check ONLY one) **(n=498)**

5.0% LESS THAN $9,999 **11.6%** $15,000 - $24,999 **18.9%** $35,000 - $49,999 **8.6%** $75,000 - $99,999
4.6% $10,000 - $14,999 **15.3%** $25,000 - $34,999 **17.5%** $50,000 - $74,999 **18.5%** GREATER THAN $100,000

67. What is your age? **52.5 years (SD=12.0)**

68. How long have you been farming in **[county name]** county? **29.8 years (SD=15.9)**

69. What was your highest level of schooling **completed** or degree received? (Check ONLY one)

0.2% NO SCHOOL
3.7% LESS THAN 9TH. GRADE
5.0% SOME HIGH SCHOOL
35.5% HIGH SCHOOL DIPLOMA OR EQUIVALENT (GED)
26.4% SOME COLLEGE OR TECHNICAL SCHOOL
20.4% COLLEGE OR TECHNICAL SCHOOL DEGREE (BA, BS, AB, etc)
0.1% GRADUATE OR PROFESSIONAL SCHOOL DEGREE (MA, MS, Ph D , M Ed , etc)

Mean schooling was =4.78, SD=1.20, n=569.

70. Please indicate if you currently belong to any of the following organizations. (Check ALL that apply)
Percent of all respondents

60.2% FARM BUREAU
20.8% OTHER FARMING ORGANIZATIONS _____, _____
4.0% LOCAL ORGANIZATIONS CONCERNED WITH CROP DAMAGE (e g , Upward, Responsible Wildlife Management, etc)
PLEASE SPECIFY _____, _____, _____
11.9% CONSERVATION ORGANIZATIONS (e g , MUCC, Pheasants Forever, National Wildlife Federation)
PLEASE SPECIFY _____, _____, _____

APPENDIX H

DEER HUNTER NONRESPONSE SURVEY INSTRUMENT

STATUS:

Nonrespondent Phone Survey: 1995 Deer Hunter Opinion Survey

NAME:_____

PHONE NUMBER:_____ CITY:_____

COUNTY OF HUNT: Benzie Calhoun Leelanau Menominee Montcalm Oceana Presque Isle ID #:_____

CALLS	DATE	TIME	COMMENTS
Attempt 1		a.m./p.m.	
Attempt 2		a.m./p.m.	
Attempt 3		a.m./p.m.	
Attempt 4		a.m./p.m.	
Attempt 5		a.m./p.m.	

- "Hello. I am calling from Michigan State University as part of a deer hunting study. I would like to ask _____ a few questions related to deer hunting which should take less than 10 minutes. Is [first name] available to speak with me right now?"

  ☐ YES

  ☐ NO: "When would be a good time for me to call [him/her] back at this number?"

  Time(s): _____ Day(s): _____ NEVER

  "Is there another number I might reach [him/her] at? _____

  - "We have a toll-free number. Would you please take it down and let [first name] know that [he/she] can return my call at [his/her] convenience: 1-800-433-3741"

[If the person comes to the phone, repeat the intro.]

- "Your participation is voluntary, and your name and responses will be kept confidential. Any time you would like a question repeated, just say so."

- "First, I need to know a little about your deer hunting participation."

1. "In a **typical** year, do you hunt using a...
   - ☐ bow only
   - ☐ firearm only (including muzzleloader), or
   - ☐ both bow and firearm?"

2. "About how many years have you actually gone deer hunting in Michigan?" _____ years ☐ Doesn't Know

3. "Our records indicate that you deer hunted in _____ county last year in the November firearm season... Is that correct?" ☐ Yes ☐ No: Skip to #14
   ☐ Doesn't Know [ask him/her for the nearest city and try to identify county. City: _____]

4. "Last year in _____, what percent of your total deer hunting time were you hunting on public land?" _____%

5. "How would you describe your level of satisfaction with your overall deer hunting experience in _____ last year? Would you say you are...

   ☐ 1. Very Satisfied
   ☐ 2. Satisfied
   ☐ 3. Neither Satisfied Nor Dissatisfied
   ☐ 4. Dissatisfied or
   ☐ 5. Very Dissatisfied with your overall deer hunting experience in _____"

   Comments:

6. "For this next question, I am going to read 4 statements about antlerless deer harvest. Please tell me which of the statements best describes your opinion about the legal recreational harvest of antlerless deer.
   ☐ 1. I am opposed to the harvest of antlerless deer by hunters.
   ☐ 2. I support the choice of other hunters to harvest antlerless deer, but I am **not** willing to harvest antlerless deer myself.
   ☐ 3. I am willing to harvest antlerless deer myself, or
   ☐ 4. I am not sure about my opinion regarding antlerless deer harvest."

   Comments:

7. "Would you mind telling me in what year you were born?" 19_____ ☐ Refused

8. [Note Gender: ☐ Male ☐ Female]

9. **"The next question deals with how important deer hunting is to you. I will ask you to chose 1 of 5 options. Are you ready?**

   How important is deer hunting to you compared to other types of recreation in which you participate, such as fishing, camping, jogging, bowling, competitive sports, or other types of hunting?

   Would you say deer hunting is...

   - ☐ 1. the most important recreational activity in which you participate
   - ☐ 2. more important than most other recreational activities in which you participate
   - ☐ 3. about as important as the other recreational activities in which you participate
   - ☐ 4. less important than most other recreational activities, or
   - ☐ 5. not at all important to you?"

   COMMENTS:

10. "The next question deals with deer damage control. I will first read you a statement and then ask your opinion. Are you ready?

    In Michigan, disagreement exists about whether deer numbers should be reduced in certain areas to control deer damage to agricultural crops. Compared to other issues facing deer management in Michigan, such as the buck to doe ratio, bag limits for deer, and the accuracy of deer counts, How important to you is the issue-of deer numbers being reduced in certain areas to control crop loss?

    Would you say the crop loss issue is...

    - ☐ 1. the most important issue facing deer management in Michigan
    - ☐ 2. more important than most other issues facing deer management in Michigan
    - ☐ 3. about as important as the other issues facing deer management in Michigan
    - ☐ 4. less important than most other issues facing deer management in Michigan, or
    - ☐ 5. not at all important to you?"

    COMMENTS:

11. "The next question deals with DNR policy. Again I will read a statement and ask your opinion. Are you ready?

The Michigan Department of Natural Resources has a policy of reducing deer numbers in certain areas in order to decrease the extent of deer damage to agricultural crops. To what extent do you approve or disapprove of this policy? Do you...

- ☐ 1. Strongly Approve
- ☐ 2. Approve
- ☐ 3. Undecided
- ☐ 4. Disapprove, or
- ☐ 5. Strongly Disapprove?"

Comments:

12. "Are you aware of the **current** DNR program to control crop losses caused by deer, which involves (1) regular lottery-drawing antlerless permits for hunters and (2) deer control permits for use on farms?"

☐ Aware ☐ Unaware

Comments:

13. "To what extent do you agree or disagree with the following statement:

I trust the DNR to fairly consider the interests of deer hunters when making decisions about how to manage the State's deer herd. Do you...

- ☐ 1. Strongly Agree
- ☐ 2. Agree
- ☐ 3. Undecided
- ☐ 4. Disagree, or
- ☐ 5. Strongly Disagree?"

Comments:

14. "The last question I have deals with the [_____ color] survey on deer hunting that you should have received in the mail about a month ago. Could you tell me why you did not return the survey?"

- ☐ Did not receive it
- ☐ Lost it
- ☐ Did not hunt in the county specified
- ☐ Did not hunt in 1994
- ☐ Too long
- ☐ No time to complete it
- ☐ Does not trust DNR
- ☐ Won't do any good in terms of changing things
- ☐ Out of town
- ☐ Ill
- ☐ No reason
- ☐ OTHER:

■ Thank you.