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By

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ABSTRACT

BOVINE TUBERCULOSIS IN MICHIGAN: UNDERSTANDING STAKEHOLDER ATTITUDES TOWARD THE DISEASE AND ERADICATION EFFORTS

By

Meegan Leah Dorn

Bovine tuberculosis has been discovered at unprecedented levels in Michigan wildlife, especially white-tailed deer (*Odocoileus virginianus*). Human behaviors, particularly the use of bait and feed, have facilitated the spread of the disease into free-ranging white-tailed deer populations. Policies aimed at eradicating bovine tuberculosis in Michigan require public compliance and cooperation in order to be successful. Because of the human contribution to the spread of bovine tuberculosis in Michigan wildlife, and the social nature of subsequent bovine tuberculosis eradication policies, we conducted a survey of bovine TB issue stakeholder groups in northeast Michigan, including non-resident hunters, resident hunters, livestock producers, business owners/managers, and the general public. Social data can help determine public support for wildlife management policies, such as bovine TB eradication strategies, as well as identify targets and messages for ongoing communication efforts. We found differing attitudes, beliefs and levels of knowledge between stakeholder groups. We also found that different beliefs predict hunter attitudes toward bovine TB eradication in principle versus in practice. We use these results to make recommendations for future communication efforts aimed at bolstering public support for bovine tuberculosis eradication and eradication policies.

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CHAPTER I

INTRODUCTION

Emerging infectious zoonotic diseases in wildlife (i.e. those that can be transmitted between wildlife and people) can have serious social and biological consequences; human health, regional economies, wildlife health, species conservation, and biodiversity have all suffered from such diseases (Daszak, Cunningham, and Hyatt 2000). Although zoonotic diseases spread through biological processes, they often have direct or indirect anthropogenic causes (Daszak et al. 2000). For example, human colonization patterns, agricultural practices, management policies, and recreation behaviors have all contributed to the incidence and prevalence of zoonoses (Daszak et al. 2000).

Daszak et al. (2000) endorse a multidisciplinary approach to understanding the underlying causes and factors that contribute to the spread of wildlife diseases. Once a wildlife disease has spread, it often requires costly risk management efforts, efforts which also involve interdisciplinary cooperation (Knuth 1990). Traditionally, research conducted in disciplines such as veterinary medicine, epidemiology, wildlife biology, and ecology contribute to the management of zoonotic wildlife diseases. However, when zoonotic diseases pose clear risks to human populations, or when controlling wildlife diseases necessitates changes in human behavior, the social components of wildlife disease issues must be considered. Social data can aid in the development of effective policies aimed at eliminating wildlife disease threats. Wildlife is a publicly owned resource in the United States. Without public acceptance of management

policies, such policies can be, and have been, stymied by opposition groups (Zinn et al. 1998).

The human dimensions of wildlife management discipline offers a valuable framework within which the social aspects of wildlife disease issues can be examined (Knuth et al.1992). Bright and Manfredo (1997) defined human dimensions as "an area of investigation which attempts to describe, predict, understand, and affect human thought and action toward natural environments and to acquire such understanding for the primary purpose of improving stewardship of natural resources." Human dimensions information can assist managers in predicting public response to management practices and quantify and predict future demands for wildlife resources. Human dimensions research can also help managers understand wildlife resource user groups (both consumptive and nonconsumptive), and influence public opinion toward wildlife and wildlife management practices (Bright and Manfredo 1995). Finally, human dimensions research can help managers identify latent or emerging issues, such as conflicts between stakeholder groups, or between an agency and its constituents. This can enable managers address wildlife management issues before these issues are thrust into the legislative arena (Peyton 1984).

Each of these functions of the human dimensions discipline could provide critical insight into wildlife disease control, yet to date relatively few studies have examined public responses to wildlife disease issues. Seimer et al. (1992) studied public response to Lyme disease in New York. They found public perceptions of the risk of Lyme disease to be associated with beliefs about the likelihood of contracting Lyme disease, perceived control over contracting the disease, and beliefs about the

seriousness of the disease. Siemer et al. also found that people living in areas that had a longer history of Lyme disease tended to believe that controlling human health risks should be a top priority driving deer management decisions. Siemer et al. (1994) studied public attitudes toward rabies and rabies control efforts in New York state. They found strong support for state-sponsored programs to control the spread of the disease through oral bait vaccinations. McGuill et al. (1997) studied public attitudes toward rabies in raccoons in Massachusetts. They also found support for oral vaccination programs and they found that residents of areas with high rabies prevalence were highly aware of both the risk of rabies to public health, and of the efforts involved in the vaccination program. McGuill et al. attributed these awareness levels to education campaigns in the regions of Massachusetts with the highest prevalence of rabies. White and Whiting (2000) investigated public attitudes toward bovine tuberculosis eradication measures in badgers in the United Kingdom and found that people tended to prefer that the government not cull tuberculous badgers. However, White and Whiting also found that more knowledgeable individuals tended to support the most invasive means of eradicating bovine TB in badgers (a widespread cull).

Each of the aforementioned studies has provided social information about a specific wildlife disease issue that can be applied in other circumstances. However, context is a critical consideration for social research on wildlife management topics (Riley and Decker 2000), so managers will likely draw the strongest implications from research that is region-specific and issue-specific. This principle provided the impetus for social research on a wildlife disease issue raging in Michigan. Michigan is currently facing epidemic levels of bovine tuberculosis (bovine TB) in white-tailed deer

(*Odocoileus virginianus*) (O'Brien et al 2001). Bovine tuberculosis began as a spill-over disease from agriculture into wildlife populations worldwide. It is now a global threat that will likely "spill back" more frequently into domestic livestock and eventually into humans (Daszak 2000). In the United States, known wildlife reservoirs of bovine TB are extremely rare. Previous to the finding of a tuberculous white-tailed deer in Michigan in 1995, only 5 individuals in this species had ever been found with bovine TB nationwide (Schmitt et al. 1997). By February 2003, approximately 450 white-tailed deer and over 70 cattle from 27 individual operations had been found with bovine TB in Michigan (Bovine TB Eradication Project 2003). In addition to white-tailed deer and livestock, over 40 carnivores had been found with bovine TB in Michigan, including bobcat (*Felis rufus*), coyote (*Canis latrans*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), and red fox (*Vulpes vulpes)* (Bruning-Fann et al. 2001).

Anthropogenic causes (e.g. deer baiting and feeding) have been cited as contributions to the spread of bovine TB in Michigan white-tailed deer (Schmitt et al. 1997). Efforts to eradicate bovine TB in Michigan wildlife are thereby largely contingent upon public participation in or compliance with eradication policies. In addition, bovine tuberculosis has resulted in substantial social costs, both directly from the disease itself, and indirectly from the policies enacted to eradicate the disease, yet public response to these costs has not been quantified.

Objectives of the Research

Our research arose from the recognition that there was a dearth of social data that could inform bovine TB eradication efforts. We conducted a survey in the region of Michigan with the highest prevalence of bovine tuberculosis. We surveyed five bovine TB issue stakeholder groups: non-resident hunters, resident hunters, livestock producers, business owners/managers, and the general public, a total of 4,449 individuals. Survey results are presented as two studies contained herein. In Chapter 2, we address the first study. The objectives of this study were as follows: First, we wanted to identify and compare stakeholder attitudes toward various components of the bovine TB issue, such as the disease itself, risks of the disease to human health and animal health, and community impacts of eradication efforts. Next, we wanted to identify and compare stakeholder knowledge of the bovine TB disease and the bovine TB issue in northeast Michigan. Third, we wanted to evaluate factors that may affect stakeholder support for bovine TB eradication and eradication programs. We wanted to determine support for eradication efforts and variables associated with such support. Finally, we wanted to determine stakeholder interest in receiving new information, and stakeholder preferences for information sources.

In Chapter 3, we focus on one critical stakeholder group in the bovine TB issue: hunters who reside in northeast Michigan. We selected northeast Michigan hunters because many of the policies aimed at eradicating bovine tuberculosis in white-tailed deer relied specifically on hunter compliance and cooperation to be successful. As residents of northeast Michigan, these hunters are clearly crucial partners in eradication efforts. The first objective of this study was to compare hunter support for the bovine

TB eradication goal in principle, with support for bovine TB eradication in practice (e.g. support for specific bovine TB eradication policies). Second, we wanted to determine the hunter beliefs, attitudes, and attributes that predict each type of support (e.g. support in principle versus support in practice), in order to inform communication efforts.

Literature cited

Bovine TB eradication project. 2003. Bovine Tuberculosis. Accessed February 21, 2003. <http://www.bovinetb.com>.

Bright, A. and M. J. Manfredo. 1997. The quality of attitudinal information regarding natural resource issues: the role of attitude strength, importance and information. Society and Natural Resources 8:399-414.

Bruning-Fann, C. S., S. M. Schmitt, S. D. Fitzgerald, J. S. Fierke, P. D. Friedrich, J. B, Kaneene, K. A. Clarke, K. L. Butler, J. B. Payeur, D. L. Whipple, T. M. Cooley, J. M. Miller, and D. P. Muzo. Bovine tuberculosis in free-ranging carnivores from Michigan. Journal of Wildlife Diseases 37(1):58-64.

Daszak, P., A. A. Cunningham, A. D. Hyatt. January 21, 2000. Emerging infectious diseases of wildlife: threats to biodiversity and human health. Science 287:443-449.

Knuth, B. A. 1990. Risk communication: a new dimensions in sport-fisheries management. North American Journal of Fisheries Management 10:374-381.

Knuth, B.A., R.J Stout, W.F. Siemer, D.J. Decker, and R.C. Stedman. 1992. Risk management concepts for improving wildlife population decisions and public communication strategies. Transactions of the 57th Annual Wildlife and Natural Resources Conference. 63-75.

McGuill, M. W., S. M. Kreindel, A. DeMaria, Jr., and C. Rupprech. August 1, 1997. Knowledge and attitudes of residents in two areas of Massachusetts about rabies and an oral vaccination program in wildlife. Journal of the American Veterinary Medical Association 211:305-309.

O'Brien, D. J., S. D. Fitzgerald, T. J. Lyon, K. L. Butler, J. S. Fierke, K. R. Clark, S. M. Schmitt, T. M. Cooley, and D. E. Berry. 2001. Tuberculosis lesions in free-ranging white-tailed deer in Michigan. Journal of Wildlife Diseases 37:608-613.

Peyton, R. B. 1984. A typology of natural resource issues with implications for resource management and education. Michigan Adademician 17:49-58.

Riley and Decker. 2000. Wildlife stakeholder acceptance capacity for cougars in Montana. Wildlife society bulletin. 28(4):931-939.

Schmidt, S. M., S. D. Fitzgerald, T. M. Cooley, C. S. Bruning-Fann, L. Sullivan, D. Berry, T. Carlson, R. B. Minnis, J. B. Payeur, and J. Sikarskie. 1997. Bovine

tuberculosis in free-ranging white-tailed deer from Michigan. Journal of Wildlife Diseases 33:749-758.

Siemer, W. F., T. L. Brown, S. M. Stehman, L. L. Bigler, D. H. Lein. 1994. Public perceptions of rabies and proposed oral bait vaccination trial. Human Dimensions Research Unit Publication Number 94-7. Department of Natural Resources, Cornell University. 46 pp.

Siemer, W. F., B. A. Knuth, D. J. Decker, V. L. Alden. 1992. Human perceptions and behaviors associated Lyme disease: Implications for land and wildlife management. Human Dimensions Research Unit Publication Number 92-8. Department of Natural Resources, Cornell University. 128 pp.

White, P. C. L., and S. J. Whiting. 2000. Public attitudes towards badger culling to control bovine tuberculosis in cattle. Veterinary Record 147:179-184.

Chapter II

STUDY 1: BOVINE TUBERCULOSIS IN MICHIGAN: STAKEHOLDER ATTITUDES AND IMPLICATIONS FOR ERADICATION EFFORTS

Abstract

Bovine tuberculosis (bovine TB) has been discovered in unprecedented levels in Michigan's white-tailed deer herd. Human practices have facilitated the spread of bovine TB in white-tailed deer, and public cooperation and compliance are necessary to reduce the spread of the disease. Social data can determine public support for eradication strategies, as well as identify targets and messages for ongoing communication efforts. We conducted a survey of 5 bovine TB issue stakeholder groups in order to assess and compare their attitudes toward bovine TB-related topics and their support for eradication and eradication policies. We also identified their levels of knowledge and interest in future bovine TB issue communications and preference for communication sources. Results indicate that stakeholders support the bovine TB eradication goal, but are less supportive of specific eradication policies. Stakeholder groups hold different beliefs about the threats posed by bovine tuberculosis, and about the means in which the disease is transmitted; stakeholder groups also have different levels of bovine TB-related knowledge. A strong majority of respondents (89%) were interested in being informed about new bovine TB issue-related information.

Introduction

Bovine tuberculosis (TB) was once the most prevalent disease in livestock in the United States (USDA 1995). When the U.S. began its bovine TB eradication program in 1917, approximately 1 cow in every 20 was bovine TB-positive (Roswurm and Ranney 1973). Bovine TB is caused by a bacterium called *Mycobacterium bovis* that can infect all warm-blooded mammals, including humans (Diehl 1971, Fanning and Edwards 1991). Bovine TB chiefly affects the respiratory system of infected individuals. It spreads primarily through tiny moisture droplets called aerosols that are expelled when infected parties sneeze or cough and it can also be transmitted through infected saliva (Center for Anim. Dis. Info. and Analysis 1996).

Despite a well-documented history of bovine TB in US cattle, there have been few known cases of bovine TB in North American cervids (O'Brien et al. 2001). Prior to 1994 bovine TB had only been discovered in 5 free-ranging white-tailed deer (*Odocoileus virginianus*) in North America (Schmitt et al. 1997). However, in 1994, a white-tailed deer harvested in the northeastern Lower Peninsula of Michigan contained suspicious lung lesions that were determined to be bovine tuberculosis upon bacterial culture (Schmitt et al. 1997). Further testing in wildlife and livestock in the state of Michigan revealed more bovine TB-positive deer, dairy cattle, beef cattle, and wild carnivores, including bobcat (*Felis rufus*),

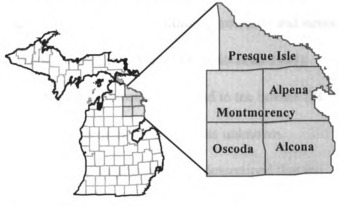


Figure 1: Map of Northeast Michigan

coyote (*Canis latrans*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), and red fox (*Vulpes vulpes)* (Bruning-Fann et al. 2001). At the time of this writing, approximately 450 white-tailed deer, over 70 cattle from 27 individual operations and over 40 carnivores had been found with bovine TB in Michigan (Bovine TB Eradication Project 2003). Nearly all of these animals were discovered within a five-county area in Michigan's northeastern Lower Peninsula[1] (see Figure 1).

State veterinarians and wildlife biologists attributed the prevalence of bovine TB in white-tailed deer in northeast Michigan, in part, to baiting and feeding practices[2] of area residents and hunters (Schmitt et al. 1997). These practices encouraged exceptionally high densities of deer to encounter one another at close range at bait and feed piles (Schmitt et al. 1997). Such encounters increased the opportunity for bovine TB to spread through aerosols or on half-eaten foodstuffs. In addition, when feeding supplemented deer diets, it enabled a large number of deer to survive over winters, thereby sustaining an artificially high density of white-tailed deer in northeast Michigan and creating conditions of crowding and stress, conditions which are known to exacerbate bovine TB infection (Schmitt et al. 1997). Authorities believed that bovine TB infection in livestock was related to the bovine TB infection in white-tailed deer, although the means of transmission was unknown. Restriction length fragment polymorphism (RFLP) sequencing has determined that the strains of *Mycobacterium bovis* in infected deer and livestock are identical (Community Health Laboratory, Michigan Department of Community Health, unpublished data). State

[1] The term "northeast Michigan" specifically refers to the 5-counties shown in Figure 1. Any generalizations made about "northeast Michigan" in the text pertain to this 5-county area.

[2] Baiting is defined in Michigan natural resource policy as "putting out food materials to attract, lure, or entice [deer] as an aid in hunting" (MDNR 2003). Feeding, in contrast, is defined in Michigan natural resource policy as "placing food materials out that attract deer for any reason other than for hunting" (MDNR 2003). Feeding is further distinguished as either recreational feeding, for deer viewing, or supplemental feeding, to sustain deer over the winter by supplementing their diet.

veterinarians posit that bovine TB infection in wild carnivores was a spill-over effect from infected deer, possibly from carnivores consuming infected deer carcasses (Bruning-Fann et al. 2001); RFLP sequencing has also revealed that these are identical strains of *M. bovis* (Bruning-Fann et al. 2001).

Citing risks to wildlife and domestic animal health, public health, wildlife-related recreation, tourism, and USDA tuberculosis-free accreditation for Michigan cattle, Michigan's governor issued an executive directive in 1998 mandating that the Michigan Departments of Natural Resources (MDNR), Agriculture (MDA), and Community Health (MDCH) work together toward the goal of eradicating bovine tuberculosis in the state (Engler 1998). In an attempt to eradicate bovine TB in Michigan white-tailed deer the MDNR implemented strategies to 1) decrease the number of deer in northeast Michigan, 2) decrease the opportunity for nose-to-nose contact[3], and 3) implement further surveillance of harvested deer in order to assess bovine TB prevalence (Schmitt et al. 1997). In order to reduce deer numbers the MDNR instituted unlimited antlerless deer permits and extended the length of the deer-hunting season in northeast Michigan. The Natural Resources Commission, the policy-making authority over the MDNR Wildlife Division, instituted a ban on deer baiting and deer feeding in northeast Michigan. The MDNR also established voluntary deer check stations in many locations throughout Michigan where hunters could bring harvested deer to be examined for gross bovine TB lesions. The MDA established different risk zones within the state of Michigan and implemented zone-specific testing requirements and movement restrictions for livestock.

[3] Nose-to-nose contact is defined as deer coming within 15 cm or less of one another (Garner 2001).

Each of the bovine TB eradication policies that State of Michigan agencies implemented in an effort to eradicate bovine TB has been aimed at curbing human behavior and has relied on public support in order to be successful (e.g., bait and feed bans, participation in the extended hunting season, antlerless deer permit purchases, deer check stations, and cooperation with livestock testing and movement regulations). However, evidence in the mass media has indicated that Michigan publics, especially hunters, have been strongly opposed to many bovine TB eradication measures (Sharp 1999). Public education has been cited as a critical factor in achieving bovine TB eradication in Michigan (Bovine TB Eradication Project 2003, Schmitt et al. 2002) and nationwide (Nelson 1999). The need to garner public support for bovine TB eradication policies and strengthen public education campaigns necessitated more reliable, representative social data that could help inform management actions and communication efforts. Information about stakeholder attitudes can help determine who will support management actions, as well as reveal the belief structure that underlies attitudes (Donnelly and Vaske 1997). Such information can help agencies tailor communication efforts aimed at bolstering support for policy actions to specific stakeholders (Tarrant et al. 1997). Reliable information about stakeholder attitudes and perceptions is also critical in order to minimize management-related conflicts (Knuth et al. 1992). For these reasons we conducted a survey in the fall of 2000 that targeted multiple bovine TB issue stakeholder groups. The objectives of the survey were: 1) to identify and compare stakeholder attitudes toward various aspects of the bovine TB issue; 2) to identify and compare stakeholder knowledge regarding the bovine TB disease and issue in Michigan; 3) to evaluate factors that may affect support for bovine TB eradication and eradication programs; and 4) to identify future communication channels and messages.

Methods

In order to develop valid survey instruments, we conducted individual in-depth interviews with residents of northeast Michigan (N = 31) between March and June of 2000; these interviews aided in identifying priority issues and clarifying terminology for the surveys. Interviewees included hunters, livestock producers, and business owners/managers in northeast Michigan. We obtained interviewee names through recommendations by Michigan State University Extension employees and MDNR personnel in northeast Michigan and from referrals made by other interviewees. Business owners/managers were chosen by ad hoc selection in the telephone book.

Survey groups and study area

We targeted the following five stakeholder groups with our survey: 1) deer hunters who hunt within northeast Michigan but who do not reside there (hereafter: nonresident hunters), 2) deer hunters who reside and hunt in northeast Michigan (hereafter: resident hunters), 3) livestock producers whose operation is located within northeast Michigan (hereafter: livestock producers), 4) business owners or managers whose business is located within northeast Michigan (hereafter: business owners), and 5) members of the general public who reside in northeast Michigan (hereafter: the general public). We attempted to create non-overlapping groups, to the degree possible, by using filter questions on the survey. However, in some cases, it was not feasible to create truly non-overlapping groups due to the low sample sizes that would have resulted (e.g., most livestock producers also hunt, so removing hunters from this sample would have created an insufficient sample size).

Deer hunters

In sampling Michigan deer hunters, we distinguished between non-resident and resident hunters. We defined non-resident hunters as individuals who have hunted in northeast Michigan (see Figure 1) at least once, but who reside elsewhere in the state of Michigan. Non-resident hunters were included in the survey because they constitute a substantial portion of the hunting community in northeast Michigan and they contribute greatly to the northeast Michigan tourism base. One thousand non-resident hunters, who reported that they had hunted in the 5-county area in 1998, were sampled from respondents to the MDNR's 1998[4] deer harvest survey.[5]

We defined resident hunters as individuals who reside in northeast Michigan and have hunted in one or more of these 5 counties since 1996. A simple random sample of 1,000 resident hunters was taken from the MDNR's 1998[6] general deer hunting license purchaser database, a list that contains the county of residence for each deer hunter, and the county in which each license was purchased. To determine whether the hunters had actually hunted in northeast Michigan, we asked respondents to indicate whether they had hunted in the 5-county area since 1996; we then removed those who indicated that they had not for analysis (N = 15). To remove individuals whose interests overlapped with those of our other survey groups, all resident hunter respondents who we could verify as people who raise livestock based on a list provided by the MDA were removed for analysis (N = 3), as

[4] The 1998 list was used for sampling because this was the last year that baiting and feeding were allowed in the 5-county area.

[5] It must be noted that a potential bias was introduced by choosing to sample non-resident hunters in this fashion. Because the sampling frame consisted entirely of MDNR hunting survey respondents, all non-respondents to the DNR survey were not available to be selected. The 1998 harvest survey achieved a 64% response rate.

were all individuals who claimed on the survey to own or manage their place of employment (N = 80). Thus, the resident hunter respondents included in the analysis can be summarized as non-livestock owning, non-business owning/managing individuals who reside and hunt in northeast Michigan.

Livestock producers

We defined livestock producers as individuals who currently raise bovine TB-testable livestock in the 5-county area of northeast Michigan and who have tested these animals for bovine tuberculosis.[7] The MDA provided a list of nearly all individuals in northeast Michigan who met the above criteria, a total of 699. The MDA removed three households from the list, as MDA officials felt that the issue was too sensitive to these households; all remaining households were included in the survey. Although we attempted to reduce overlap between samples, we did not remove hunters (since most livestock producers also hunt) or business owners from the livestock producer sample (as many of the livestock producers, by definition, also own or manage their livestock business).

Business owners/managers

We defined business owners/managers as individuals who own and/or manage a business in northeast Michigan in one of the following economic sectors: 1) business services (N = 275); 2) retail trade (N = 275); 3) wholesale trade (N = 100); and 4) finance, insurance, and real estate (N = 100), for a total of 750 businesses. We chose these four

[6] The 1998 list was used for sampling because this was the last year that baiting and feeding were allowed in the 5-county area.
[7] At the time the survey was administered, the MDA, to its knowledge, had successfully completed bovine TB testing for all required livestock in the 5-county area.

sectors, emphasizing the business services and retail sectors, because businesses in these sectors tend to have the most direct interaction with hunting-based business and tourism. Businesses tend to respond poorly to surveys, so we chose to sample the business sectors to which the bovine TB issue would be most salient. Thus, any generalization to "businesses" or to the "business owners/managers" in this report actually refers to businesses/business owners or managers in the four sectors that were sampled. We acquired this sample from Survey Sampling, Inc., a firm that randomly samples businesses in any US locale through listings in the telephone book. All individuals who claimed on the survey to currently raise livestock were removed for analysis (N = 80). We did not remove hunters from this sample because most business owners also hunt.

General public

We defined the general public as all individuals who reside in northeast Michigan and are 18 years of age or older. We took the general public sample of 1,000 individuals from the list of registered drivers through the Michigan Secretary of State. All individuals with overlapping interests were retained in the sample so that we could truly sample the "general public."

Survey design and implementation

We developed a different survey instrument for each of our survey groups, making 5 survey versions in all. The majority of questions on all of the surveys were the same, but all surveys contained a small number of questions that were group-specific. We utilized multiple contacts as outlined by Dillman (1978). The first mailing contained a personalized

cover letter, a survey instrument, and a self-addressed, stamped envelope. We mailed a reminder postcard 10 days after the first surveys and we conducted a second mailing approximately 3 weeks after we sent the initial surveys.[8]

Survey content

Our questionnaires consisted of items in 4 major topic areas. We asked stakeholders about 1) bovine TB-related attitudes and beliefs, 2) bovine TB issue knowledge, 3) attitudes toward bovine TB eradication strategies (we focus on attitudes toward deer-based bovine TB eradication strategies in this paper), and 4) communication issues. We measured stakeholder attitudes toward the overall goal to eradicate bovine tuberculosis with Likert-type response questions ranging from "strongly support" (+2) to "strongly oppose" (-2); we scored "no opinion" responses as missing. We evaluated whether people believed that it is possible to eradicate bovine tuberculosis in northeast Michigan (strongly agree = 2, strongly disagree = -2). We assessed public perceptions of local economic impact by asking whether people agree or disagree that "the bovine TB issue has hurt the economy in northeast Michigan" (strongly agree = 2, strongly disagree = -2). We also asked stakeholders to agree or disagree that "beef and milk in northeast Michigan are safe to consume" (strongly agree = 2, strongly disagree = -2). We evaluated stakeholder concern about white-tailed deer and livestock having been found with bovine tuberculosis in northeast Michigan by asking whether they "strongly agreed" (+2) to "strongly disagreed" (-2) that they were concerned, and whether they believed that the bovine TB disease is a serious threat to the health of the deer herd in Michigan (strongly agree = 2, strongly

[8] Copies of all of the survey materials, including cover letters, the reminder postcard, and survey instruments, are included as appendices beginning on page 98.

disagree = -2). We asked whether stakeholders believed that bovine TB in wild deer is a serious threat to the health of livestock in Michigan (strongly agree = 2, strongly disagree = -2). Finally, we determined public beliefs about bovine TB transmission by asking whether people believed that bovine TB spreads by nose-to-nose contact between deer, between livestock, and between deer and livestock (definitely true = 2, definitely false = -2). We asked whether people believed that bovine TB spreads on infected feed from one deer to other deer, from one livestock animal to other livestock animals, and from deer to livestock, or from livestock to deer (definitely true = 2, definitely false = -2).

We asked stakeholders a number of factual questions regarding the bovine TB issue so that we could ascertain their level of knowledge or awareness of the issue. Each of these items had an answer that natural resource and agriculture professionals considered "true" or "false" at the time the questionnaire was administered. We posed the following statements and awarded one point each for the correct answer: 1) "There is a vaccine that can be used to keep animals from getting bovine tuberculosis" (true = 0, false = 1, unsure = 0); 2) "Less than 25 deer have been found with bovine TB in Michigan since 1995" (true = 0, false = 1, unsure = 0); 3) "Animals that have bovine tuberculosis almost always show visible signs of the disease in their organs and lymph tissue" (true = 0, false = 1, unsure = 0); 4) "Most states in the US have found bovine TB in their wildlife" (true = 0, false = 1, unsure = 0); 5) "All dairy herds in the State of Michigan must now be tested for bovine TB every year until Michigan regains its bovine TB-free status" (true = 1, false = 0, unsure = 0). Finally, we asked, "Do you believe that humans can get bovine tuberculosis?" (yes = 1, no = 0, unsure = 0).

We measured support for the bait ban and feed ban among all survey groups with a Likert-type response question ranging from "strongly support" (+2) to "strongly oppose" (-2) ("don't care" responses were scored as missing). We provided definitions of baiting and feeding in order to distinguish between the two practices on the survey. We asked hunters whether they used bait before the bait ban in northeast Michigan (yes = 1, no = 0) and we asked all groups whether they fed deer on property in northeast Michigan before the feed ban (yes = 1, no = 0). We asked all groups whether they would support a "further reduction in the number of deer in northeast Michigan in order to slow the spread of bovine TB (strongly support = 2, strongly oppose = -2).

We also asked the two hunter groups whether they supported the extended deer-hunting season and unlimited antlerless deer permits with answer choices ranging from "strongly support" (+2) to "strongly oppose" (-2) ("don't care" responses were scored as missing). We asked hunters whether they would bring harvested deer to a MDNR check station (yes = 1, unsure = 0, no= -1) and whether they would report a deer to the MDNR that they thought may have bovine TB (yes = 1, unsure = 0, no = -1).

We also addressed communication topics on the survey. We asked stakeholders whether they were interested in being informed about new bovine TB issue-related findings and about the different information sources (newsletter, mass media, etc.) that they would prefer (yes = 1, no = 0 for each). We also asked stakeholders whether they had access to the Internet at home or at work (yes = 1, no = 0).

Data analysis

We first calculated summary statistics and frequencies for each of the items on our surveys. We tested for significant differences between stakeholder groups on ordinal variables with analysis of variance and comparison of means tests. We tested for relationships between two ordinal variables using correlation, and we used chi-square analysis to test for differences between stakeholder groups on variables with two or three response categories.

In order to determine the mean "knowledge level" among stakeholder groups, we first calculated individual knowledge scores by summing answers to the six knowledge items described above. We calculated individual knowledge scores by giving respondents a 1 for each correctly answered question and a 0 for every question that was either answered incorrectly or with an "unsure" response. We then summed these scores to calculate an individual knowledge score. The highest score an individual could receive was 6, indicating that the individual answered all 6 questions correctly; the lowest possible score was 0, indicating that the individual was either unsure or incorrect in his/her answers to all 6 questions. We did not calculate a knowledge score for respondents who answered less than four of the six knowledge questions on the survey. Other items with missing responses (up to 2 questions) received a score of zero. After calculating individual knowledge scores, we calculated mean knowledge scores for each of the stakeholder groups. We tested the difference between stakeholder groups' knowledge scores using a difference of means test.

Results

We mailed the surveys to a total of 4449 people. After adjusting for ineligible individuals and nondeliverable surveys, the overall response rate to the survey was 60%. We calculated this response rate before we removed overlapping individuals for analysis. Table II-1 presents adjusted response rates for each stakeholder group.

We discuss general bovine TB-related attitudes, bovine TB issue-related knowledge, attitudes toward deer-based bovine TB eradication strategies, and communication findings below. Elsewhere (Dorn and Mertig 2002) we present additional findings.

Attitudes and beliefs regarding bovine TB

Table II-2 presents stakeholders' attitudes and beliefs regarding bovine TB in general. A majority of stakeholders in all five of our survey groups supported or strongly supported the overall goal of eradicating bovine tuberculosis in Michigan (69% overall). Non-resident hunters were more likely to support the goal of bovine TB eradication (with 79% support) than were any of the other survey groups ($F = 16.92$, $p < 0.01$). Respondents were evenly divided on their belief about whether it is possible to eradicate bovine TB in northeast Michigan; roughly equivalent proportions (nearly one-third each) agreed, disagreed, or were unsure about whether bovine TB eradication is possible. More non-resident hunters agreed that bovine TB eradication is possible in northeast Michigan (37% agreed) than did members of any other stakeholder group ($F = 8.82$, $p < 0.01$). The belief that it is possible to eradicate bovine TB was significantly correlated with support for the bovine TB eradication goal ($r = 0.385$, $p < 0.01$). A majority of respondents in all groups agreed that bovine TB

has hurt the economy in northeast Michigan, but business owners (89%), livestock producers (86%), and resident hunters (81%) agreed most with this statement.

Table II-3 presents stakeholder attitudes and beliefs regarding bovine TB-positive deer and livestock. A strong majority of respondents in all groups were concerned that tuberculous white-tailed deer had been found in northeast Michigan (83% overall). Once again, non-resident hunters were the most likely to express concern about bovine TB- positive deer ($F = 10.14$, $p < 0.01$). A majority of respondents in all stakeholder groups, 60% overall, agreed that "the bovine TB disease is a serious threat to the health of the deer herd in Michigan." However, approximately one-third of resident hunters, livestock producers, and business owners disagreed with this statement. There was a fairly strong correlation between the belief that bovine TB is a threat to the health of the deer herd and support for the goal to eradicate bovine tuberculosis in Michigan ($r = 0.458$, $p < 0.01$).

Eighty-eight percent of livestock producers were concerned that bovine TB has been found in northeast Michigan livestock, making them the stakeholder group most likely to be concerned about bovine TB-positive livestock findings ($F = 3.06$, $p = 0.02$). Livestock producers were also more likely than other stakeholder groups to believe that bovine TB in deer is a threat to livestock health ($F = 20.36$, $p < 0.01$). Concern that bovine TB has been found in northeast Michigan livestock was related to support for the bovine TB eradication goal ($r = 0.444$, $p < 0.01$), and the belief that bovine TB in wild deer is a serious threat to livestock health was also related to support for the bovine TB eradication goal ($r = 0.441$, $p < 0.01$). Fifty-eight percent of livestock producers agreed that bovine TB is a serious threat to livestock health,

whereas only 34% of resident hunters agreed that it is a serious threat. Finally, livestock producers were also the most likely to agree that beef and milk from northeast Michigan are safe to consume ($F = 45.49$, $p < 0.01$). Ninety-one percent of livestock producers agreed with this statement, whereas only 62% of non-resident hunters agreed with this statement. There was a slightly negative relationship between the belief that beef and milk from northeast Michigan are safe to consume, and support for the bovine TB eradication goal ($r = -0.092$, $p < 0.01$)

Tables II-4 and II-5 present stakeholder beliefs about bovine TB transmission via nose-to-nose contact and on infected feed. We found strong differences between stakeholder groups regarding beliefs about bovine TB transmission. Forty-four percent of non-resident hunters believed that it was "definitely true" or "probably true" that bovine TB spreads between deer and livestock (or vice versa) by nose-to-nose contact, but only 29% of resident hunters believed that bovine TB spreads between deer and livestock by nose-to-nose contact. Similarly, 49% of non-resident hunters and 59% of livestock producers believed that bovine TB spreads between deer and livestock on infected feed, but only 37% of resident hunters believed that bovine TB is transmitted by this means between deer and livestock. Sixty-seven percent of livestock producers found the statement "bovine TB spreads from one deer to other deer on infected feed" definitely or probably true, whereas only 42% of resident hunters shared the same opinion.

Knowledge of bovine TB issues

Table II-6 presents stakeholder knowledge of bovine TB issues. A comparison of means test showed that the mean knowledge scores for each stakeholder group were significantly different from one another ($F = 19.90$, $p < 0.01$). The mean knowledge scores were highest for livestock producers (3.20 out of 6) and lowest for business owners/managers (2.34 out of 6). There was a slight but significant correlation between knowledge and support for the overall goal to eradicate bovine tuberculosis ($r = 0.104$, $p < 0.01$).

Less than half of the respondents in every stakeholder group, except livestock producers, believed that human beings can contract bovine tuberculosis. Resident hunters were least likely to believe that human beings can contract bovine tuberculosis, with only 39% of these respondents answering this question correctly ($X^2 = 33.29$, $p < 0.01$). Respondents who believed that humans can get bovine tuberculosis, or who were unsure of whether or not humans can get bovine tuberculosis, were more likely to support the goal of bovine TB eradication ($F = 25.73$, $p < 0.01$).

Attitudes toward deer-based bovine TB eradication strategies

Baiting and the bait ban

Table II-7 displays stakeholder bait and feed use and attitudes toward the bait and feed bans. Seventy-two percent of non-resident hunters and 87% of resident hunters reported that they used bait when hunting in northeast Michigan before the bait ban. More respondents opposed than supported the bait ban among all survey groups except non-resident hunters. Differences between hunter groups were especially evident, as

40% of non-resident hunters supported the bait ban, whereas only 26% of resident hunters supported the bait ban. As one might expect, those who baited deer before the bait ban in northeast Michigan were more likely to oppose the ban than those who did not use bait when baiting was legal ($F = 258.16$, $p < 0.01$).

Feeding and the feed ban

Over half of the resident hunter (74%), business owner (59%), and general public (54%) respondents reported that they fed deer on property in northeast Michigan before the feed ban, whereas slightly less than half of the non-resident hunter and livestock producer respondents reported that they had fed deer (49% and 48% respectively). More respondents opposed than supported the feed ban in all groups except non-resident hunters and livestock producers. Livestock producers were much more likely to support the feed ban than they were to support the bait ban, with 48% supporting the feed ban, and only 33% supporting the bait ban. Those who had fed deer in northeast Michigan before the feed ban were more likely to oppose the ban than those who had not fed deer ($F = 313.77$, $p < 0.01$).

Reduction in deer numbers

Table II-7 presents stakeholder attitudes toward eradication strategies aimed at reducing deer numbers, and hunters' intended participation at DNR check stations. There was strong contrast between the attitudes of different stakeholder groups toward a "further reduction in the number of deer in northeast Michigan in order to slow the spread of bovine TB." Livestock producers were the only group in which a majority of

respondents supported the measure. Fifty-seven percent of livestock producers supported a reduction in deer numbers; in contrast, 57% of resident hunters opposed a reduction in deer numbers.

We asked the resident and non-resident hunter groups about their opinion on unlimited antlerless deer permits and the extended hunting season in northeast Michigan. A majority of hunters in both groups opposed unlimited antlerless deer permits (67% resident hunters and 54% non-resident hunters). Although less than half of the hunters supported the extended deer hunting season (38% resident hunters and 49% non-resident hunters), both hunter groups were more likely to support this policy than the unlimited antlerless deer permits (21% resident hunters and 33% non-resident hunters).

Deer checks

We found that 66% percent of non-resident hunter respondents and 56% of resident hunter respondents who intended to hunt in northeast Michigan during 2000 reported that they planned to take harvested deer to a check station.[9] Additionally, 1% of the non-resident hunter respondents who intended to hunt in northeast Michigan during 2000 and 7% of the resident hunter respondents would not report a harvested white-tailed deer that they thought may have bovine TB to the MDNR.

[9] We determined hunter intention to hunt in northeast Michigan in 2000 by asking the following question: "Do you plan to hunt in northeast Michigan during the 2000 hunting season?" (Answer choices were "yes", "no", or "unsure.")

Communication issues

An overwhelming majority of respondents reported that they would like to be informed about bovine TB issue developments (89% overall). Table II-9 presents data on bovine TB issue communication topics. Stakeholders who wanted to be informed preferred direct contact through a newsletter. More than half of the respondents in all groups except livestock producers also preferred to receive information through the mass media. Those who indicated that they did not want new information held statistically different attitudes from those who did want new information on many of the bovine TB eradication strategies. However, although these differences were statistically significant, they were not markedly different. For example, 94% of those who strongly supported the feed ban wanted new bovine TB information, while 89% of those who strongly opposed the feed ban also wanted new information. A website had been designed for communication purposes, so we also asked stakeholder to indicate whether they had Internet access at home or at work. Only 51% of both livestock producers and resident hunters and 52% of the general public reported that they had access to the Internet, while 71% of non-resident hunters and 73% of business owners reported having Internet access.

Discussion and implications

Our research found rather strong support for the goal of bovine TB eradication in principle (69% overall), but there were strong differences between stakeholder groups in support for this goal. For example, 79% of non-resident hunters and 70% of livestock producers supported the bovine TB eradication goal, while only 60% of resident hunters

and business owners supported the goal. Such differences reveal a need to bolster stakeholder support for the bovine TB eradication goal, particularly among resident hunters and business owners. There was a correlation between support for the bovine TB eradication goal and the belief that it is possible to eradicate bovine TB in northeast Michigan ($r = 0.385$, $p < 0.01$). It follows then that evidence that eradication efforts are working (i.e., evidence that eradication goals can be achieved) might be used to garner more public support for the bovine TB eradication goal.

Stakeholders seemed highly concerned about bovine TB-positive animal findings in northeast Michigan (over 75% of the respondents in every stakeholder group were concerned about tuberculous deer and livestock findings). However, there were strong differences between stakeholder groups regarding perceptions of the threat of bovine TB to animal health. Sixty-eight percent of non-resident hunters agreed that bovine TB is a serious threat to the health of the deer herd, but only 45% of business owners agreed that bovine TB is a serious threat to deer herd health. Fifty-eight percent of livestock producers agreed that bovine TB in wild deer is a serious threat to the health of livestock in Michigan, but only 34% of resident hunters believed that bovine TB in wild deer is a serious threat to livestock health. Such differences in stakeholder perceptions of the threat of bovine TB to animal health could result in different levels of commitment between stakeholder groups for bovine TB eradication efforts in the long run.

Although stakeholders supported the bovine TB eradication goal and were highly concerned about bovine TB-positive animal findings, they were much less willing to support specific strategies to achieve the eradication goal. For example, 60% of resident hunters supported the overall goal to eradicate bovine TB in Michigan, but

only 26% of resident hunters supported the bait ban, and only 31% of resident hunters supported the feed ban. Similarly, only 33% of livestock producers supported the bait ban, and only 48% of livestock producers supported the feed ban (compared to 70% who supported the bovine TB eradication goal). Less than half of resident and non-resident hunter respondents supported the extended deer-hunting season (38% and 49%) and unlimited antlerless deer permits (21% and 33%). Stakeholder support for bovine TB eradication in principle (i.e., support for the goal to eradicate bovine TB), and in practice (i.e., support for specific eradication policies) is necessary for bovine TB eradication success. The fact that stakeholders, especially hunters, are rather unsupportive of practical eradication strategies could be a hindrance to eradication goals.

When we compared the two hunter groups on all deer-based bovine TB eradication policies, non-resident hunters were significantly more likely than resident hunters to support the eradication policies (the bait and feed bans, unlimited antlerless deer permits, and the extended deer hunting season). We suspect that more non-resident hunters are able to support such policies for two main reasons. First, most non-resident hunters do not have to live with the consequences of the policies as clearly as do local stakeholder groups. Next, non-resident hunters may be more supportive of eradication efforts because of the method in which we sampled them. Recall that these individuals had all responded to a MDNR survey prior to responding to our survey. Thus, our sampling method may have selected for individuals who are more likely to support state government and state government policies. However, general support for a state agency does not necessarily translate into support for

specific policies instituted by the agency (Donnelly and Vaske 1997). The tendency of resident hunters to be more resistant to eradication policies means that state agency officials might focus their efforts on northeast Michigan resident hunters in order to increase support for eradication measures.

Stakeholders held some beliefs that might affect their support for specific eradication strategies. First, relatively few resident hunters believed that bovine tuberculosis spreads between deer (42%), or between deer and livestock (37%), on infected feed, although state agency officials have contended that this is a highly probable mechanism for bovine TB transmission. Next, only 36% of our respondents overall believed that bovine TB spreads between deer and livestock by nose-to-nose contact, another mechanism hypothesized by the state. Discrepancies between the views of "experts" and stakeholders can injure agency credibility (Slovic 1993) and result in conflict between agencies and constituents (Loker and Decker 1995). State agencies might consider increasing efforts to persuade hunters that infected feed and nose-to-nose contact provide probable means of bovine TB transmission in an effort to garner support for eradication policies and protect agency credibility.

A majority of stakeholders who planned to hunt in northeast Michigan in 2000 believed that they would bring harvested deer to a check station (56% of resident hunters and 66% of non-resident hunters). Check stations are the MDNR's main method of evaluating the prevalence of bovine TB so increased participation would help the accuracy of eradication effort evaluation.[10] It is potentially problematic that 7% of resident hunters admitted that they would withhold information about a bovine

[10] Recognizing the necessity for comprehensive surveillance, the MDNR made deer check stations mandatory for those who harvested a deer in the northern half of Michigan's Lower Peninsula in 2002.

TB-positive deer from the MDNR. Such admissions and the low commitment to bringing harvested deer to MDNR check stations mean that bovine tuberculosis may go under-detected, although the probability of a hostile individual finding a tuberculous deer is very small (O'Brien et al. 2001).

Overall knowledge of the bovine TB issue was rather low; livestock producers had the highest mean knowledge score (3.2 out of 6). This finding was expected in northeast Michigan because much of the state's communication efforts have been focused on the farming community in order to accomplish Federal bovine TB testing requirements. In addition, producers have had contact with veterinary personnel during bovine TB testing which could have enhanced their bovine TB disease and/or issue knowledge. Increased issue-related knowledge was somewhat correlated with increased support for the goal to eradicate bovine TB across all groups ($r = 0.104$, $p < 0.01$), so efforts to inform stakeholders, especially hunters, business owners, and the general public, of facts about bovine tuberculosis and the bovine TB issue should be enhanced. White and Whiting (2000) found that those who were more knowledgeable about bovine tuberculosis in Britain were more likely to favor the most invasive method proposed for eradicating bovine tuberculosis in badgers. Likewise, we found moderate correlations between increased bovine TB issue-related knowledge and support for the bait ban ($r = 0.133$, $p < 0.01$) and the feed ban ($r = 0.117$, $p < 0.01$).

It was especially surprising that so many stakeholder groups either did not believe that humans can get bovine tuberculosis or were unsure about whether humans can get bovine tuberculosis. For example, only 39% of resident hunters believed that humans can get bovine tuberculosis. Public perception of the risk of wildlife disease

to human health has strongly influenced public support for government policies aimed at reducing the prevalence of Lyme disease (Siemer et al. 1992, McGuill et al. 1997) and rabies (Siemer et al. 1994). However, Lyme disease and rabies both result in higher human mortality and are more frequently transmitted to humans than bovine tuberculosis. Still, the lack of acknowledgement that the bovine TB issue poses risks to public health may deplete stakeholder support for bovine TB eradication and eradication efforts.

Efforts to increase public support for wildlife disease eradication goals should ideally be concentrated as an issue emerges (Gilmour and Munro 1991). This can enable managers to keep an issue from becoming disruptive (Peyton 1984). However, on-going communication efforts are beneficial, and our survey revealed that a strong majority of stakeholders desired more bovine TB issue-related information. Even stakeholders who strongly opposed eradication efforts reported that they wanted new bovine TB-related information. This demonstrates that those who are unsupportive of eradication measures may not necessarily dismiss communication attempts.

Of the respondents who wanted new information (89% overall), a majority in every stakeholder group preferred that news be distributed via a newsletter. Although it may be impossible to disseminate information in newsletters to all stakeholders, this method seems strongly preferred, so we advise agencies to utilize this method with selected groups where feasible. A majority of these same respondents (those who wanted new information) in all groups except livestock producers also preferred mass media, such as the television, newspaper, or radio, as information sources. However, regarding mass media, and the newspaper in particular, Bull and Peyton (1999) have

shown that although Michigan hunters get much of their information from newspapers, they do not necessarily perceive this source to be credible. Mass media may therefore be most appropriate for delivering non-contentious information, while other sources, like newsletters, may be more effective venues for detailed persuasion communication.

An Internet site has been created by the State of Michigan for bovine TB issue communication purposes (Bovine TB Eradication Project 2003). However, when we asked stakeholders about their access to the Internet, we found that only half of resident hunters and livestock producers have Internet access at home or at work. This means that the Internet is a viable medium for disseminating bovine TB issue-related information, but in order to thoroughly reach these critical stakeholders, additional channels must be emphasized.

We have demonstrated that Michigan stakeholders hold a high level of support for bovine TB eradication in principle. There exist strong differences between stakeholder groups regarding bovine TB issue-related attitudes, beliefs, and knowledge. There is a high level of interest among stakeholders to be informed of future developments in the bovine TB issue. We recommend that additional research focus on examining specific perceptions of bovine TB-related risk among stakeholders, and test communication messages.

Literature Cited

Bruning-Fann, C. S., S. M. Schmitt, S. D. Fitzgerald, J. S. Fierke, P. D. Friedrich, J. B, Kaneene, K. A. Clarke, K. L. Butler, J. B. Payeur, D. L. Whipple, T. M. Cooley, J. M. Miller, and D. P. Muzo. Bovine tuberculosis in free-ranging carnivores from Michigan. Journal of Wildlife Diseases 37(1):58-64.

Bovine TB eradication project. 2003. Bovine Tuberculosis. Accessed February 21, 2003. <http://www.bovinetb.com>.

Bull, P. and R. B. Peyton. 1999. An assessment of possible antler restrictions and quality deer management by Michigan deer hunters. Technical report submitted to the Michigan Department of Natural Resources Wildlife Division. Michigan State University. East Lansing, Michigan, USA.

Center for Animal Disease Information and Analysis. September 1996. Assessing the risks associated with *M. bovis* in Michigan free-ranging white-tailed deer. United States Department of Agriculture, Centers for Epidemiology and Animal Health, CAIDA Technical Report No. 01-96, Fort Collins, Colorado, USA.

Cox, M., E. B. Barbier, and P. C. L. White. August 23, 1999. Public preferences regarding rabies-prevention policies in the UK. Preventative Veterinary Medicine 41(4): 257-270.

Diehl, K. E. 1971. An epizootic of bovine tuberculosis traced from slaughter. Journal of the American Veterinary Medical Association 159:1534-1537.

Dillman, D. A. 1978. Mail and telephone surveys: the total design method. John Wiley
and sons, New York, New York, USA.

Donnelly, M. P., and J. J. Vaske. 1997. Predicting attitudes toward a moose hunt. Society and Natural Resources 8:307-319.

Dorn, M. L., and A. G. Mertig. 2002. Bovine tuberculosis in Michigan: 2000-2001 stakeholder survey. Technical report submitted to the Michigan Department of Natural Resources Wildlife Division. Michigan State University. East Lansing, Michigan, USA.

Engler, J. Executive directive 1998-1. January 29, 1998. Lansing, Michigan, USA.

Fanning, A. and S. Edwards. 1991. *Mycobacterium bovis* infection in human beings in contact with elk (*Cervus elaphus*) in Alberta, Canada. The Lancet 338: 1253-1255.

Garner, Mark S. 2001. Movement patterns and behavior at winter feeding and fall baiting stations in a population of white-tailed deer infected with bovine tuberculosis in the northeastern lower peninsula of Michigan. Dissertation, Michigan State University, East Lansing, Michigan, USA.

Gilmour, J. and R. Munro. 1991. Wildlife disease: management or masterly inactivity? Journal of Natural History 25:537-541.

Knuth, B. A., R. J Stout, W. F. Siemer, D. J. Decker, and R. C. Stedman. 1992. Risk management concepts for improving wildlife population decisions and public communication strategies. Transactions of the 57th Annual Wildlife and Natural Resources Conference 63-74.

Loker, C. A. and D. J. Decker. 1995. Colorado black bear hunting referendum: what was behind the vote? Wildlife Society Bulletin 23:370-376.

McGuill, M. W., S. M. Kreindel, A. DeMaria, Jr., and C. Rupprech. August 1, 1997. Knowledge and attitudes of residents in two areas of Massachusetts about rabies and an oral vaccination program in wildlife. Journal of the American Veterinary Medical Association 211:305-309.

Michigan Department of Natural Resources Wildlife Division. 2003. Baiting and Feeding Publications. Accessed March 21, 2003. <http://www.michigan.gov/dnr/0,1607,7-153-10363_10919_11748-31617--,00.html>.

Nelson, A. M. 1999. The cost of disease eradication: small pox and bovine tuberculosis. Annals of New York Academy of Sciences 894:83-91.

O'Brien, D. J., S. D. Fitzgerald, T. J. Lyon, K. L. Butler, J. S. Fierke, K. R. Clark, S. M. Schmitt, T. M. Cooley, and D. E. Berry. 2001. Tuberculosis lesions in free-ranging white-tailed deer in Michigan. Journal of Wildlife Diseases 37:608-613.

Peyton, R. B. 1984. A typology of natural resource issues with implications for resource management and education. Michigan Academician 17:49-58.

Roswurm, J. D, and A. F. Ranney. 1973. Sharpening the attack on bovine tuberculosis. American Journal of Public Health 63:884-886.

Schmitt, S. M., S. D. Fitzgerald, T. M. Cooley, C. S. Bruning-Fann, L. Sullivan, D. Berry, T. Carlson, R. B. Minnis, J. B. Payeur, and J. Sikarskie. 1997. Bovine tuberculosis in free-ranging white-tailed deer from Michigan. Journal of Wildlife Diseases 33:749-758.

Schmitt, S. M., D. J. O'Brien, C. S. Bruning-Fann, and S. D. Fitzgerald. 2002. Bovine tuberculosis in Michigan wildlife and livestock. Annals of the New York Academy of Sciences 969:262-268.

Sharp, E. 1999. Many hunters ignoring baiting ban in TB zone. Detroit Free Press. 4 November 1999; section D: 4.

Siemer, W. F., T. L. Brown, S. M. Stehman, L. L. Bigler, D. H. Lein. 1994. Public perceptions of rabies and proposed oral bait vaccination trial. Human Dimensions Research Unit Publication Number 94-7. Department of Natural Resources, Cornell University. 46 pp.

Siemer, W. F., B. A. Knuth, D. J. Decker, V. L. Alden. 1992. Human perceptions and behaviors associated Lyme disease: Implications for land and wildlife management. Human Dimensions Research Unit Publication Number 92-8. Department of Natural Resources, Cornell University. 128 pp.

Slovic, P. 1993. Perceived risk, trust, and democracy. Risk Analysis 13:675-682.

Tarrant, M. A., A. D. Bright, and H. K. Cordell. 1997. Attitudes toward wildlife species protection: assessing moderating and mediating effects in the value-attitude relationship. Human Dimensions of Wildlife 2(2):1-20.

USDA Factsheet. September, 1995. Accessed February 21, 2003. <http://www.cdfa.ca.gov/ahfss/ah/tb_infor.htm>.

White, P. C. L., and S. J. Whiting. 2000. Public attitudes towards badger culling to control bovine tuberculosis in cattle. Veterinary Record 147:179-184.

Table II-1. Response rates by stakeholder group

Stakeholder Group	Response rate	Number of respondents
Non-resident hunters	75%	734
Resident hunters	62%	592
Livestock producers	60%	399
Business owners	47%	313
General public	52%	465

Table II-2. Attitudes and beliefs regarding bovine TB

Variable	Statistic	Stakeholder Group[1]					
		Total	NRH	RH	LP	BO	GP
Support for BTB eradication goal[2]	% Strongly support	34	42	25	36	30	32
	% Support	35	37	35	34	30	35
	% Unsure	19	13	25	17	24	21
	% Oppose	6	3	8	6	11	5
	% Strongly oppose	4	3	5	4	3	4
	% No opinion	3	2	3	3	2	3
	n	2289	720	478	340	290	461
It is possible to eradicate BTB in northeast Michigan.	% Strongly agree	8	9	7	10	7	8
	% Agree	24	28	19	23	20	24
	% Unsure	34	36	32	33	30	37
	% Disagree	23	20	28	20	29	22
	% Strongly disagree	11	7	14	15	13	10
	n	2283	719	475	342	290	457
The BTB issue has hurt the economy in northeast Michigan.	% Strongly agree	36	26	37	51	49	33
	% Agree	41	44	44	35	40	40
	% Unsure	14	17	12	9	6	18
	% Disagree	7	11	6	3	4	7
	% Strongly disagree	1	1	1	2	1	2
	n	2271	717	476	338	288	452

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

[2] Do you support the overall goal to eradicate bovine TB in wildlife and domestic livestock in Michigan?

Table II-3. Attitudes and beliefs regarding bovine TB-positive deer and livestock

Variable	Statistic	Stakeholder Group[1]					
		Total	NRH	RH	LP	BO	GP
I am concerned	% Strongly agree	24	27	21	30	16	23
that deer have	% Agree	59	61	57	53	62	60
been found with	% Unsure	7	6	9	5	8	8
BTB in northeast	% Disagree	8	5	11	10	10	9
Michigan.	% Strongly disagree	2	1	3	2	3	1
	n	2283	715	478	336	291	463
The BTB disease	% Strongly agree	21	26	15	24	14	20
is a serious threat	% Agree	39	42	40	37	31	41
to the health of	% Unsure	17	17	16	13	25	18
the deer herd in	% Disagree	20	13	25	21	26	18
Michigan.	% Strongly disagree	3	2	4	4	3	3
	n	2282	714	478	336	291	463
I am concerned	% Strongly agree	28	28	26	37	21	29
that livestock have	% Agree	57	58	57	51	63	58
been found with	% Unsure	7	8	8	4	7	8
BTB in northeast	% Disagree	6	6	8	6	7	6
Michigan.	% Strongly disagree	1	1	2	2	3	0
	n	2295	721	481	340	290	463
BTB in wild deer	% Strongly agree	15	11	9	32	9	18
is a serious threat	% Agree	28	34	25	26	26	26
to the health of	% Unsure	25	29	24	16	26	26
livestock in	% Disagree	24	20	31	20	27	22
Michigan.	% Strongly disagree	8	6	11	7	12	8
	n	2294	719	481	341	290	463
Beef and milk	% Strongly agree	24	12	22	53	24	22
from northeast	% Agree	48	50	52	38	49	49
Michigan are safe	% Unsure	24	34	21	7	25	25
to consume.	% Disagree	3	3	4	1	2	3
	% Strongly disagree	1	1	1	2	1	2
	n	2290	719	480	341	288	462

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

Table II-4. Beliefs about bovine TB transmission by nose-to-nose contact

Variable	Statistic	Stakeholder Group[1]					
		Total	NRH	RH	LP	BO	GP
BTB spreads...							
...between deer	% Definitely true	29	36	22	35	23	24
by nose-to-nose	% Probably true	48	45	50	47	53	50
contact.	% Unsure	15	13	17	11	17	17
	% Probably false	6	4	8	5	8	7
	% Definitely false	2	1	3	2	0	2
	n	2283	721	478	334	289	461
...between	% Definitely true	27	33	21	30	21	22
livestock by	% Probably true	47	45	48	43	52	48
nose-to-nose	% Unsure	18	15	20	15	20	21
contact.	% Probably false	7	5	9	8	7	8
	% Definitely false	2	2	3	4	1	1
	n	2281	721	476	335	288	461
...between deer	% Definitely true	14	18	10	14	12	13
and livestock	% Probably true	22	26	19	20	22	23
by nose-to-nose	% Unsure	25	25	25	22	29	25
contact.	% Probably false	27	24	29	25	27	30
	% Definitely false	12	7	17	19	10	8
	n	2281	720	478	334	288	461

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

Table II-5. Beliefs about bovine TB transmission on infected feed

Variable	Statistic	Stakeholder Group[1]					
		Total	NRH	RH	LP	BO	GP
BTB spreads...							
...from one deer	% Definitely true	13	13	9	24	9	14
to other deer on	% Probably true	38	38	33	43	39	38
infected feed.	% Unsure	27	27	32	17	29	29
	% Probably false	18	18	22	14	20	16
	% Definitely false	4	5	5	4	4	3
	n	2273	717	475	334	286	461
...from one	% Definitely true	13	13	10	20	10	14
livestock animal	% Probably true	39	39	35	43	39	39
to other livestock	% Unsure	28	26	33	19	30	30
animals on	% Probably false	16	16	18	13	19	15
infected feed.	% Definitely false	4	5	4	5	3	3
	n	2283	719	478	337	288	461
...from deer to	% Definitely true	12	12	7	19	8	13
livestock, or	% Probably true	35	37	30	40	36	34
livestock to deer,	% Unsure	29	28	34	21	29	31
on infected feed.	% Probably false	19	18	22	15	23	18
	% Definitely false	5	5	7	6	4	4
	n	2284	719	479	336	289	461

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

Table II-6. Knowledge of bovine TB issues

Variable	Statistic[2]	Stakeholder Group[1]					
		Total	NRH	RH	LP	BO	GP
There is a vaccine that	% True	16	18	18	8	16	15
can be used to keep	% False	32	26	31	55	28	28
animals from getting	% Unsure	52	56	51	37	55	56
BTB.	*n*	2285	717	478	339	289	462
Less than 25 deer have	% True	18	20	20	10	18	18
been found with BTB in	% False	54	52	55	68	50	48
Michigan since 1995.	% Unsure	29	29	26	23	33	34
	n	2289	720	480	337	290	462
Animals that have BTB	% True	47	50	49	41	38	49
almost always show visible	% False	37	35	38	47	40	30
signs of the disease in their	% Unsure	16	15	13	13	22	20
organs and lymph tissue.	*n*	2294	720	481	340	291	462
Most states in the US	% True	33	23	38	39	41	33
have found BTB in their	% False	26	28	24	29	20	24
wildlife.	% Unsure	42	49	38	32	40	43
	n	2276	712	479	337	289	459
All diary herds in the	% True	66	65	68	73	58	68
state of MI must now be	% False	11	9	13	12	13	10
tested for BTB every	% Unsure	22	26	19	15	29	22
year until MI regains its	*n*	2288	719	480	338	288	463
BTB-free status.							
Do you believe that	% Yes	43	42	39	54	40	42
humans can get BTB?	% No	34	30	39	30	36	35
	% Unsure	23	28	22	16	24	23
	n	2262	716	472	336	290	448

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

[2] The answer considered correct at the time we administered the survey is underlined in the second column of this table.

Table II-7. Deer baiting and feeding behaviors and attitudes toward eradication strategies

Variable	Statistic	Stakeholder Group[1]					
		Total	NRH	RH	LP	BO	GP
Bait use[2]	% Yes	78	72	87	N/A	N/A	N/A
	% No	22	28	13			
	n	1196	714	482			
Bait ban opinion[3]	% Strongly support	19	22	14	17	13	26
	% Support	16	18	12	16	16	17
	% Unsure	11	14	13	9	9	7
	% Oppose	24	21	26	21	28	24
	% Strongly oppose	27	20	31	34	34	24
	% Don't Care	3	4	3	3	1	2
	n	2293	718	477	341	294	463
Feed use[4]	% Yes	56	49	74	48	59	54
	% No	44	51	26	52	41	46
	n	2280	717	480	338	295	450
Feed ban opinion[5]	% Strongly support	18	19	12	27	11	19
	% Support	21	25	19	21	16	19
	% Unsure	12	15	12	9	11	11
	% Oppose	23	22	28	16	29	23
	% Strongly oppose	24	18	27	22	32	25
	% Don't Care	2	1	2	5	2	3
	n	2303	719	483	344	294	463
Attitude toward a reduction in deer numbers[6]	% Strongly support	11	9	6	30	5	9
	% Support	22	26	18	27	18	21
	% Unsure	21	24	20	13	21	24
	% Oppose	21	23	24	12	21	22
	% Strongly oppose	24	18	33	17	33	23
	% Don't Care	1	0	0	1	1	0
	n	2282	713	477	342	290	460

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

[2] "Did you use bait when you hunted in northeast Michigan before the bait ban?"

[3] "What is your opinion of the ban on baiting deer as defined above?" (Definition provided: "Baiting deer is defined as putting out food materials for deer to lure, attract, or entice them as an aid in hunting.")

[4] "Before the feed ban, did you feed deer on property in northeast Michigan?"

[5] "What is your opinion of the ban on feeding deer as defined above?" (Definition provided: "Feeding deer is defined in Michigan policy as placing food materials out that attract deer for any reason other than for hunting.")

[6] "Please indicate how much you support or oppose the following action(s): further reduction in the number of deer in northeast Michigan in order to slow the spread of bovine TB."

Table II-8. Hunter attitudes toward efforts to reduce deer numbers and intended participation in eradication efforts

Variable	Statistic	Stakeholder Group[1]	
		NRH	RH
Extended deer hunting season opinion[2]	% Strongly support	18	11
	% Support	31	27
	% Unsure	13	12
	% Oppose	18	22
	% Strongly oppose	20	27
	% Don't Care	1	1
	n	715	481
Unlimited antlerless deer permit opinion[3]	% Strongly support	13	8
	% Support	20	13
	% Unsure	13	12
	% Oppose	26	28
	% Strongly oppose	28	39
	% Don't Care	1	1
	n	714	478
Intention to participate in a DNR check station[4]	% Yes	66	56
	% No	17	28
	% Unsure	17	17
	n	567	400
Intention to report BTB-suspect deer to the DNR[5]	% Yes	98	88
	% No	1	7
	% Unsure	1	6
	n	558	396

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

[2] "Please indicate you opinion about the following DNR management decision(s) in northeast Michigan for the 1998-2000 deer hunting seasons: extended deer hunting season."

[3] "Please indicate you opinion about the following DNR management decision(s) in northeast Michigan for the 1998-2000 deer hunting seasons: unlimited antlerless deer permits."

[4] "If you harvest a deer in northeast Michigan this hunting season, do you intend to take it to a DNR check station?" This question was only asked of hunters who indicated that they planned to hunt in northeast Michigan in 2000.

[5] "If you harvested a deer this hunting season and you thought it may have bovine TB, would you report this to the DNR?" This question was only asked of hunters who indicated that they planned to hunt in northeast Michigan in 2000.

Table II-9. Communication topics

Variable	Statistic	Stakeholder Group[1]					
		Total	NRH	RH	LP	BO	GP
Desire new	% Yes	89	95	90	94	83	81
BTB-related	% No	11	5	10	6	18	19
information[2]	*n*	2259	707	476	340	291	445
Information sources[3]							
Newsletter	% Preferred	69	71	68	89	58	58
Mass-media, such as TV, newspaper, radio	% Preferred	53	55	54	37	58	57
Internet	% Preferred	19	27	17	9	17	14
Public meetings	% Preferred	21	18	22	24	24	19
From professionals	% Preferred	20	23	21	19	22	16
Local clubs or organizations	% Preferred	18	23	17	8	19	15
Family or friends	% Preferred	5	6	7	3	4	4
Other	% Preferred	3	5	3	2	3	2
	n	2020	672	428	319	240	361
Do you have access	% Yes	60	71	51	51	73	52
to the Internet at home	% No	40	29	49	49	27	48
or at work?	*n*	2241	692	476	344	271	458

[1] NRH = Non-resident Hunter, RH = Resident Hunter, LP = Livestock Producer, BO = Business Owner or Manager, GP = General Public

[2] "As new information is discovered about bovine TB in Michigan, would you like to be informed about it?

[3] "How would you prefer that new information be communicated to you?" This question was only asked of those who indicated that they desire to be informed about new information about the bovine TB issue. The information sources listed in the first column of Table II-9 were provided on the survey.

Chapter III

STUDY 2: PREDICTING HUNTER ATTITUDES TOWARD BOVINE TUBERCULOSIS ERADICATION IN WHITE-TAILED DEER

Abstract

The bovine tuberculosis (TB) outbreak in white-tailed deer in northeast Michigan has been facilitated by social practices, (e.g. deer baiting and feeding); eradication of the disease therefore requires public support, especially from area hunters. Further, two types of support are important: support for the eradication in principle and in practice. However, state agencies did not have information about hunter support for bovine TB eradication at either level, nor did they have information about the beliefs that underlied hunter attitudes toward bovine TB eradication in principle and in practice. Results show that there is indeed a difference between hunter support for bovine TB eradication in principle and in practice and that predominantly different beliefs underlie each type of support. Beliefs about risks posed by bovine tuberculosis and the belief about the achievability of bovine TB eradication are the strongest antecedents to hunter attitude toward bovine TB eradication in principle. Beliefs about the costs of risk mitigation efforts, beliefs about bovine TB transmission, and beliefs about state agencies involved in bovine TB eradication efforts are the strongest antecedents to attitude toward bovine TB eradication in practice. Results have implications for ongoing communications with northeast Michigan hunters and implications for the management of zoonotic disease issues in other contexts.

Introduction

Reliable information about stakeholder attitudes has become increasingly recognized as a critical contribution to effective natural resource management (Decker, Brown and Knuth 1996, Bright and Manfredo 1996). Such information can help managers understand wildlife resource user groups, which is particularly important as wildlife constituencies become increasingly diverse and as wildlife management projects take place over larger scales (e.g. ecosystem management) (Tarrant, Bright, and Cordell 1997). Information about stakeholder attitudes can also help managers predict stakeholder responses to controversial management decisions (Donnelly and Vaske 1995) and influence public opinion toward wildlife and wildlife management practices (Bright and Manfredo 1995).

Attitudes are especially important constructs because they can influence behavior (Fishbein and Ajzen 1975). Fishbein and Ajzen (1975) argued that one's behavior depends, in part, on one's attitudes (which are defined as evaluations of a behavior and the object of a behavior), and that attitudes derive from beliefs about the attitude object. Fishbein and Ajzen thus place attitudes as central in their construct hierarchy; beliefs shape attitudes, and attitudes influence behavior. Others have qualified this hierarchy by noting that important attitudes predict behavior better than unimportant attitudes (Krosnick and Petty 1996, Bright and Manfredo 1996, Brooks et al. 1999). An individual's personal characteristics may also interact with his/her beliefs to influence subsequent attitudes (Kellert and Berry 1987, Lauber, Anthony and Knuth 2001), but specific attitudes (regarding a specific behavior) tend to be better than sociodemographic characteristics at predicting specific behavior; this has been shown

particularly well with public response to wildlife management actions (Donnelly and Vaske 1995, Riley and Decker 2000a).

In risk-based situations, beliefs about risk can have strong influences on public attitudes (Slovic 1987). Research indicates that people are more willing to tolerate risk from activities that they feel are beneficial, from activities in which they participate voluntarily, and from hazards that are familiar, equitable, and have less catastrophic potential (Slovic 1987). Further, risk assessments must consider not only risks perceived from a specific hazard, but also risks perceived to result from mitigating a hazard (Knuth et al. 1992). Public trust in the individuals and institutions responsible for managing risk has proven to be necessary for minimizing risk management-related conflicts and promoting effective risk communication (Knuth 1990, Slovic 1993).

Studies of risk have only recently been conducted vis-à-vis wildlife management (Riley and Decker 2000b). Such research has found that beliefs about risk have implications for public response to wildlife policies, specifically wildlife population goals, due to perceived risks to property, such as crop damage (Knuth et al. 1992), or human health and safety, such as human-animal interactions (Riley and Decker 2000b) car-deer collisions and zoonotic diseases (Knuth et al. 1992). In order to communicate with publics in wildlife management situations that involve risk, managers need information about the risks that people perceive from a potential hazard, as well as the costs that people perceive to be associated with mitigating the hazard (Knuth et al. 1992). Unless the benefit of policies designed to eliminate risks exceeds the costs of eliminating risks, stakeholders may be resistant to such policies.

The bovine tuberculosis issue

Michigan is currently facing a wildlife disease issue that poses risk to wildlife, agriculture, and public health, but also involves social cost in order to be eradicated. Bovine tuberculosis has been discovered at unprecedented levels in Michigan's white-tailed deer (*Odocoileus virginianus)* herd (O'Brien et al. 2001); the area of greatest prevalence has been a five-county area in the northeastern portion of Michigan's Lower Peninsula. Baiting and feeding practices of hunters and area residents have likely contributed to this situation (Schmidt et al. 1997). Baiting is defined in Michigan policy as putting out food materials to attract, lure, or entice [deer] as an aid in hunting" (MDNR 2003); in contrast, feeding is defined as "placing food materials out that attract deer for any reason other than for hunting" (MDNR 2003). These practices likely contributed to the spread of bovine tuberculosis by two main mechanisms. First, they encouraged artificially high numbers of deer to congregate at bait and feed piles (Schmidt et al 1997). This enabled bovine tuberculosis to spread via aerosols, or infected moisture droplets that are expelled when a tuberculous animal sneezes or coughs, and through saliva left on half-eaten foodstuffs. Second, by supplementing deer diets, feeding allowed more deer to survive in northeast Michigan, which likely facilitated the spread of bovine TB through density-dependent effects (Schmitt et al. 1997).

The Michigan Department of Natural Resources (MDNR) has been given a mandate to reduce the prevalence of bovine TB in Michigan wildlife to a non-detectible level (hereafter referred to as "eradication") (Engler 1999). The MDNR recognizes that hunters are critical partners in accomplishing this effort in white-tailed deer; the MDNR

and their partner agencies have cited the need for continued hunter education and communication efforts in order to elicit hunter cooperation and compliance with eradication efforts (Bovine TB Eradication Project 2003). Indeed, many of the eradication strategies that the MDNR has implemented are aimed at altering hunter behavior and require hunter cooperation in order to be successful. For example, in order to reduce deer numbers, the MDNR instituted unlimited antlerless deer permits and extended the deer hunting season in northeast Michigan. The Natural Resources Commission, the policy-making authority over the MDNR Wildlife Division, instituted a ban on baiting white-tailed deer (for hunting purposes) and feeding white-tailed deer (for recreational viewing or supplemental feeding purposes) in northeast Michigan in order to reduce nose-to-nose contact between deer and, in the case of feeding, to decrease deer numbers by eliminating an artificial nutrition source.

In order to realize the goal of bovine TB eradication, the MDNR needs support from Michigan hunters. Two different, albeit related, types of hunter support are critical for accomplishing bovine TB eradication. Hunters must support the bovine TB eradication goal in principle because bovine TB eradication involves serious commitment and resource allocation from agencies and the public to be achieved (Nelson 1995). Roswurm and Raney (1973) cited lack of public commitment to the goal of bovine TB eradication as the primary obstacle to bovine TB eradication nationwide. Without support for the goal to eradicate bovine TB this initiative can be stymied through public demands that resources be allocated elsewhere. In addition, hunters must support bovine TB eradication in practice by cooperating and complying with bovine TB eradication policies and regulations. Efforts to reduce deer numbers

and nose-to-nose contact between deer will not be achieved without hunter participation in the extended deer hunting season and antlerless permit programs and compliance with bait and feed bans. However, many hunters have responded with hostility toward and noncompliance with the MDNR's bovine TB eradication policies (Sharp 1999). Qualitative research with hunters in northeast Michigan has suggested that hunters conceptually distinguish between both types of eradication support (support in principle and support in practice), further demonstrating the need for this distinction to be understood before communication efforts can be adequately designed (M.L. Dorn, Michigan State University, unpublished data).

Problem statement and theoretical framework

Achieving bovine TB eradication in Michigan white-tailed deer requires support from hunters, both in principle and in practice. However, state agencies had no representative data on hunter attitudes toward the bovine TB eradication goal and eradication strategies, nor had anyone determined the belief structures that serve as antecedents to these attitudes. State agencies are best equipt to develop messages that influence stakeholder positions if they understand the factors underlying stakholder attitudes and behaviors (Fishbein and Manfredo 1992); such information could greatly enhance the effectiveness of ongoing bovine TB issue communication efforts. For these reasons, we conducted a survey of northeast Michigan hunters in order to assess and compare their attitudes toward the bovine TB eradication goal and eradication efforts, as well as to determine the variables that contribute to these attitudes.

The Theory of Reasoned Action provides a potentially useful model for conceptualizing variables that contribute to one's intention to support bovine TB eradication. This theory is used to predict one's behavioral intention from one's attitudes and subjective norms (i.e., the influence of "important others'" attitudes and the relative importance a person places on the wishes of others) and the beliefs and evaluations that precede them (Fishbein and Ajzen 1975). Bright and Manfredo (1996), for instance, utilized the Theory of Reasoned Action to model public attitudes toward the behavioral intention of supporting wolf reintroduction. As we mentioned above, however, there are two behavioral intentions that can influence one's overall intention to support bovine TB eradication. These are the intention to support the goal of bovine TB eradication in principle, and the intention to support bovine TB eradication efforts in practice. These two behavioral intentions, according to the Theory of Reasoned Action, will each be best predicted by the corresponding attitude toward the goal of bovine TB eradication in principle, and attitude toward specific eradication strategies in practice. This paper focuses on understanding the beliefs that underlie these two sets of attitudes. While we do not specifically examine other key components of the Theory of Reasoned Action with regard to the bovine TB issue (primarily due to the lack of key measures)- such as subjective norms and actual behavioral intentions/behavior- careful attention to underlying beliefs constitutes an important contribution considering the lacunae of studies in this area (i.e., risk analyses of wildlife management situations).

The Theory of Reasoned Action posits that specific belief structures will underlie attitudes that predict behavioral intentions. We wanted to determine which belief structures underlie hunter attitudes toward bovine TB eradication in principle versus in

practice in order to inform ongoing communication efforts. Because of the risk-related nature of the bovine TB issue, we assessed hunter beliefs about the following topics. First, we determined hunter beliefs about the risks posed by bovine tuberculosis in northeast Michigan. We assessed beliefs about risk of bovine TB to animal health, as this was the clearest risk relevant to the bovine TB issue. We evaluated beliefs about the risk of bovine TB to human health, including beliefs about food safety, as such beliefs have been found to influence public attitudes toward measures to reduce disease prevalence in other zoonotic disease issues (McGuill et al. 1997). We asked deer hunters whether their hunting satisfaction had been compromised by the presence of bovine TB in northeast Michigan to assess whether bovine TB posed risks to deer hunter satisfaction. Because the bovine TB issue could deter tourists from visiting or hunting in northeast Michigan, we asked hunters whether the bovine TB issue has hurt, and thereby posed risk to, the northeast Michigan economy.

Next, government efforts to mitigate risks from hazards (such as wildlife diseases) often result in new risks, or costs, to communities or individuals. Beliefs about these costs may also influence public attitudes. Therefore, we determined hunters' beliefs and evaluations of the costs that they might incur due to efforts aimed at mitigating bovine TB risks, specifically due to the bait and feed bans and to the proposed reduction in deer numbers (as accomplished through the extended deer hunting season and unlimited antlerless deer permits). We did not quantify specific costs; we instead inferred costs from the benefits that hunters had to forego due to bovine TB eradication policies. We determined the frequency of bait and feed use among northeast Michigan hunters, as well as the importance of each practice to those individuals who had baited

or fed deer. In order to infer the costs of reduced deer in northeast Michigan to deer hunter satisfaction, we asked them how important it is to their deer hunting satisfaction that they harvest a deer and see many deer (i.e., the deer density-dependent components of their hunting satisfaction) and we asked about their preference for the size of the deer herd in their county of residence.

Third, we asked hunters about their beliefs about the risk managers (or state agencies) involved in the bovine TB issue, as these beliefs have been shown to be important antecedents to attitudes in risk-related situations (Slovic 1993). Peters, Covello, and McCallum (1997) found that public trust in government institutions, and public perceptions of agency credibility, depended on the public's beliefs about an agency's knowledge and expertise, openness and honesty, and concern and care; therefore, we focused on hunter beliefs about these attributes of risk managers in the bovine TB issue. Attitudes toward the state agencies involved in this situation are also of particular importance as there has traditionally been a great deal of mistrust of government in this part of Michigan.

Next, we addressed beliefs about the bovine TB eradication goal and beliefs about the reasoning that underlies bovine TB eradication strategies (e.g. beliefs about bovine TB transmission). We asked hunters whether they believed that bovine TB eradication is possible, because attitude toward a goal, or toward the strategies used to achieve a goal, could certainly be influenced by one's belief about whether a goal can be achieved. We measured beliefs about bovine TB transmission in order to evaluate whether hunters believed some of the basic tenets of bovine TB transmission

mechanisms (i.e., that bovine TB can be transmitted on infected feed and through close contact) that provided impetus for the bait and feed bans.

Finally, we also identified potentially relevant hunter background variables to test their influence on attitudes toward bovine TB eradication. We asked hunters about their age and gender, as these are basic sociodemographic variables that have been shown to influence public attitudes toward natural resource issues in the past (Kellert 1980, Kellert and Berry 1987, Kaltenborn, Bjerke and Vittersø 1999). We asked about property ownership and the type of property on which individuals hunted because these variables can influence the frequency and amount of past bait and feed use (i.e., those who own property and hunt on private land tended, before the bait and feed bans, to be more likely to consistently use bait and feed). We asked hunters about the implement they typically used when deer hunting (i.e., bow, firearm, or both) because bow hunters have reported higher bait use. Finally, we asked about the number of years an individual has been a deer hunter in order to determine whether experience as a deer hunter affected eradication attitudes.

Figure 1 presents the model that we use to evaluate stakeholder attitudes toward the bovine TB eradication goal, and bovine TB eradication strategies, from which hunter intention to support the bovine TB eradication goal and strategies may be inferred. In order to explore the beliefs and background characteristics that might contribute to hunter attitudes toward bovine TB eradication, our model uses the same independent variables to predict two different dependent variables (hunter attitude toward bovine TB eradication in principle and hunter attitude toward bovine TB eradication in practice). We hypothesize that different beliefs will account for the

variance in a multiple regression model predicting hunter attitudes toward the bovine TB eradication goal in principle, and bovine TB eradication strategies in practice. More specifically, we hypothesize that beliefs and evaluations regarding bovine TB-related risks will be significant predictors of attitude toward bovine TB eradication in principle because it follows that those who perceive higher risk related to bovine TB would be more willing to agree with the principle that it must be eradicated. In contrast, we posit that beliefs and evaluations regarding the cost of bovine TB risk mitigation will be significant predictors of attitude toward bovine TB eradication in practice because those who incur the most opportunity cost due to practical bovine TB eradication policies will likely be less supportive of those policies. We hypothesize that beliefs about the bovine TB eradication goal will predict attitude toward bovine TB eradication in principle, while beliefs about bovine TB transmission will predict attitude toward bovine TB eradication in practice because each set of beliefs is more specific to one of the two eradication attitudes.

We further predict that beliefs about risk managers (the agencies involved in bovine TB eradication) will have significant positive influences on respondent support for bovine TB eradication in principle and in practice (i.e., respondents with more favorable attitudes toward the relevant government agencies are expected to be more supportive of the agency policies and rules with regard to bovine TB). Finally, we expect that hunters' background characteristics will play only a slight role in determining their attitudes toward eradication in principle and in practice.

Methods

We began our research by interviewing hunters (N = 18) in the 5-county area of northeast Lower Michigan that was most affected by bovine tuberculosis. Hunters were chosen through purposive snowball sampling: MDNR personnel and hunter interviewees identified additional hunters to be contacted for interviewing. We conducted the interviews in order to identify stakeholder concerns and clarify terminology to be used on the questionnaire.

Questionnaire development and content

Our questionnaire consisted of items in 6 major topic areas. We asked hunters about 1) background characteristics, 2) beliefs and evaluations regarding bovine TB-related risks, 3) beliefs and evaluations regarding the costs of bovine TB risk mitigation, 4) beliefs about bovine TB eradication and eradication strategies, 5) beliefs about state agencies, and 6) attitudes toward bovine TB eradication in principle and in practice. A copy of the full questionnaire is available in Appendix C (beginning on page 109).

Background characteristics

We asked hunters about the year in which they were born (which we then converted to age), their gender, and their northeast Michigan property ownership ("yes," "no"). We asked hunters about the number of years they had been a deer hunter, the hunting implement that they typically use ("firearm," "bow," or "both"), and

the type of land on which they primarily hunted in northeast Michigan ("private," "public," or "equally on both").

Beliefs and evaluations regarding bovine TB-related risks

We asked hunters about their beliefs regarding the risks of bovine tuberculosis to animal health, human health, food safety, their hunting satisfaction and the northeast Michigan economy. We asked whether they believed that bovine TB is a serious threat to the health of the Michigan deer herd, and to the health of livestock in Michigan ("strongly agree" to "strongly disagree"). We asked hunters whether they believed that humans can get bovine tuberculosis ("yes," "no," or "unsure"); we further asked those who believed that humans can get bovine tuberculosis to evaluate the chance of someone getting bovine TB in northeast Michigan if the disease is not eradicated ("extremely high" to "extremely low"). We then added these two variables to create one variable that described hunters' perceived risk of bovine TB to humans (see Table III-1 for a description of each value of this variable). We asked hunters whether they believed that beef and milk from northeast Michigan are safe to consume, whether the presence of bovine TB in northeast Michigan caused a decrease in their hunting satisfaction, and whether they believed that the bovine TB issue has hurt the economy in northeast Michigan ("strongly agree" to "strongly disagree").

Beliefs and evaluations regarding the costs of bovine TB risk mitigation

We asked hunters if they had fed deer on property in northeast Michigan before the feed ban, and if they had used bait when hunting in northeast Michigan before the

bait ban ("yes," "no"). For those who had fed/baited deer, we further asked how important feeding/baiting deer was to them ("very important" to "not important," or "unsure"). We then combined feed use and the importance of feeding deer to the individual into one variable and bait use and the importance of baiting to the individual into another variable (see Table III-1 for a description of each value of these variables).

Next, we asked hunters how important it is to their hunting enjoyment to see many deer ("very important" to "not important," or "unsure"), and to harvest a deer ("very important" to "not important," or "unsure"). We then added answers to these two variables (treating "unsure" responses as missing) in order to create a combined variable that measured deer density-dependent components of hunting satisfaction. We also asked hunters to evaluate the number of deer that they believe would be a reasonable management goal in the county in which they live in order to determine preference for deer numbers ("no deer" to "at least twice as many deer" or "unsure").

Beliefs about the bovine TB eradication goal and strategies

We also asked hunters about some specific beliefs regarding the bovine TB eradication goal and transmission mechanisms that could affect their attitudes toward the bovine TB eradication goal and eradication strategies. We asked hunters whether they believed it is possible to eradicate bovine TB in northeast Michigan ("strongly agree" to "strongly disagree"). We also asked about their beliefs regarding bovine TB transmission between deer by nose-to-nose contact and on infected feed, as these transmission mechanisms were the main reasons why the bait and feed bans were implemented. We asked hunters to evaluate the statements, "bovine TB spreads

between deer by nose-to-nose contact" ("definitely true" to "definitely false"), and "bovine TB spreads from one deer to other deer on infected feed" ("definitely true" to "definitely false"). We then added respondent answers to these two questions about bovine TB transmission and created one variable that measured hunters' summative transmission beliefs.

Beliefs about state agencies

We asked hunters a number of questions about their beliefs about the MDNR and the Michigan Department of Agriculture (MDA), as these were two of the agencies with primary responsibility for managing the bovine TB issue. We asked hunters to evaluate statements about the accuracy of the information that each agency provides (to assess beliefs about agency openness and honesty), whether each agency cares about sportsmen's concerns (to assess beliefs about agency concern and care), and the job each agency has done dealing with the bovine TB issue. We also asked hunters about their belief on whether the MDNR managing natural resources in a scientifically sound manner (to assess beliefs about MDNR knowledge and expertise). We then created a state agency beliefs scale. We removed any cases from this computation where the respondent left three or more questions unanswered. Any remaining unanswered questions (for respondents who only left one or two questions unanswered and were therefore not removed from the analysis) were assigned the "unsure" category. The highest possible score, indicating that the respondent strongly agreed with each of the statements is 35. The lowest score, indicating that a respondent strongly disagreed with all of the statements is 7, and the midpoint for the index is 21.

Attitude toward bovine TB eradication in principle and in practice

To determine hunter attitudes toward bovine TB eradication in principle, versus in practice, we asked the following questions. First, we asked hunters whether or not they support the overall goal to eradicate bovine TB in wildlife and domestic livestock in Michigan. Their responses ranged from "Yes, I strongly support the overall goal to eradicate bovine TB," to "No, I strongly oppose the overall goal to eradicate bovine TB." Individuals who responded "don't care" were coded 0 with "unsure" respondents. Next, we asked hunters about their opinion on the bait ban, the feed ban, unlimited antlerless deer permits, and the extended deer-hunting season ("strongly support" to "strongly oppose"). We added hunter responses to these four questions about specific eradication strategies to create one variable measuring their summative attitude toward the practical efforts aimed at achieving the goal of bovine TB eradication. Again, we coded "don't care" responses as "unsure" when creating this variable. In order to give this variable the same range as bovine TB eradication support in principle (+2 to –2), we divided it by 4.

Questionnaire administration

We administered the questionnaire using a multiple contact mailing method (Dillman 1978). Our sample included adult individuals (18 years or older) who both hunt and reside in the 5-county area of northeast Michigan with the greatest prevalence of bovine tuberculosis. Our sample of hunters was taken from the Michigan Department of Natural Resources 1998 general license purchasers list, a list which contains each

hunter's county of residence and the county in which his/her deer hunting license was purchased. To determine whether these individuals had actually hunted in northeast Michigan (as opposed to purchasing their license there but hunting elsewhere in the state), we asked respondents to indicate whether they had hunted in the 5-county area since 1996; we then removed those who indicated that they had not for analysis (N = 15). We used the 1998 license purchasers list because this was the last year that hunters were allowed to use bait and feed in northeast Michigan. We did not want to bias the sample by only querying individuals who continued to hunt in northeast Michigan in 1999 despite the bans. We sampled 1,000 individuals, and we sent the first mailing in October 2000. We offered a prize drawing of a $50 gift certificate to a hunting catalog for all respondents who mailed their completed survey within two weeks. We then sent a reminder postcard, and finally another mailing to those who had not yet responded. All surveys received by April 2001 were included in analysis.

Data analysis

We used descriptive statistics to evaluate stakeholder demographics. We used scale reliability analysis and principle component analysis to determine the reliability and dimensionality of our state agency beliefs scale. We used bivariate correlation to determine whether there was a relationship between bovine TB eradication support in principle and bovine TB eradication support in practice, and a one-sample t-test to determine if the mean values for each type of support were significantly different from one another. We used multiple linear regression to predict bovine TB eradication support in principle and bovine TB eradication support in practice using antecedent

beliefs and hunter background characteristics. Table III-1 presents the coding for the dependent and independent variables used in the models. Independent variables included beliefs about the threat of bovine TB to deer herd health and livestock health, perceived risk of bovine TB to humans, belief about the safety of beef and milk from northeast Michigan for consumption, belief about the effect of bovine TB on hunting satisfaction, belief that the bovine TB issue has hurt the northeast Michigan economy, feed use and importance, bait use and importance, deer density-based components of hunting satisfaction, deer numbers preference, the belief that it is possible to eradicate bovine TB, transmission beliefs, beliefs about government agencies and hunter background variables.

Results

We mailed our survey to a total of 1,000 individuals. After adjusting for nondeliverable surveys and ineligible respondents, the survey achieved a response rate of 62% (N = 592). The survey has a sampling error (at 95% confidence) of +/-4%.

Sample background characteristics

Table III-2 presents respondent demographics and other background characteristics. Respondents ranged in age from 18 to 100 years (mean 52 years, s.d. 17.17). Eighty-nine percent of our respondents were male, while 11% were female; this is largely due to the fact that men are more likely to hunt than women and necessarily made up more of the initial sample and the population from which the sample was drawn. Approximately 86% of our respondents reported that they own

property in northeast Michigan. Respondents had hunted deer from 2 to 76 years (mean = 31 years, s.d. = 15.5). A majority (53%) of respondents indicated that they hunted with a firearm only. Forty-six percent reported hunting with either firearm or bow, while only 1% of respondents were solely bow hunters. Respondents were most likely to report that they hunt on private land.

Beliefs and evaluations regarding bovine TB-related risks

Table III-3 presents hunter attitudes about bovine TB-related risks. Fifty-four percent of respondents believed that bovine TB is a serious threat to the health of the deer herd and 33% believed that bovine TB in wild deer is a serious threat to livestock health in Michigan. Only 42% of respondents believed that humans can get bovine tuberculosis. However, of those who believed that humans can contract bovine TB, very few (9%) thought there was a high risk of someone contracting the disease in northeast Michigan if the disease is not eradicated. Seventy-five percent of hunters believed that beef and milk from northeast Michigan are safe to consume, and 46% believed that the presence of bovine TB in northeast Michigan has caused their hunting satisfaction to decrease. Finally, 81% agreed that the bovine TB issue has hurt the economy in northeast Michigan.

Beliefs and evaluations regarding the cost of bovine TB risk mitigation

Table III-4 presents hunter feeding and baiting information. Seventy-three percent of our respondents fed deer on property in northeast Michigan before the feed ban. Of those who had fed deer (n = 411), 67% percent reported that feeding deer

before the feed ban was very important/important to them. A majority of respondents (86%) had used bait when hunting in northeast Michigan before the bait ban. Of those who had used bait (n = 488), 64% reported that baiting was very important/important to them. Table III-5 presents hunter attitudes toward deer density-based attributes of hunting satisfaction and preferences for deer numbers. When asked about some of the deer density-based attributes of hunting satisfaction, 70% of hunters reported that it is important or very important for their deer hunting enjoyment that they see many deer. Fifty percent of hunters reported that it is important or very important for their deer hunting enjoyment that they harvest a deer.

Hunters, on average, preferred slightly more deer in their county of residence than were there at the time of the survey (mean = 0.471, S. D. = 2.02; individuals who marked "unsure" for this question were removed from this analysis). Nineteen percent of hunters preferred the current number of deer in their county, while 3% preferred no deer, and 9% preferred twice as many deer in their county as were currently there.

Beliefs about the bovine TB eradication goal and strategies

Table III-6 presents the hunter beliefs about the achievability of the bovine TB eradication goal and about bovine TB transmission. Twenty-seven percent of respondents believed that it is possible to eradicate bovine TB in northeast Michigan, while 45% did not believe that such eradication is possible, and 30% were unsure. Seventy-two percent of respondents believed that bovine TB spreads between deer by nose-to-nose contact, while only 44% believed that bovine TB spreads between deer on infected feed.

Beliefs about state agencies

Table III-7 presents hunter attitudes toward the MDNR and the MDA. This scale resulted in a Cronbach's alpha of 0.87, indicating that the scale items were highly consistent and reliable. The scale was found to be bidimensional using principle components analysis. Two factors accounted for 72% of the variance in the items of our state agency beliefs scale. These two factors were beliefs about the MDA and beliefs about the MDNR. However, despite there being two dimensions, for our purposes it is sufficient to treat the scale as one measure, and we conducted analysis this way for simplicity. The mean state agency beliefs scale score was 19.35 (S.D. = 5.34) out of 35, so hunters, on average, held a slightly negative opinion of the MDNR and the MDA and the way in which these agencies have handled the bovine TB issue. For example, 26% of respondents believed that the MDNR provides accurate information on natural resource issues, and 33% of respondents believed that the MDA provides accurate information on agriculture issues. Few respondents believed that the MDNR and the MDA have done a good job dealing with the bovine TB issue (19% and 17% respectively).

Attitude toward bovine TB eradication in principle and in practice

Table III-8 presents hunter attitudes toward the eradication goal and eradication strategies. The mean value for bovine TB eradication support in principle was 0.64 (S.D. = 1.10), which shows that, on average, hunters were slightly supportive of the goal to eradicate bovine TB in Michigan. Fifty-nine percent responded that they

support or strongly support the goal to eradicate bovine TB in "wildlife and domestic livestock in Michigan." However, hunters were not nearly as supportive of particular eradication strategies. The mean bovine TB eradication support in practice response for hunters was -0.48 (S.D. = 1.01), indicating that, on average hunters opposed bovine TB eradication strategies. Only 33% of hunters supported the feed ban, and 26% of hunters supported the bait ban. Thirty-seven percent of hunters supported the extended deer hunting season in northeast Michigan, and only 21% of hunters supported the unlimited antlerless deer permit policy. Even so, there was a rather strong correlation between bovine TB eradication support in principle and bovine TB eradication support in practice ($r = 0.453$, $p \leq 0.01$). But, a one-sample t-test showed that mean values for bovine TB eradication support in principle and bovine TB eradication support in practice were significantly different from one another ($p \leq 0.01$) (recall that the variable measuring bovine TB eradication support in practice was divided by 4 so both variables have the same range).

Predicting eradication support in principle and in practice

Table III-9 presents the bivariate and multivariate regression coefficients between the explanatory variables and dependent variables (bovine TB eradication support in principle and bovine TB eradication support in practice). All explanatory variables except 3 (the belief that bovine TB has decreased hunter satisfaction, the belief that beef and milk from northeast Michigan are safe to consume, and the belief that the bovine TB has hurt the northeast Michigan economy) were significantly correlated with bovine TB eradication support in principle at the bivariate level. The variables that

were most strongly correlated with bovine TB eradication support in principle at the bivariate level were perceived threat to deer health ($r = 0.472$, $p \leq 0.01$) and perceived threat to livestock health ($r = 0.437$, $p \leq 0.01$). All explanatory variables except 2 (the perceived risk of bovine TB to humans and the belief that beef and milk from northeast Michigan are safe to consume) were significantly correlated with bovine TB eradication support in practice at the bivariate level. The variables that were most strongly correlated with bovine TB eradication support in practice at the bivariate level were the perceived threat of bovine TB in wild deer to livestock health ($r = 0.46$, $p \leq 0.01$) and transmission beliefs ($r = 0.446$, $p \leq 0.01$).

At the multivariate level, or when we controlled for all other variables, only 7 variables remained significant in predicting bovine TB eradication support in principle. These variables were as follows: the belief that bovine TB is a threat to deer health, the belief that bovine TB in wild deer is a threat to livestock health, feed use and importance, deer-based components of hunting satisfaction, the belief that bovine TB eradication is possible, transmission beliefs and gender. This model resulted in an R^2 of 0.356. Ten variables were significant in predicting support for bovine TB eradication in practice. These variables were as follows: the belief that bovine TB in wild deer is a threat to livestock health, the belief that the bovine TB disease has caused a decrease in one's hunting satisfaction, feed use and importance, bait use and importance, deer-based components of hunting satisfaction, numbers preference, the belief that bovine TB eradication is possible, transmission beliefs, beliefs about the government and property ownership. This model resulted in an R^2 of 0.474.

Discussion

Our results showed that there was indeed a difference between hunter support for bovine TB eradication in principle versus in practice. For example, 59% of hunters supported the goal of bovine TB eradication in principle, but only 33% supported the feed ban, a specific bovine TB eradication strategy. Table III-10 shows respondent attitudes toward the goal of bovine TB eradication by attitudes toward the feed ban. Twenty-seven percent of those represented (N = 148) supported bovine TB eradication in principle, but did not support the feed ban as a means to achieve bovine TB eradication. Only 10% of hunters in the table opposed both the goal to eradicate bovine TB and the feed ban. Thirty-six percent of hunters in this table (N = 201) were unsure about their opinion on the goal of bovine TB eradication, the feed ban, or both. These results suggest that there may be promising opportunities for agency officials to utilize communication efforts to increase support for bovine TB eradication among northeast Michigan hunters. A full 90% of hunters were either supportive or unsure of their opinion on the goal to eradicate bovine TB, the feed ban, or both. This means that while there is certainly not full support of the bovine TB eradication goal and efforts among northeast Michigan hunters, there is either sympathy or uncertainty among a strong majority of them.

The Theory of Reasoned Action proved to be a useful tool for guiding our model, as hunter beliefs and demographics accounted for a substantial amount of the variance in hunter attitude toward bovine TB eradication in principle ($R^2 = 0.356$) and in practice ($R^2 = 0.474$). Hunter beliefs were indeed strong antecedents to their attitudes. Similar to previous research (Donnelly and Vaske 1997, Riley and Decker 2000a), we found

that background characteristics were not as successful at predicting hunter attitudes as were specific beliefs; a different background variable was significant in each model, but the effect of the coefficients was not strong for either variable. We did find that different beliefs and background characteristics accounted for significant amounts of the variance in attitude toward bovine TB eradication in principle versus in practice at the multivariate level. However, there were beliefs that were significant in both models.

We found partial support for our hypothesis that beliefs about risk will be significant predictors of attitude toward bovine TB eradication in principle. Only two of the six risk-related belief variables (the belief that bovine TB is a serious threat to deer health ($b = 0.228$, $p \leq 0.01$), and the belief that bovine TB in wild deer is a serious threat to livestock health ($b = 0.138$, $p \leq 0.01$)) were significant in predicting bovine TB eradication support in principle. However, two of the risk-related belief variables were also significant predictors of bovine TB eradication support in practice (the belief that bovine TB in wild deer is a serious threat to livestock health ($b = 0.180$, $p \leq 0.01$), and the belief that one's hunting satisfaction has decreased due to the presence of bovine TB in northeast Michigan ($b = -0.099$, $p \leq 0.05$)). We asked the question that addressed risk of bovine TB to hunting satisfaction in order to prompt hunters to consider the relationship between the bovine TB disease itself and their hunting satisfaction. However, we suspect that hunters believed that bovine TB has affected their hunting satisfaction via the eradication strategies, so this may be why this variable was significant and negatively correlated with attitude toward bovine TB eradication in practice at the multivariate level. Although the same number of risk-related beliefs was

significant in both models, the effects of the coefficients in the model predicting attitude toward bovine TB eradication in principle tended to be stronger than in the model predicting attitude toward bovine TB eradication in practice; this demonstrates that risk-related beliefs were more important in predicting attitude toward bovine TB eradication in principle. These results suggest that beliefs about the risks posed by bovine TB are better predictors of attitude toward bovine TB eradication in principle; however, beliefs about the risk of bovine TB to livestock health may motivate hunter support for both the eradication goal and eradication strategies. We suspect that beliefs about risks posed to livestock health were significant at the multivariate level in both models because such concerns were not off-set by beliefs about personal costs (i.e., hunters do not perceive livestock health to threaten their recreation preferences).

Respondents were relatively unconcerned about the risk of bovine TB to human health. We found a significant, but very small, correlation between the perceived risk of bovine TB to humans and bovine TB eradication support in principle at the bivariate level (0.09, $p \leq 0.05$), but no significant correlation between the perceived risk of bovine TB to humans and bovine TB eradication support in practice at the bivariate level. Perceptions of the risk of bovine TB to human health were not significant in either model at the multivariate level. Hunters tended to agree that beef and milk from northeast Michigan are safe to consume, but this variable, another indicator of human health concern, also was not related to attitude toward bovine TB eradication in principle or in practice at either the bivariate or multivariate levels. As stated earlier, people tend to accept risks that are equitable, voluntary, and non-catastrophic (Slovic 1987). Hunter exposure to bovine TB could be considered equitable and voluntary (i.e.,

all hunters are equally susceptible, and one volunteers to hunt and thereby to expose himself/herself to deer-related bovine TB risks). Further bovine TB is non-catastrophic in its effects, as it has a nearly 95% cure-rate for those who contract the illness; immunocompetent adults rarely contract bovine TB (Nelson 1999). These results demonstrate that perception of human health risk does not, and will not likely, serve as a strong motivation for stakeholder support for bovine TB eradication goals or strategies.

We found support for our hypothesis that beliefs and evaluations of the costs related to bovine TB risk mitigation would predict hunter attitude toward bovine TB eradication in practice at the multivariate level. All four of our cost-related variables were significant in the model that predicted bovine TB eradication support in practice (feed use and importance ($b = -0.187$, $p \leq 0.01$) bait use and importance ($b = -0.122$, $p \leq 0.05$), deer density-based components of hunting satisfaction ($b = -0.10$, $p \leq 0.05$), and deer numbers preference ($b = -0.10$, $p \leq 0.05$)). This means that those who did not use bait or feed (or valued baiting and feeding less), those who placed less value on deer density-based components of the hunting experience, and those who preferred fewer deer in their county of residence were most likely to support bovine TB eradication in practice.

Only 2 of our 4 variables measuring cost-related beliefs and evaluations were significant in the model that predicted bovine TB eradication support in principle (feed use and importance ($b = -0.089$, $p \leq 0.05$), and deer-based components of hunting satisfaction ($b = -0.088$, $p \leq 0.05$)). However, though these effect coefficients were significant, they were very small. This means that there was only a slight tendency for

those to who did not feed deer (or to whom feeding was less important) and those who placed less value on deer density-dependent components for their hunting satisfaction to be more supportive of bovine TB eradication in principle.

We found partial support for our hypothesis that belief about the bovine TB eradication goal (i.e. the achievability of the goal) will be related to attitude toward bovine TB eradication in principle. This belief was significant in both models, (attitude toward bovine TB eradication in principle: $b = 0.202$, $p \leq 0.01$; attitude toward bovine TB eradication in practice: $b = 0.102$, $p \leq 0.05$). Further, we only found partial support for our hypothesis that beliefs about bovine TB transmission will be related to attitude toward bovine TB eradication in practice. Once again, these beliefs (which were combined into one variable) were significant in both models (attitude toward bovine TB eradication in principle: $b = 0.119$, $p \leq 0.05$; attitude toward bovine TB eradication in practice: $b = 0.199$, $p \leq 0.01$). In fact, transmission beliefs had the highest effect coefficient of all of the significant variables used to predict bovine TB eradication support in practice. These results suggest that hunter beliefs about the achievability of the bovine TB eradication goal and about bovine TB transmission are not inconsequential to their attitude toward bovine TB eradication in principle and in practice. State agencies should consider enhancing communication efforts that provide evidence that bovine TB eradication efforts are working, when such evidence becomes available, as well as evidence supporting their claims about bovine TB transmission mechanisms. Such efforts may enhance hunter support for bovine TB eradication goals and efforts.

We also found partial support for our hypothesis that beliefs about risk managers will have significant positive influence on hunter support for bovine TB eradication in principle and in practice. Our results showed that beliefs about government agencies were significant at the multivariate level only for the model that predicted bovine TB eradication support in practice ($b = 0.160$, $p \leq 0.01$). Such results demonstrate that agency credibility is an important factor in on-going bovine TB eradication efforts. Recall that hunters had an overall slightly negative attitude toward the MDNR and the MDA. This further suggests that these agencies should look for ways to maintain, and even strengthen their credibility among northeast Michigan hunters. However, we must caution that public trust in risk managers is tenuous and asymmetrical, or, more easily destroyed than created (Slovic 1993). Therefore, an agency must be fully committed in efforts to enhance its credibility. Public trust may not be attained in the short run, and may require open, two-way communication with stakeholders in order to ever be achieved (Slovic 1993).

Finally, previous research might predict women to be more sympathetic to bovine TB eradication goals than men because women tend to be more sensitive to situations involving risk (Boholm and Löfstedt 1999). However, we did not find support for this notion. On the contrary, our research found a slight tendency for men to be more supportive of the bovine TB eradication goal than women. Previous predictions about gender and natural resource attitudes have typically been drawn about samples of suburban women, and females in our sample population were entirely from rural areas. We also surveyed only female hunters, who may tend to have different perspectives than a sample of female non-hunters. We also found that hunters who owned property

in northeast Michigan were more supportive of bovine TB eradication in practice, although this effect coefficient was rather small ($b = 0.073$, $p \leq 0.05$).

We have found that northeast Michigan hunters differentiate between bovine TB eradication in principle and in practice when forming attitudes about bovine TB eradication. State agencies must consider this distinction as they develop future communication efforts. Future social research on wildlife disease issues should recognize the difference between support for such efforts in principle and in practice as well. Beliefs about the risks of bovine TB to animal health, and the belief that bovine TB eradication is possible are the strongest antecedents to attitude toward bovine TB eradication in principle. State agencies should clarify risks and emphasize that eradication efforts can be successful in order to bolster support for bovine TB eradication in principle. In contrast, beliefs and evaluations of the cost of bovine TB eradication efforts to hunters, beliefs about bovine TB transmission, beliefs about the government, and beliefs about the risk of bovine TB to livestock health are the variables that most effectively predict support for bovine TB eradication in practice. Efforts to enhance hunter support for bovine TB eradication strategies should attempt to minimize perceived costs to of eradication strategies to hunters, clarify the evidence for baiting and feeding as mechanisms of bovine TB spread, and enhance agency credibility.

We believe that our work could have been strengthened by determining the personal importance of the bovine TB issue to hunters (Bright and Manfredo 1996) and investigating subjective norms that could influence hunter attitudes toward bovine TB eradication and eradication strategies (Fishbein and Manfredo 1992), and we

recommend that future work address these topics. Future research should also elaborate on risks and costs perceived by stakeholders by quantifying these perceived risks and costs. Further, we recommend that future research test specific communication messages among hunters to assess their effectiveness at shaping public attitudes to the benefit of bovine TB eradication goals.

Literature cited

Boholm, Å. and R. Löfstedt. 6 September 1999. Issues of risk, trust, and knowledge: The Hallandsås tunnel case. Ambio 28:556-561.

Bovine TB eradication project. 2003. Bovine Tuberculosis. Accessed February 21, 2003. <http://www.bovinetb.com>.

Bright, A. D. and M. J. Manfredo. 1995. The quality of attitudinal information regarding natural resource issues: the role of attitude- strength, importance, and information. Society and Natural Resources 8:399-414.

Bright, A. D. and M. J. Manfredo. Spring 1996. A conceptual model of attitudes toward natural resource issues: a case study of wolf reintroduction. Human Dimensions of Wildlife 1(1):1-21.

Brooks, J. J., R. J. Warren, M. G. Nelms, and M. A. Tarrant. 1999. Visitor attitudes toward and knowledge of restored bobcats on Cumberland Island National Seashore, Georgia. Wildlife Society Bulletin 27:1089-1097.

Center for Animal Disease Information and Analysis. September 1996. Assessing the risks associated with *M. bovis* in Michigan free-ranging white-tailed deer. United States Department of Agriculture, Centers for Epidemiology and Animal Health, CAIDA Technical Report No. 01-96, Fort Collins, Colorado, USA.

Decker, D. J., T. L. Brown, and B. A. Knuth. 1996. Human dimensions research: its importance in natural resource management. Pages 29-47 *in* A. W. Ewert, editor. Natural resource management: The human dimension. Westview Press, Inc., Boulder, Colorado, USA.

Dillman, D. A. 1978. Mail and telephone surveys: the total design method. John Wiley
and sons, New York, New York, USA.

Donnelly, M. P., and J. J. Vaske. 1997. Predicting attitudes toward a moose hunt. Society and Natural Resources 8:307-319.

Engler, J. Executive directive 1998-1. January 29, 1998. Lansing, Michigan, USA.

Fishbein, M. and I. Ajzen. 1975. Beliefs, attitude, intention and behavior: An introduction to the theory and research. Reading, MA: Addison-Wesley.

Fishbein, M. and M. J. Manfredo. 1992. A theory of behavior change. Pages 29-50 *in* M. J. Manfredo, editor. Influencing human behavior: Theory and applications in recreation, tourism, and natural resource management. Sagamore Publishing, Inc., Champaign, Illinois, USA.

Kaltenborn, B. P., T. Bjerke, and J. Vittersø. 1999. Attitudes toward large carnivores among sheep farmers, wildlife managers, and research biologists in Norway. Human Dimensions of Wildlife 4:57-73.

Kellert, S. R. 1980. Americans' attitudes toward and knowledge of animals: An update. International Journal for the Study of Animal Problems 1:87-119.

Kellert, S. R. and J. K. Berry. 1987. Attitudes, knowledge, and behaviors toward wildlife as affected by gender. Wildlife Society Bulletin 15:363-371.

Knuth, B. A. 1990. Risk communication: A new dimension in sport-fisheries management. North American Journal of Fisheries Management 10:374-381.

Knuth, B. A., R. J Stout, W. F. Siemer, D. J. Decker, and R. C. Stedman. 1992. Risk management concepts for improving wildlife population decisions and public communication strategies. Transactions of the 57th Annual Wildlife and Natural Resources Conference 63-75.

Krosnick, J. A., and R. E. Petty. 1996. Attitude strength: An overview. Pages 1-24 *in* R. E. Petty and J. A. Krosnick, editors. Attitude strength: Antecedents and consequences. Erlbaum, Mahwah, New Jersey, USA.

Lauber, B. T., M. L. Anthony, and B. A. Knuth. 2001. Gender and ethical judgements about suburban deer management. Society and Natural Resources 14:571-583.

McGuill, M. W., S. M. Kreindel, A. DeMaria, Jr., and C. Rupprech. August 1, 1997. Knowledge and attitudes of residents in two areas of Massachusetts about rabies and an oral vaccination program in wildlife. Journal of the American Veterinary Medical Association 211:305-309.

Michigan Department of Natural Resources Wildlife Division. 2003. Baiting and Feeding Publications. Accessed March 21, 2003.

Nelson, A. M. 1999. The cost of disease eradication: small pox and bovine tuberculosis. Annals of New York Academy of Sciences 894:83-91.

O'Brien, D. J., S. D. Fitzgerald, T. J. Lyon, K. L. Butler, J. S. Fierke, K. R. Clark, S. M. Schmitt, T. M. Cooley, and D. E. Berry. 2001. Tuberculosis lesions in free-ranging white-tailed deer in Michigan. Journal of Wildlife Diseases 37:608-613.

Peters, R. G., V. T. Covello, D. B. McCallum. 1997. The determinants of trust and credibility in risk communication: An empirical study. Risk analysis 17(1):43-54.

Riley, S. J. and D. J. Decker. 2000a. Wildlife stakeholder acceptance capacity for cougars in Montana. Wildlife Society Bulletin 28:931-939.

Riley, S. J., and D. J. Decker. 2000b. Risk perception as a factor in wildlife stakeholder acceptance capacity for cougars in Montana. Human Dimensions of Wildlife 5:50-62.

Roswurm, J. D, and A. F. Ranney. 1973. Sharpening the attack on bovine tuberculosis. American Journal of Public Health 63:884-886.

Schmidt, S. M., S. D. Fitzgerald, T. M. Cooley, C. S. Bruning-Fann, L. Sullivan, D. Berry, T. Carlson, R. B. Minnis, J. B. Payeur, and J. Sikarskie. 1997. Bovine tuberculosis in free-ranging white-tailed deer from Michigan. Journal of Wildlife Diseases 33:749-758.

Sharp, E. 1999. Many hunters ignoring baiting ban in TB zone. Detroit Free Press. 4 November 1999; section D: 4.

Slovic, P. 1987. Perception of risk. Science. 236:280-285.

Slovic, P. 1993. Perceived risk, trust, and democracy. Risk Analysis 13:675-682.

Tarrant, M. A., A. D. Bright, and H. K. Cordell. 1997. Attitudes toward wildlife species protection: assessing moderating and mediating effects in the value-attitude relationship. Human Dimensions of Wildlife 2(2):1-20.

Zinn, H. C., M. J. Manfredo, J. J. Vaske, and K. Wittmann. 1998. Using normative beliefs to determine the acceptability of wildlife management actions. Society and Natural Resources 11:649-662.

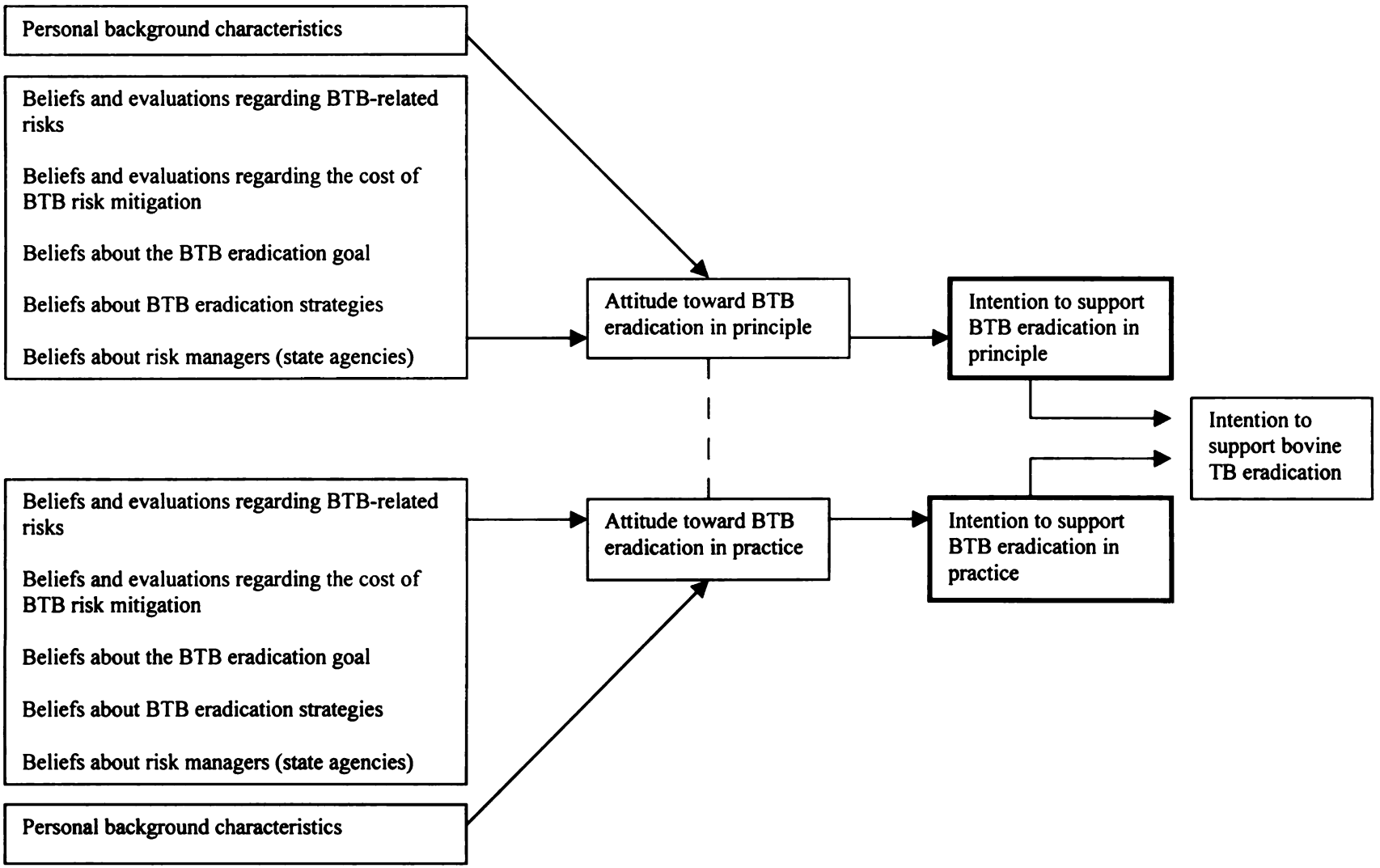


Figure 1. Proposed model of support for bovine tuberculosis eradication in Michigan

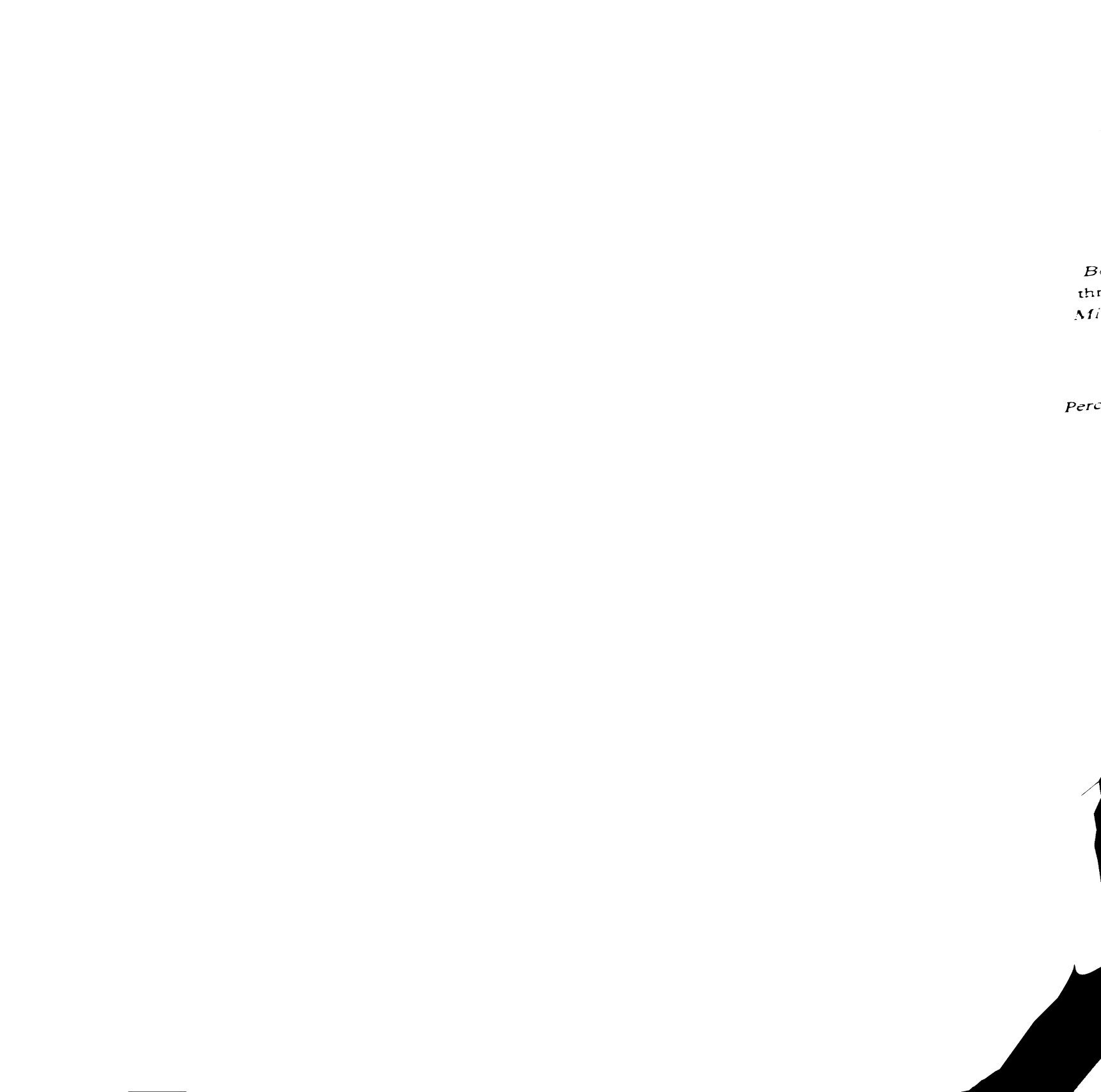


Table III-1. Variable coding for multivariate models

Variable	Coding
The bovine TB disease is a serious threat to the health of the deer herd in Michigan.	5 Strongly agree 4 Agree 3 Unsure 2 Disagree 1 Strongly disagree
Bovine TB in wild deer is a serious threat to the health of livestock in Michigan.	5 Strongly agree 4 Agree 3 Unsure 2 Disagree 1 Strongly disagree
Perceived risk of bovine TB to humans[1]	5 Yes, Extremely high 4 Yes, High 3 Yes, Low 2 Yes, Extremely low 1 Yes, Unsure 0 No or unsure
Beef and milk from northeast Michigan are safe to consume.	5 Strongly agree 4 Agree 3 Unsure 2 Disagree 1 Strongly disagree
My hunting satisfaction has decreased because of the presence of bovine TB in northeast Michigan.	5 Strongly agree 4 Agree 3 Unsure 2 Disagree 1 Strongly disagree
The bovine TB issue has hurt the economy in northeast Michigan.	5 Strongly agree 4 Agree 3 Unsure 2 Disagree 1 Strongly disagree

Table III-1. Variable coding for multivariate models- continued

Feed use and importance[2]	4 Fed deer, very important 3 Fed deer, important 2 Fed deer, somewhat important 1 Fed deer, not important or unsure 0 Did not feed deer
Bait use and importance[3]	4 Baited deer, very important 3 Baited deer, important 2 Baited deer, somewhat important 1 Baited deer, not important or unsure 0 Did not bait deer
Deer-based components of hunting satisfaction[4]	Continuous
Preferred number of deer[5]	Continuous
It is possible to eradicate bovine TB in northeast Michigan	5 Strongly agree 4 Agree 3 Unsure 2 Disagree 1 Strongly disagree
Transmission beliefs[6]	Continuous
Beliefs about the government[7]	Continuous
Bovine TB eradication support in principle[8]	5 Yes, I strongly support the goal to eradicate BTB 4 Yes, I support the goal to eradicate BTB 3 I am unsure/don't care about the goal to eradicate BTB 2 No, I oppose the goal to eradicate BTB 1 No, I strongly oppose the goal to eradicate BTB
Bovine TB eradication support in practice[9]	Continuous

1 This variable was the respondent's cumulative score on two questions. 1) Do you believe that humans can get bovine tuberculosis? 2) In your opinion, what is the chance that some person will get bovine TB in northeast Michigan if the disease is not eradicated? (This question was only asked of those who answered "yes" to question number 1.)

2 This variable was the respondent's cumulative score on two questions. 1) Before the feed ban, did you feed deer on property in northeast Michigan? 2) How important was feeding deer to you before the feed ban? (This question was only asked of those who answered "yes" to question number 1.)

3 This variable was the respondent's cumulative score on two questions. 1) Did you use bait when you hunted in northeast Michigan before the bait ban? 2) How important was baiting deer to you before the bait ban? (This question was only asked of those who answered "yes" to question number 1.)

4 This variable was the respondent's cumulative score on two questions. (How important is each of the following for your deer hunting enjoyment?)... 1) To see many deer. 2) To harvest a deer.

5 In the figure above, E represents the current number of deer in the county in which you live. Choose the letter above the line which is closest to the number of deer you think would be a reasonable management goal just before the 2001 deer hunting season in the county in which you live.

6 This variable was the respondent's cumulative score on two questions. 1) Bovine TB spreads between deer by nose-to-nose contact" ("definitely true" to "definitely false"). 2) "Bovine TB spreads from one deer to other deer on infected feed" ("definitely true" to "definitely false").

7 This variable was the respondent's cumulative score on seven questions. (Answers: strongly agree to strongly disagree). 1) The MDA provides accurate information on agriculture issues. 2) The MDA cares about sportsmen's concerns. 3) The MDA has done a good job dealing with the bovine TB issue. 4) In general, the DNR manages natural resources in a scientifically sound manner. 5) The DNR provides accurate information on natural resource issues. 6) The DNR cares about sportsmen's concerns. 7) The DNR has done a good job dealing with the bovine TB issue.

8 Do you support the overall goal to eradicate bovine TB in wildlife and domestic livestock in Michigan?

9 This variable was the respondent's cumulative score on four questions. 1)"What is your opinion of the ban on feeding deer as defined above?" (Definition provided: "Feeding deer is defined in Michigan policy as placing food materials out that attract deer for any reason other than for hunting.") 2) "What is your opinion of the ban on baiting deer as defined above?" (Definition provided: "Baiting deer is defined as putting out food materials for deer to lure, attract, or entice them as an aid in hunting.") 3) Please indicate your opinion about the following DNR management decision(s) in northeast Michigan for the 1998-2000 deer hunting seasons: extended deer hunting season. 4) Please indicate your opinion about the following DNR management decision(s) in northeast Michigan for the 1998-2000 deer hunting seasons: unlimited antlerless deer permits.

Table III-2. Hunter background characteristics

Variable	Statistic	Result
Age[1]	Range	18-100 years
	Mean	52.46 years
	Std. Dev.	17.17
	n	571
Gender[2]	% Male	89
	% Female	11
	n	561
Property ownership[3]	% Yes	86
	% No	14
	n	555
Years hunted deer[4]	Range	2-76 years
	Mean	30.77 years
	Std. Dev.	15.55
	n	563
Hunting implement[5]	% Firearm	53
	% Bow	1
	% Both firearm & bow	46
	n	565
Type of land hunted[6]	% Private land	65
	% Public land	18
	% Equally on both	18
	n	566

1 In what year were you born? (Age = (1999 – year born))
2 Are you male or female?
3 Do you own property in northeast Michigan?
4 Approximately how many years have you hunted deer?
5 Which of the following do you normally use when you deer hunt?
6 On what type of land do you primarily hunt in northeast Michigan?

Table III-3. Hunter beliefs about bovine TB-related risks

Variable	Statistic	Result
The bovine TB disease is a serious threat to the health of the deer herd in Michigan	% Strongly agree	14
	% Agree	40
	% Unsure	16
	% Disagree	25
	% Strongly disagree	5
	n	556
Bovine TB in wild deer is a serious threat to the health of livestock in Michigan	% Strongly agree	9
	% Agree	24
	% Unsure	25
	% Disagree	31
	% Strongly disagree	11
	n	564
Do you believe that humans can get bovine tuberculosis?	% Yes	42
	% No	37
	% Unsure	21
	n	553
Likelihood that someone will get bovine TB in NE Michigan if the disease is not eradicated	% Extremely high	3
	% High	6
	% Low	34
	% Extremely low	53
	% Unsure	5
	n	218
Beef and milk from northeast Michigan are safe to consume	% Strongly agree	24
	% Agree	51
	% Unsure	20
	% Disagree	4
	% Strongly disagree	1
	n	563
My hunting satisfaction has decreased because of the presence of bovine TB in northeast Michigan	% Strongly agree	15
	% Agree	29
	% Unsure	10
	% Disagree	36
	% Strongly disagree	11
	n	552

Table III-3. Hunter beliefs about bovine TB-related risks – continued

The bovine TB issue has hurt the economy in northeast Michigan.	% Strongly agree	37
	% Agree	44
	% Unsure	11
	% Disagree	6
	% Strongly disagree	1
	n	557

Table III-4. Hunter feeding and baiting behavior

Variable	Statistic	Result
Before the feed ban, did you feed deer on property in northeast Michigan?	% Yes	73
	% No	27
	n	562
How important was feeding deer to you before the feed ban?[1]	% Very important	35
	% Important	32
	% Somewhat important	24
	% Not important	8
	% Unsure	1
	n	391
Did you use bait when you hunted in northeast Michigan before the bait ban?	% Yes	86
	% No	14
	n	565
How important was baiting deer to you before the bait ban?[2]	% Very important	33
	% Important	31
	% Somewhat important	25
	% Not important	11
	% Unsure	0
	n	470

1 This question was only asked of those who answered "yes" to the question, "before the feed ban, did you feed deer on property in northeast Michigan?"

2 This question was only asked of those who answered "yes" to the question, "did you use bait when you hunted in northeast Michigan before the bait ban?"

Table III-5. Deer density-dependent components of hunter satisfaction and deer numbers preferences

Variable	Statistic	Result
How important is seeing many deer to your deer hunting enjoyment?	% Very important	34
	% Important	36
	% Somewhat important	6
	% Not important	0
	% Unsure	24
	n	550
How important is harvesting a deer to your deer hunting enjoyment?	% Very important	20
	% Important	30
	% Somewhat important	16
	% Not important	0
	% Unsure	34
	n	548
Preference for deer numbers in respondent's county of residence[1]	% A - At least 2X as many deer	9
	% B	2
	% C - 50 % more deer	20
	% D	14
	% E - Current number of deer	19
	% F	7
	% G - Half as many deer	11
	% H	4
	% I - No deer	3
	% J - Not sure	11
	n	556

1 In the figure above, E represents the current number of deer in the county in which you live. Choose the letter above the line which is closest to the number of deer you think would be a reasonable management goal just before the 2001 deer hunting season in the county in which you live.

Table III-6. Hunter beliefs about bovine TB eradication and transmission

Variable	Statistic	Result
It is possible to eradicate bovine TB in northeast Michigan	% Strongly agree	7
	% Agree	20
	% Unsure	30
	% Disagree	30
	% Strongly disagree	15
	n	556
Bovine TB spreads between deer by nose-to-nose contact	% Definitely true	22
	% Probably true	50
	% Unsure	17
	% Probably false	8
	% Definitely false	3
	n	560
Bovine TB spreads from one deer to other deer on infected feed	% Definitely true	10
	% Probably true	34
	% Unsure	31
	% Probably false	21
	% Definitely false	5
	n	557

Table III-7. Hunter beliefs about state agencies

Variable	Statistic	Result
The MDA provides accurate information on agriculture issues	% Strongly agree	4
	% Agree	29
	% Unsure	47
	% Disagree	16
	% Strongly disagree	4
	n	546
The MDA cares about sportsmen's concerns	% Strongly agree	2
	% Agree	15
	% Unsure	36
	% Disagree	33
	% Strongly disagree	13
	n	547
The MDA had done a good job dealing with the bovine TB issue	% Strongly agree	1
	% Agree	16
	% Unsure	44
	% Disagree	27
	% Strongly disagree	13
	n	543
In general, the DNR manages natural resources in a scientifically sound manner	% Strongly agree	3
	% Agree	30
	% Unsure	30
	% Disagree	25
	% Strongly disagree	12
	n	546
The DNR provides accurate information on natural resource issues	% Strongly agree	2
	% Agree	24
	% Unsure	33
	% Disagree	29
	% Strongly disagree	12
	n	545
The DNR cares about sportsmen's concerns	% Strongly agree	5
	% Agree	29
	% Unsure	27
	% Disagree	27
	% Strongly disagree	13
	n	543

Table III-7. Hunter beliefs about state agencies – continued

The DNR has done a good job dealing with the bovine TB issue	% Strongly agree	1
	% Agree	18
	% Unsure	30
	% Disagree	31
	% Strongly disagree	21
	n	547

Table III-8. Attitude toward bovine TB eradication in principle and in practice

Variable	Statistic	Result
Opinion on the goal to eradicate bovine TB in principle[1]	% Strongly support	24
	% Support	35
	% Unsure	25
	% Oppose	8
	% Strongly oppose	5
	% No opinion	3
	n	560
Feed ban opinion[2]	% Strongly support	13
	% Support	20
	% Unsure	12
	% Oppose	27
	% Strongly oppose	28
	% Don't care	2
	n	566
Bait ban opinion[3]	% Strongly support	15
	% Support	11
	% Unsure	13
	% Oppose	27
	% Strongly oppose	32
	% Don't care	3
	n	560
Opinion on the extended deer hunting season[4]	% Strongly support	11
	% Support	26
	% Unsure	12
	% Oppose	23
	% Strongly oppose	27
	% Don't care	1
	n	564
Opinion on unlimited antlerless deer permits[5]	% Strongly support	8
	% Support	13
	% Unsure	12
	% Oppose	28
	% Strongly oppose	39
	% Don't care	1
	n	561

1 Do you support the overall goal to eradicate bovine TB in wildlife and domestic livestock in Michigan?
2 "What is your opinion of the ban on feeding deer as defined above?" (Definition provided: "Feeding deer is defined in Michigan policy as placing food materials out that attract deer for any reason other than for hunting.")

3 "What is your opinion of the ban on baiting deer as defined above?" (Definition provided: "Baiting deer is defined as putting out food materials for deer to lure, attract, or entice them as an aid in hunting.")
4 Please indicate your opinion about the following DNR management decision(s) in northeast Michigan for the 1998-2000 deer hunting seasons: extended deer hunting season.
5 Please indicate your opinion about the following DNR management decision(s) in northeast Michigan for the 1998-2000 deer hunting seasons: unlimited antlerless deer permits.

Table III-9. Bivariate correlation coefficients and standardized multiple correlation coefficients

	Support for Bovine TB Eradication			
Explanatory variable	In principle bivariate	In principle multivariate	In practice bivariate	In practice multivariate
BTB is a threat to deer health	0.472**	0.228**	0.385**	0.071
BTB is a threat to livestock health	0.437**	0.138**	0.460**	0.180**
Perceived risk of BTB to humans	0.090*	0.019	0.062	0.012
NE MI beef and milk are safe to eat	-0.029	0.054	-0.024	0.040
BTB has hurt hunting satisfaction	-0.040	-0.039	-0.159**	-0.099*
BTB issue has hurt NE MI economy	-0.026	0.020	-0.109**	-0.005
Feed use and importance	-0.192**	-0.089*	-0.344**	-0.187**
Bait use and importance	-0.152**	0.018	-0.319**	-0.122*
Deer density and hunting satisfaction	-0.153**	-0.088*	-0.226**	-0.100*
Deer numbers preference	-0.119**	-0.009	-0.189**	-0.100*
BTB eradication is possible	0.378**	0.202**	0.299**	0.102*
Transmission beliefs	0.351**	0.119*	0.446**	0.199**
Beliefs about the government	0.322**	0.083	0.393**	0.160**
Age	0.071	0.040	-0.104*	-0.036
Gender	0.049	0.088*	-0.011	0.030
Property ownership	-0.011	0.003	-0.008	0.073*
Years hunting deer	0.015	-0.031	-0.053	-0.044
Hunting implement	-0.061	0.003	-0.046	0.020
Type of land hunted	-0.065	-0.007	-0.105*	-0.023
n		501		505
R^2		0.356		0.474

* $P \leq 0.05$ ** $P \leq 0.01$

1 Male = 1, Female = 0
2 Yes = 1, No = 0
3 Bow or both = 1, Firearm = 0
4 Private or both = 1, Public = 0

Table III-10 Attitudes toward the eradication goal and the feed ban

Attitude toward the BTB eradication goal

Support	Unsure	Oppose	
137	27	16	**Support**
42	27	5	**Unsure**
148	100	56	**Oppose**

Attitude toward the feed ban

Non-Resident Hunter Letter #1:

October 23, 2000

Dear (*Personalized Name)*,

In the past few years, the people of Michigan have been presented with a particularly challenging task: how to properly address bovine tuberculosis. Attempts to eradicate bovine tuberculosis (TB) have received both criticism and support from Michigan residents. We are very interested in your opinions about this issue, and in your opinions about related topics, such as wildlife and agriculture. Bovine TB has now been found in various places in the State of Michigan; however, we are specifically interested in the perspectives of Michigan hunters who have hunted in Northeast Michigan. We are asking for about 15 minutes of your time to complete the enclosed questionnaire regarding bovine tuberculosis and related topics. Please do not be concerned if you do not feel that you are very familiar with the issue. We are interested in *everyone's* responses.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Michigan hunters. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age and is a hunter. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope. We would really appreciate it because this will enable us to take you off of our list so that we don't send you reminders to complete the survey.

If you respond by **November 6, 2000**, your name will be entered in a **prize drawing to receive a $50 gift certificate to the Cabelas Catalog**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the Michigan State University Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution to the success of this study is essential, and it will be greatly appreciated.

Sincerely,

Angela G. Mertig
Project Manager

Non-Resident Hunter Letter #2:

November 17, 2000

Dear (*Personalized Name)*,

A few weeks ago you were mailed a "Bovine Tuberculosis Issue Opinion Survey." As of today, we have not received your completed survey. If you have recently mailed us your completed survey, we would like to thank you for returning it. If you have not yet filled out the survey, we hope you will take the opportunity to do so now. We are sending you another survey, along with a stamped return envelope, to make it easier for you to respond.

The people of Michigan have been presented with a challenging task in recent years: how to properly address bovine tuberculosis. Your opinions on this issue are particularly important to us because you are a Michigan hunter. We are asking for about 15 minutes of your time to complete the enclosed questionnaire. Whether or not you feel you are very familiar with the issue, we encourage you to respond. We are interested in *everyone's* opinions.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Michigan hunters. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age, is a hunter, and is a resident of Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope.

If you respond by **December 15, 2000,** your name will be entered into a **new prize drawing to receive a $50 gift certificate to Wal-Mart**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the MSU Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution is essential to the success of this study. We truly appreciate it!

Sincerely,

Angela G. Mertig
Project Manager

Resident Hunter Letter #1:

October 23, 2000

Dear (*Personalized Name)*,

In the past few years, the people of Michigan have been presented with a particularly challenging task: how to properly address bovine tuberculosis. Attempts to eradicate bovine tuberculosis (TB) have received both criticism and support from Michigan residents. We are very interested in your opinions about this issue, and in your opinions about related topics, such as wildlife and agriculture. Bovine TB has now been found in various places in the State of Michigan; however, we are specifically interested in the perspectives of hunters from Northeast Michigan. We are asking for about 15 minutes of your time to complete the enclosed questionnaire regarding bovine tuberculosis and related topics. Please do not be concerned if you do not feel that you are very familiar with the issue. We are interested in *everyone's* responses.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan hunters. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age, is a hunter, and is currently a resident of Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope. We would really appreciate it because this will enable us to take you off of our list so that we don't send you reminders to complete the survey.

If you respond by **November 6, 2000**, your name will be entered in a **prize drawing to receive a $50 gift certificate to the Cabelas Catalog**. I would be happy to answer any questions you may have regarding this survey. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the Michigan State University Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution to the success of this study is essential, and it will be greatly appreciated.

Sincerely,

Angela G. Mertig
Project Manager

Resident Hunter Letter #2:

November 17, 2000

Dear (*Personalized Name)*,

A few weeks ago you were mailed a "Bovine Tuberculosis Issue Opinion Survey." As of today, we have not received your completed survey. If you have recently mailed us your completed survey, we would like to thank you for returning it. If you have not yet filled out the survey, we hope you will take the opportunity to do so now. We are sending you another survey, along with a stamped return envelope, to make it easier for you to respond.

The people of Michigan have been presented with a challenging task in recent years: how to properly address bovine tuberculosis. Your opinions on this issue are particularly important to us because you are a Northeast Michigan hunter. We are asking for about 15 minutes of your time to complete the enclosed questionnaire. Whether or not you feel you are very familiar with the issue, we encourage you to respond. We are interested in *everyone's* opinions.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan hunters. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age, is a hunter, and is currently a resident of Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope.

If you respond by **December 15, 2000,** your name will be entered into a **new prize drawing to receive a $50 gift certificate to Wal-Mart**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the MSU Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution is essential to the success of this study. We truly appreciate it!

Sincerely,

Angela G. Mertig
Project Manager

Livestock Producer Letter #1:

October 23, 2000

Dear (*Personalized Name),*

In the past few years, the people of Michigan have been presented with a particularly challenging task: how to properly address bovine tuberculosis. Attempts to eradicate bovine tuberculosis (TB) have received both criticism and support from Michigan residents. We are very interested in your opinions about this issue, and in your opinions about related topics, such as agriculture and wildlife. Bovine TB has now been found in various places in the State of Michigan; however, we are specifically interested in the perspectives of people who raise livestock in Northeast Michigan. We are asking for about 15 minutes of your time to complete the enclosed questionnaire regarding bovine tuberculosis and related topics. Please do not be concerned if you do not feel that you are very familiar with the issue. We are interested in *everyone's* responses.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan livestock producers. However, **your name and address will never be associated with your responses in any way.**

This survey is intended for someone who is at least 18 years of age, is a full-time or part-time livestock producer, and is currently a resident of Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope. We would really appreciate it because this will enable us to take you off of our list so that we don't send you reminders to complete the survey.

If you respond by **November 6, 2000**, your name will be entered in a **prize drawing to receive a $50 gift certificate to Quality Farm & Fleet**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the Michigan State University Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution to the success of this study is essential, and it will be greatly appreciated.

Sincerely,

Angela G. Mertig
Project Manager

Livestock Producer Letter #2:

November 17, 2000

Dear (*Personalized Name)*,

A few weeks ago you were mailed a "Bovine Tuberculosis Issue Opinion Survey." As of today, we have not received your completed survey. If you have recently mailed us your completed survey, we would like to thank you for returning it. If you have not yet filled out the survey, we hope you will take the opportunity to do so now. We are sending you another survey, along with a stamped return envelope, to make it easier for you to respond.

The people of Michigan have been presented with a challenging task in recent years: how to properly address bovine tuberculosis. Your opinions on this issue are particularly important to us because you are a livestock producer from Northeast Michigan. We are asking for about 15 minutes of your time to complete the enclosed questionnaire. Whether or not you feel that you are very familiar with the issue, we encourage you to respond. We are interested in *everyone's* opinions.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan livestock producers. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age and currently raises livestock in Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope.

If you respond by **December 15, 2000,** your name will be entered into a **new prize drawing to receive a $50 gift certificate to Wal-Mart**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the MSU Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution is essential to the success of this study. We truly appreciate it!

Sincerely,

Angela G. Mertig
Project Manager

Business Owner/Manager Letter #1:

October 23, 2000

Dear Sir or Madam,

In the past few years, the people of Michigan have been presented with a particularly challenging task: how to properly address bovine tuberculosis. Attempts to eradicate bovine tuberculosis (TB) have received both criticism and support from Michigan residents. We are very interested in your opinions about this issue, and in your opinions about related topics, such as wildlife and agriculture. Bovine TB has now been found in various places in the State of Michigan; however, we are interested in the opinions and perspectives of the owners/managers of Northeast Michigan businesses. We are asking for about 15 minutes of your time to complete the enclosed questionnaire regarding bovine tuberculosis and related topics. Please do not be concerned if you do not feel that you are very familiar with the issue. We are interested in *everyone's* responses.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan business owners/managers. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum amount allowable by law.

This survey is intended for someone who is at least 18 years of age and is currently the owner or manager of a business in Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your business who does. If no one in your business fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope. We would really appreciate it because this will enable us to take you off of our list so that we don't send you reminders to complete the survey.

We ask that you kindly respond by **November 6, 2000**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the Michigan State University Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution to the success of this study is essential, and it will be greatly appreciated.

Sincerely,

Angela G. Mertig
Project Manager

Business Owner/Manager Letter #2:

November 17, 2000

Dear Sir or Madam,

A few weeks ago you were mailed a "Bovine Tuberculosis Issue Opinion Survey." As of today, we have not received your completed survey. If you have recently mailed us your completed survey, we would like to thank you for returning it. If you have not yet filled out the survey, we hope you will take the opportunity to do so now. We are sending you another survey, along with a stamped return envelope, to make it easier for you to respond.

The people of Michigan have been presented with a challenging task in recent years: how to properly address bovine tuberculosis. Your opinions on this issue are particularly important to us because you own or manage a business in Northeast Michigan. We are asking for about 15 minutes of your time to complete the enclosed questionnaire. Whether or not you feel you are very familiar with the issue, we encourage you to respond. We are interested in *everyone's* opinions.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan business owners/managers. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age and is currently the owner or manager of a business in Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your business who does. If no one in your business fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope.

We ask that you kindly respond by **December 15, 2000**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the MSU Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution is essential to the success of this study. We truly appreciate it!

Sincerely,

Angela G. Mertig
Project Manager

General Public Letter #1:

October 23, 2000

Dear (*Personalized Name*),

In the past few years, the people of Michigan have been presented with a particularly challenging task: how to properly address bovine tuberculosis. Attempts to eradicate bovine tuberculosis (TB) have received both criticism and support from Michigan residents. We are very interested in your opinions about this issue, and in your opinions about related topics, such as wildlife and agriculture. Bovine TB has now been found in various places in the State of Michigan; however, we are specifically interested in the perspectives of Northeast Michigan residents. We are asking for about 15 minutes of your time to complete the enclosed questionnaire regarding bovine tuberculosis and related topics. Please do not be concerned if you do not feel that you are very familiar with the issue. We are interested in *everyone's* responses.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan residents. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age and is currently a resident of Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope. We would really appreciate it because this will enable us to take you off of our list so that we don't send you reminders to complete the survey.

If you respond by **November 6, 2000**, your name will be entered in a **prize drawing to receive a $50 gift certificate to Wal-Mart**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the Michigan State University Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution to the success of this study is essential, and it will be greatly appreciated.

Sincerely,

Angela G. Mertig
Project Manager

General Public Letter #2:

November 17, 2000

Dear (*Personalized Name)*,

A few weeks ago you were mailed a "Bovine Tuberculosis Issue Opinion Survey." As of today, we have not received your completed survey. If you have recently mailed us your completed survey, we would like to thank you for returning it. If you have not yet filled out the survey, we hope you will take the opportunity to do so now. We are sending you another survey, along with a stamped return envelope, to make it easier for you to respond.

The people of Michigan have been presented with a challenging task in recent years: how to properly address bovine tuberculosis. Your opinions on this issue are particularly important to us because you are a resident of Northeast Michigan. We are asking for about 15 minutes of your time to complete the enclosed questionnaire. Whether or not you feel you are very familiar with the issue, we encourage you to respond. We are interested in *everyone's* opinions.

You may be assured of complete confidentiality when filling out this survey. The survey has identifying information for mailing purposes only so that we may check your name off of the mailing list when your survey is returned. Information from the surveys we receive will be summarized and reported to state agencies so that they have a better understanding of the opinions and concerns of Northeast Michigan residents. However, **your name and address will never be associated with your responses in any way.** Your privacy will be protected to the maximum extent allowable by law.

This survey is intended for someone who is at least 18 years of age and is currently a resident of Northeast Michigan. If the person to whom this letter is addressed does not fit this description, please give this survey to a person in your household who does. If no one in your household fits this description, please write on the survey that no one was eligible to complete it, and send the survey back to us in the enclosed stamped and self-addressed envelope.

If you respond by **December 15, 2000,** your name will be entered into a **new prize drawing to receive a $50 gift certificate to Wal-Mart**. I would be happy to answer any questions you may have. Feel free to call me **toll free at 1-888-206-4350**. If you have any further concerns about participating in this study, you may also write to Dr. David Wright, Chair of the MSU Committee on Research Involving Human Subjects at 246 Administration Building, East Lansing, Michigan, 48824, or call him at (517) 355-2180. Thank you for your assistance. Your contribution is essential to the success of this study. We truly appreciate it!

Sincerely,

Angela G. Mertig
Project Manager

Follow-up Postcard

November 3, 2000

Recently you were mailed a questionnaire seeking your opinion about the bovine tuberculosis issue in Michigan.

If you have already completed and returned the survey, please accept our sincere thanks! If not, please do so today. Because this has been a critical issue in Michigan, it is **very important** that we receive your feedback.

If, by some chance, you did not receive the questionnaire, or it got misplaced, please call me **toll free at 1-888-206-4350** and I will mail another one to you.

Sincerely,

A. Mertig
Project Coordinator

This survey deals with the bovine tuberculosis (TB) issue in Michigan and related topics such as wildlife and agriculture. Remember, you don't have to be very familiar with the bovine TB issue in order to answer the survey. We are interested in everyone's responses.

HUNTING

This set of questions deals with different aspects of deer hunting.

1. Approximately how many years have you hunted deer? _____YEARS

2. In how many years of the last 10 years have you hunted deer in Michigan?
   _____YEARS

3. Which of the following do you normally use when you deer hunt? (Check one.)
   1 ☐ Firearm
   2 ☐ Bow
   3 ☐ Both firearm and bow

4. As a recreational activity, how important is deer hunting for you compared to your other recreational activities? (Check one.)
   1 ☐ My most important recreational activity.
   2 ☐ One of the more important recreational activities I participate in.
   3 ☐ No more important than any other recreational activity.
   4 ☐ Less important than most of my other recreational activities.
   5 ☐ Not at all important to me as a recreational activity.

5. How important is each of the following for your deer hunting enjoyment? (Circle one response for each.)

		1 Very Important	2 Important	3 Unsure	4 Somewhat Important	5 Not Important
a.	To see many deer	VI	I	U	SI	NI
b.	To see a diversity of wildlife	VI	I	U	SI	NI
c.	To spend time in nature	VI	I	U	SI	NI
d.	To harvest a deer	VI	I	U	SI	NI
e.	To see large bucks	VI	I	U	SI	NI

6. In how many years of the last 10 years have you hunted in any of these 5 counties: Alpena, Alcona, Oscoda, Montmorency, or Presque Isle? _____ YEARS

7. On what type of land do you *primarily* hunt in Northeast Michigan? (Check one.)
   1 ☐ Private land
   2 ☐ Public land
   3 ☐ Equally on private and public land

8. Do you plan to hunt in Northeast Michigan during the 2000 hunting season? (Check one.)
   1 ☐ Yes ***(If 'Yes', please skip to question 9)***
   2 ☐ No ***(If 'No', please skip to question 10)***
   3 ☐ Unsure ***(If 'Unsure', please skip to question 10)***

9. For the following statements about deer hunting, please circle Yes, No, or Unsure.

		1 Yes	2 No	3 Unsure
a.	If you harvest a deer in Northeast Michigan this hunting season, do you intend to take it to a DNR check station?	Y	N	U
b.	If you harvested a deer this hunting season and you thought it may have bovine TB, would you report this to the DNR?	Y	N	U

(Please skip to question 11)

10. If you *do not* plan to hunt in Northeast Michigan in 2000, which of the following is the most important reason why? (Check one.)
   1 ☐ I don't want to hunt in Northeast Michigan because of the bait ban.
   2 ☐ I don't believe there are adequate deer numbers in Northeast Michigan.
   3 ☐ I am concerned about bovine tuberculosis in Northeast Michigan.
   4 ☐ I have plans to hunt elsewhere.
   5 ☐ I don't plan to hunt at all in 2000.
   6 ☐ Other (please specify)_____

"Baiting" deer is defined in Michigan as putting out food materials for deer to attract, lure, or entice them *as an aid in hunting*. The Natural Resources Commission voted to ban baiting for the 2000 hunting season in all Michigan counties where a deer has been found with bovine TB.

11. What is your opinion of the ban on baiting deer as defined above? (Check one.)
    1 ☐ Strongly support ***(Please skip to question 12)***
    2 ☐ Support ***(Please skip to question 12)***
    3 ☐ Unsure ***(Please skip to question 14)***
    4 ☐ Oppose ***(Please skip to question 13)***
    5 ☐ Strongly oppose ***(Please skip to question 13)***
    6 ☐ Don't care ***(Please skip to question 14)***

12. Which of the following are reasons why you support the bait ban? (Check all that apply.)
    1 ☐ Baiting increases interference and/or competition among deer hunters.
    2 ☐ Baiting brings deer closer together, which could spread bovine TB.
    3 ☐ Baiting deer gives an unfair or unethical advantage to the hunter.
    4 ☐ I think baiting results in an overharvest of bucks.
    5 ☐ Other (please specify)_____

    Which one of the reason(s) that you checked above is the **most important** reason to you? (Check one and skip to Question 14.)
    1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

13. Which of the following are reasons why you oppose the bait ban? (Check all that apply.)
    1 ☐ I hunt more effectively with bait.
    2 ☐ I don't think the government should restrict anyone's way of hunting.
    3 ☐ I don't have time to hunt without using bait.
    4 ☐ Baiting allows me to see more wildlife when I hunt.
    5 ☐ Other (please specify)_____

    Which one of the reason(s) that you checked above is the **most important** reason to you? (Check one.)
    1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

14. Would you support a statewide ban on baiting deer? (Check one.)
    1 ☐ Yes
    2 ☐ No
    3 ☐ Unsure

15. Did you use bait when you hunted in Northeast Michigan before the bait ban? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 18)***

16. How important was baiting deer to you before the bait ban? (Check one.)
    1 ☐ Very Important
    2 ☐ Important
    3 ☐ Somewhat Important
    4 ☐ Not Important
    5 ☐ Unsure

17. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

	Even with the bait ban…	**1 Strongly Agree**	**2 Agree**	**3 Unsure**	**4 Disagree**	**5 Strongly Disagree**
a.	…I am confident in my ability to harvest a deer.	SA	A	U	D	SD
b.	…I enjoy hunting in Northeast Michigan as much as I used to.	SA	A	U	D	SD
c.	…most hunters I know enjoy hunting in Northeast Michigan as much as they used to.	SA	A	U	D	SD



18. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	Most DNR biologists feel that baiting is an acceptable hunting practice.	SA	A	U	D	SD
b.	DNR Conservation Officers will strongly enforce the *bait ban* in the 2000 deer hunting season.	SA	A	U	D	SD

19. Please indicate your opinion about the following DNR management decisions in Northeast Michigan for the 1998-2000 deer hunting seasons. (Circle one response for each.)

		1 Strongly Support	2 Support	3 Unsure	4 Oppose	5 Strongly Oppose	6 Don't Care
a.	Extended deer hunting season	SS	S	U	O	SO	DC
b.	Unlimited antlerless deer permits	SS	S	U	O	SO	DC

20. How effective do you think the extended deer hunting season is at reducing deer numbers in Northeast Michigan? (Check one.)
    1 ☐ Highly effective
    2 ☐ Effective
    3 ☐ Slightly effective
    4 ☐ Not at all effective
    5 ☐ Unsure

21. How many antlerless deer permits did you purchase for the 1999 hunting season in Northeast Michigan? _____PERMITS

22. How many antlerless deer permits do you intend to purchase for the 2000 hunting season in Northeast Michigan? _____PERMITS

WHITE-TAILED DEER

Next, we would like to know about some of your opinions on white-tailed deer and deer management.

23. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

Deer management in Northeast Michigan should...

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	...minimize crop losses due to deer.	SA	A	U	D	SD
b.	...prevent deer from disturbing or destroying natural plant communities.	SA	A	U	D	SD
c.	...maintain the highest possible deer harvest (success) rate for hunters.	SA	A	U	D	SD
d.	...ensure car-deer accident rates are as low as possible.	SA	A	U	D	SD
e.	...keep deer as physically healthy as possible.	SA	A	U	D	SD
f.	...maximize the money that deer hunters bring to Northeast Michigan's economy.	SA	A	U	D	SD

"Feeding" deer is defined in Michigan as placing food materials out that attract deer for any reason *other than for hunting*. The Natural Resources Commission voted to ban deer feeding in 2000 for all Michigan counties where a deer has been found with bovine TB. (This is *not* the same as "baiting".)

24. What is your opinion of the ban on feeding deer as defined above? (Check one.)

1 ☐ Strongly support
2 ☐ Support
3 ☐ Unsure
4 ☐ Oppose
5 ☐ Strongly oppose
6 ☐ Don't care

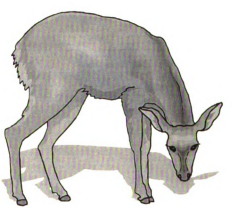
25. Before the feed ban, did you feed deer on property in Northeast Michigan? (Check one.)

1 ☐ Yes
2 ☐ No ***(If 'No', please skip to question 27)***

26. How important was feeding deer to you before the feed ban? (Check one.)
    1 ☐ Very important
    2 ☐ Important
    3 ☐ Somewhat important
    4 ☐ Not important
    5 ☐ Unsure

27. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is important for people to feed deer in order to keep deer alive through winters in Northeast Michigan.	SA	A	U	D	SD
b.	DNR Conservation Officers will strongly enforce the *feed ban* in 2000.	SA	A	U	D	SD
c.	The government has unfairly restricted people's rights by banning deer baiting and deer feeding.	SA	A	U	D	SD



BOVINE TUBERCULOSIS

The following set of questions deals with bovine tuberculosis (TB) and the attempts to eradicate the bovine TB disease in Michigan.

28. Do you support *the overall goal* to eradicate bovine TB in wildlife and domestic livestock in Michigan? (Check one.)
    - 1 ❒ Yes, I *strongly support* the overall goal to eradicate bovine TB.
    - 2 ❒ Yes, I *support* the overall goal to eradicate bovine TB.
    - 3 ❒ I am *unsure* of my opinion about the overall goal to eradicate bovine TB.
    - 4 ❒ No, I *oppose* the overall goal to eradicate bovine TB.
    - 5 ❒ No, I *strongly oppose* the overall goal to eradicate bovine TB.
    - 6 ❒ I have *no opinion* about the overall goal to eradicate bovine TB.

29. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is possible to eradicate bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB issue has hurt the economy in Northeast Michigan.	SA	A	U	D	SD
c.	My hunting satisfaction has decreased because of the *presence of bovine TB* in Northeast Michigan.	SA	A	U	D	SD




30. For the following statements about bovine TB, please indicate whether you think the statement is True or False, or whether you are Unsure. (Circle one response for each.)

		1 True	2 False	3 Unsure
a.	There is a vaccine that can be used to keep animals from getting bovine tuberculosis.	T	F	U
b.	Less than 25 deer have been found with bovine TB in Michigan since 1995.	T	F	U
c.	Animals that have bovine TB almost always show visible signs of the disease in their organs and lymph tissue.	T	F	U
d.	Most states in the US have found bovine TB in their wildlife.	T	F	U
e.	All dairy herds in the State of Michigan must now be tested for bovine TB every year until Michigan regains its bovine TB-free status.	T	F	U

31. Do you believe that humans can get bovine tuberculosis? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 34)***
    3 ☐ Unsure ***(If 'Unsure', please skip to question 34)***

32. In your opinion, what is the chance that some person will get bovine TB in Northeast Michigan if the disease is not eradicated? (Check one.)
    1 ☐ Extremely high
    2 ☐ High
    3 ☐ Low
    4 ☐ Extremely low
    5 ☐ Unsure

33. How much does this concern you? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure

34.

34. These next statements deal with the finding of bovine TB in some Michigan white-tailed deer. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that deer have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB disease is a serious threat to the health of the deer herd in Michigan.	SA	A	U	D	SD
c.	It is important for hunters in Northeast Michigan to have the deer they harvest checked for signs of bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has discouraged a large number of people from coming to Northeast Michigan to hunt.	SA	A	U	D	SD
e.	The bovine TB issue has discouraged a large number of people who live in Northeast Michigan from hunting.	SA	A	U	D	SD

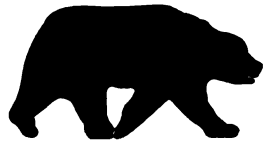
35. These next statements deal with the finding of bovine TB in some Michigan livestock. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that livestock have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	Bovine TB in wild deer is a serious threat to the health of livestock in Michigan.	SA	A	U	D	SD
c.	It is appropriate that farmers be required to have their livestock tested for bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has caused too much hardship for farmers in Northeast Michigan.	SA	A	U	D	SD
e.	Beef and milk from Northeast Michigan are safe to consume.	SA	A	U	D	SD

In addition to livestock and deer, small numbers of other animals, including bear, fox, coyote, raccoon, and bobcat, have been found with bovine TB in Northeast Michigan.

36. Before this survey, were you aware that any animals besides livestock and deer have been found with bovine TB? (Check one.)
    1 ☐ Yes
    2 ☐ No

37. How much does it concern you that these animals have also been found with bovine TB? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure



38. Some people have said that bovine TB spreads in the ways described below. Please indicate whether you think these proposed means of bovine TB spread are true or false. (Circle one response for each.)

	Bovine TB spreads...	1 Definitely True	2 Probably True	3 Unsure	4 Probably False	5 Definitely False
a.	...between deer by nose-to-nose contact.	DT	PT	U	PF	DF
b.	...between livestock by nose-to-nose contact.	DT	PT	U	PF	DF
c.	...between deer and livestock by nose-to-nose contact.	DT	PT	U	PF	DF
d.	...from one deer to other deer on infected feed.	DT	PT	U	PF	DF
e.	...from one livestock animal to other livestock animals on infected feed.	DT	PT	U	PF	DF
f.	...from deer to livestock, or livestock to deer, on infected feed.	DT	PT	U	PF	DF

39. Please indicate how much you support or oppose the following actions:
(Circle one response for each.)

		1 Strongly Support	2 Support	3 Unsure	4 Oppose	5 Strongly Oppose	6 Don't Care
a.	Further reduction in the number of deer in Northeast Michigan in order to slow the spread of bovine TB	SS	S	U	O	SO	DC
b.	Destruction of livestock animals that are found to be bovine TB-positive in the future	SS	S	U	O	SO	DC

40. Which, if any, of the activities currently used to eradicate bovine TB would you NOT support, EVEN IF you were convinced that the action(s) made an essential contribution to bovine TB eradication? (Check all that apply.)
   1 ❒ A ban on baiting deer
   2 ❒ A ban on feeding deer
   3 ❒ A reduction in white-tailed deer numbers
   4 ❒ Destruction of any livestock animal found to be bovine TB-positive
   5 ❒ Destruction of an *entire herd* of livestock if one or more animals were found to be bovine TB-positive

41. Are there actions that you believe should be taken to eradicate bovine TB other than those listed in question number 40 above? Please describe them here. ____
_____
_____
_____

42. Have *you* or has *anyone in your immediate family* been hurt financially due to the bovine TB issue or eradication strategies in Northeast Michigan? (Check one.)
   1 ❒ Yes
   2 ❒ No ***(If 'No', please skip to question 44)***

43. To what degree would you say you/they have been hurt financially? (Check one.)
   1 ❒ A great deal
   2 ❒ Somewhat
   3 ❒ Slightly
   4 ❒ Unsure

44. As new information is discovered about bovine TB in Michigan, would you like to be informed about it? (Check one.)

1 ❒ Yes
2 ❒ No ***(If 'No', please skip to question 46)***

45. How would you prefer that new information be communicated to you? (Check all that apply.)

1 ❒ Directly through a newsletter
2 ❒ Over mass-media, such as the television, newspaper or radio
3 ❒ Over the internet
4 ❒ Through public meetings
5 ❒ Through wildlife, agriculture, or medical professionals
6 ❒ Through local clubs or organizations
7 ❒ From friends or family
8 ❒ Other (please specify)_____

46. Please answer the following questions by circling one response for each.

		1 Yes	2 No
a.	Have you ever personally talked to someone from a state agency about a bovine TB-related issue?	Y	N
b.	Have you ever attended a bovine TB-related public meeting?	Y	N

47. There is already some information available about each of the following topics on bovine TB and related issues. Which of these topics would you like to know more about? (Check all that apply.)

1 ❒ General information about the bovine TB issue in Michigan
2 ❒ Research on bovine TB transmission
3 ❒ Information about the bovine TB testing process for livestock
4 ❒ Methods to attract wildlife to your property without supplemental feed
5 ❒ Information on how to identify bovine TB lesions in deer

This next set of questions deals with two of the State Agencies that have been involved with eradicating bovine TB, the Michigan Department of Natural Resources (DNR), and the Michigan Department of Agriculture (MDA).

48. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	The **MDA** provides accurate information on agriculture issues.	SA	A	U	D	SD
b.	The **MDA** cares about farmers' concerns.	SA	A	U	D	SD
c.	The **MDA** cares about sportsmen's concerns.	SA	A	U	D	SD
d.	The **MDA** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD
e.	In general, the **DNR** manages natural resources in a scientifically sound manner.	SA	A	U	D	SD
f.	The **DNR** provides accurate information on natural resource issues.	SA	A	U	D	SD
g.	The **DNR** cares about sportsmen's concerns.	SA	A	U	D	SD
h.	The **DNR** cares about farmers' concerns.	SA	A	U	D	SD
i.	The **DNR** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD

BACKGROUND INFORMATION

In order for us to more fully understand people's responses to the previous questions, we need to know a few things about your background. Remember that your responses are <u>completely confidential</u> and that neither your name nor your address will be directly linked to your responses in any way.

49. How many years have you lived in Michigan? _____YEARS

50. In what county do you currently live? _____COUNTY

51. Do you own property in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 54)***

52. Approximately how many acres do you own? _____ACRES

53. Which of the following uses do you make of this land? (Check all that apply.)
    1 ☐ Residence
    2 ☐ Agricultural Production
    3 ☐ Recreation
    4 ☐ Investment
    5 ☐ Other (please specify)_____

54. Do you have access to the internet at home or at work? (Check one.)
    1 ☐ Yes
    2 ☐ No

55. Are you male or female?
    1 ☐ Male
    2 ☐ Female

56. In what year were you born? 19____

Thank you for your participation!
If you have any other comments that you would like to share with us, please use the space below (or add additional sheets if necessary).

Please use the enclosed addressed and stamped envelope or return this survey to:

Bovine TB Opinion Survey
13 Natural Resources Building
Michigan State University
East Lansing, MI 48824-1222

This survey deals with the bovine tuberculosis (TB) issue in Michigan and related topics such as wildlife and agriculture. Remember, you don't have to be very familiar with the bovine TB issue in order to answer the survey. We are interested in everyone's responses.

HUNTING

This set of questions deals with different aspects of deer hunting.

4. Approximately how many years have you hunted deer? _____YEARS

2. In how many years of the last 10 years have you hunted in Michigan? ____YEARS

3. Which of the following do you normally use when you deer hunt? (Check one.)
   1 ❒ Firearm
   2 ❒ Bow
   3 ❒ Both firearm and bow

5. As a recreational activity, how important is deer hunting for you compared to your other recreational activities? (Check one.)
   1 ❒ My most important recreational activity.
   2 ❒ One of the more important recreational activities I participate in.
   3 ❒ No more important than any other recreational activity.
   4 ❒ Less important than most of my other recreational activities.
   5 ❒ Not at all important to me as a recreational activity.

5. How important is each of the following for your deer hunting enjoyment? (Circle one response for each.)

		1 Very Important	2 Important	3 Somewhat Important	4 Not Important	5 Unsure
a.	To see many deer	VI	I	SI	NI	U
b.	To see a diversity of wildlife	VI	I	SI	NI	U
c.	To spend time in nature	VI	I	SI	NI	U
d.	To harvest a deer	VI	I	SI	NI	U
e.	To see large bucks	VI	I	SI	NI	U

6. In the past four years, have you hunted deer in any of the following counties: Alpena, Alcona, Montmorency, Oscoda, or Presque Isle? (Check one.)
   1 ☐ Yes
   2 ☐ No ***(If 'No', please skip to question 8)***

7. In what year did you *last* hunt in any of these counties? (Check one.)
   1 ☐ 1999
   2 ☐ 1998
   3 ☐ 1997
   4 ☐ 1996

8. On what type of land do you *primarily* hunt in Northeast Michigan? (Check one.)
   1 ☐ Private land
   2 ☐ Public land
   3 ☐ Equally on private and public land

9. Do you plan to hunt in Northeast Michigan during the 2000 hunting season? (Check one.)
   1 ☐ Yes ***(If 'Yes', please skip to question 10)***
   2 ☐ No ***(If 'No', please skip to question 11)***
   3 ☐ Unsure ***(If 'Unsure', please skip to question 11)***

10. For the following statements about deer hunting, please circle Yes, No, or Unsure.

		1 Yes	2 No	3 Unsure
a.	If you harvest a deer in Northeast Michigan this hunting season, do you intend to take it to a DNR check station?	Y	N	U
b.	If you harvested a deer this hunting season and you thought it may have bovine TB, would you report this to the DNR?	Y	N	U

"Baiting" deer is defined in Michigan as putting out food materials for deer to attract, lure, or entice them *as an aid in hunting*. The Natural Resources Commission voted to ban baiting for the 2000 hunting season in all Michigan counties where a deer has been found with bovine TB.

11. What is your opinion of the ban on baiting deer as defined above? (Check one.)
    1 ☐ Strongly support ***(Please skip to question 12)***
    2 ☐ Support ***(Please skip to question 12)***
    3 ☐ Unsure ***(Please skip to question 14)***
    4 ☐ Oppose ***(Please skip to question 13)***
    5 ☐ Strongly oppose ***(Please skip to question 13)***
    6 ☐ Don't care ***(Please skip to question 14)***

12. Which of the following are reasons why you support the bait ban? (Check all that apply.)
    1 ☐ Baiting increases interference and/or competition among deer hunters.
    2 ☐ Baiting brings deer closer together, which could spread bovine TB.
    3 ☐ Baiting deer gives an unfair or unethical advantage to the hunter.
    4 ☐ I think baiting results in an overharvest of bucks.
    5 ☐ Other (please specify)_____

    Which one of the reason(s) that you checked above is the **most important** reason to you? (Check one and skip to Question 14.)
    1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

13. Which of the following are reasons why you oppose the bait ban? (Check all that apply.)
    1 ☐ I hunt more effectively with bait.
    2 ☐ I don't think the government should restrict anyone's way of hunting.
    3 ☐ I don't have time to hunt without using bait.
    4 ☐ Baiting allows me to see more wildlife when I hunt.
    5 ☐ Other (please specify)_____

    Which one of the reason(s) that you chose above is the **most important** reason to you? (Check one.)
    1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

14. Would you support a statewide ban on baiting deer? (Check one.)
    1 ☐ Yes
    2 ☐ No
    3 ☐ Unsure

15. Did you use bait when you hunted in Northeast Michigan before the bait ban? (Check one.)
    1 ❒ Yes
    2 ❒ No ***(If 'No', please skip to question 18)***

16. How important was baiting deer to you before the bait ban? (Check one).
    1 ❒ Very Important
    2 ❒ Important
    3 ❒ Somewhat Important
    4 ❒ Not Important
    5 ❒ Unsure

17. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

	Even with the bait ban…	**1 Strongly Agree**	**2 Agree**	**3 Unsure**	**4 Disagree**	**5 Strongly Disagree**
a.	…I am confident in my ability to harvest a deer.	SA	A	U	D	SD
b.	…I enjoy hunting in Northeast Michigan as much as I used to.	SA	A	U	D	SD
c.	…most hunters I know enjoy hunting in Northeast Michigan as much as they used to.	SA	A	U	D	SD

18. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

		1 Strongly Agree	**2 Agree**	**3 Unsure**	**4 Disagree**	**5 Strongly Disagree**
a.	Most DNR biologists feel that baiting is an acceptable hunting practice.	SA	A	U	D	SD
b.	DNR Conservation Officers will strongly enforce the *bait ban* in the 2000 deer hunting season.	SA	A	U	D	SD

19. Please indicate your opinion about the following DNR management decisions in Northeast Michigan for the 1998-2000 deer hunting seasons. (Circle one response for each.)

		1 Strongly Support	**2 Support**	**3 Unsure**	**4 Oppose**	**5 Strongly Oppose**	**6 Don't Care**
a.	Extended deer hunting season	SS	S	U	O	SO	DC
b.	Unlimited antlerless deer permits	SS	S	U	O	SO	DC

20. How effective do you think the extended deer hunting season is at reducing deer numbers in Northeast Michigan? (Check one.)
    1 ☐ Highly effective
    2 ☐ Effective
    3 ☐ Slightly effective
    4 ☐ Not at all effective
    5 ☐ Unsure

21. How many antlerless deer permits did you purchase for the 1999 hunting season in Northeast Michigan? _____PERMITS

22. How many antlerless deer permits do you intend to purchase for the 2000 hunting season in Northeast Michigan? _____PERMITS

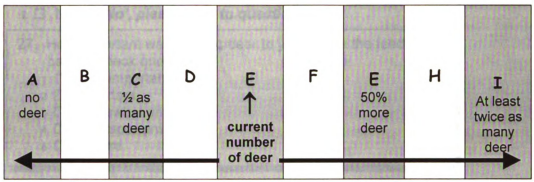
WHITE-TAILED DEER

Next, we would like to know about some of your opinions on white-tailed deer and deer management.

23. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

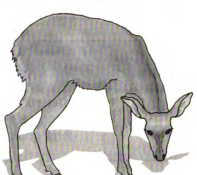
Deer management in Northeast Michigan should...

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	...minimize crop losses due to deer.	SA	A	U	D	SD
b.	...prevent deer from disturbing or destroying natural plant communities.	SA	A	U	D	SD
c.	...maintain the highest possible deer harvest (success) rate for hunters.	SA	A	U	D	SD
d.	...ensure car-deer accident rates are as low as possible.	SA	A	U	D	SD
e.	...keep deer as physically healthy as possible.	SA	A	U	D	SD
f.	...maximize the money that deer hunters bring to Northeast Michigan's economy.	SA	A	U	D	SD



24. In the figure above, **E** represents the current number of deer in the county in Which you live. Choose the letter above the line which is closest to the number of deer you think would be a reasonable goal just before the 2001 deer hunting season *in the county in which you live.* (Circle one letter or check not sure.)

A B C D E F G H I ____ NOT SURE



"**Feeding**" deer is defined in Michigan as placing food materials out that attract deer for any reason *other than for hunting.* The Natural Resources Commission voted to ban deer feeding in 2000 for all Michigan counties where a deer has been found with bovine TB. (This is *not* the same as "baiting".)

25. What is your opinion of the ban on feeding deer as defined above? (Check one.)
    1 ❒ Strongly support
    2 ❒ Support
    3 ❒ Unsure
    4 ❒ Oppose
    5 ❒ Strongly oppose
    6 ❒ Don't care

26. Before the feed ban, did you feed deer on property in Northeast Michigan? (Check one.)
    1 ❒ Yes
    2 ❒ No ***(If 'No', please skip to question 28)***

27. How important was feeding deer to you before the feed ban? (Check one.)
    1 ❒ Very important
    2 ❒ Important
    3 ❒ Somewhat important
    4 ❒ Not important
    5 ❒ Unsure

28. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is important for people to feed deer in order to keep deer alive through winters in Northeast Michigan.	SA	A	U	D	SD
b.	DNR Conservation Officers will strongly enforce the *feed ban* in 2000.	SA	A	U	D	SD
c.	The government has unfairly restricted people's rights by banning deer baiting and deer feeding.	SA	A	U	D	SD

BOVINE TUBERCULOSIS

The following set of questions deals with bovine tuberculosis (TB) and the attempts to eradicate the bovine TB disease in Michigan.

29. Do you support *the overall goal* to eradicate bovine TB in wildlife and domestic livestock in Michigan? (Check one.)
    1 ❒ Yes, I *strongly support* the overall goal to eradicate bovine TB.
    2 ❒ Yes, I *support* the overall goal to eradicate bovine TB.
    3 ❒ I am *unsure* of my opinion about the overall goal to eradicate bovine TB.
    4 ❒ No, I *oppose* the overall goal to eradicate bovine TB.
    5 ❒ No, I *strongly oppose* the overall goal to eradicate bovine TB.
    6 ❒ I have *no opinion* about the overall goal to eradicate bovine TB.

30. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is possible to eradicate bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB issue has hurt the economy in Northeast Michigan.	SA	A	U	D	SD
c.	My hunting satisfaction has decreased because of the *presence of bovine TB* in Northeast Michigan.	SA	A	U	D	SD

31. For the following statements about bovine TB, please indicate whether you think the statement is True or False, or whether you are Unsure. (Circle one response for each.)

		1 True	2 False	3 Unsure
a.	There is a vaccine that can be used to keep animals from getting bovine tuberculosis.	T	F	U
b.	Less than 25 deer have been found with bovine TB in Michigan since 1995.	T	F	U
c.	Animals that have bovine TB almost always show visible signs of the disease in their organs and lymph tissue.	T	F	U
d.	Most states in the US have found bovine TB in their wildlife.	T	F	U
e.	All dairy herds in the State of Michigan must now be tested for bovine TB every year until Michigan regains its bovine TB-free status.	T	F	U

8

32. Do you believe that humans can get bovine tuberculosis? (Check one.)
   1 ❒ Yes
   2 ❒ No ***(If 'No', please skip to question 35)***
   3 ❒ Unsure ***(If 'Unsure', please skip to question 35)***

33. In your opinion, what is the chance that some person will get bovine TB in Northeast Michigan if the disease is not eradicated? (Check one.)
   1 ❒ Extremely high
   2 ❒ High
   3 ❒ Low
   4 ❒ Extremely low
   5 ❒ Unsure

34. How much does this concern you? (Check one.)
   1 ❒ Very much
   2 ❒ Somewhat
   3 ❒ Not very much
   4 ❒ Not at all
   5 ❒ Unsure

35. These next statements deal with the finding of bovine TB in some Michigan white-tailed deer. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that deer have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB disease is a serious threat to the health of the deer herd in Michigan.	SA	A	U	D	SD
c.	It is important for hunters in Northeast Michigan to have the deer they harvest checked for signs of bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has discouraged a large number of people from coming to Northeast Michigan to hunt.	SA	A	U	D	SD
e.	The bovine TB issue has discouraged a large number of people who live in Northeast Michigan from hunting.	SA	A	U	D	SD

36. These next statements deal with the finding of bovine TB in some Michigan livestock. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that livestock have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	Bovine TB in wild deer is a serious threat to the health of livestock in Michigan.	SA	A	U	D	SD
c.	It is appropriate that farmers be required to have their livestock tested for bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has caused too much hardship for farmers in Northeast Michigan.	SA	A	U	D	SD
e.	Beef and milk from Northeast Michigan are safe to consume.	SA	A	U	D	SD

In addition to livestock and deer, small numbers of other animals, including bear, fox, coyote, raccoon, and bobcat have been found with bovine TB in Northeast Michigan.

37. Before this survey, were you aware that any animals besides livestock and deer have been found with bovine TB? (Check one.)
    1 ☐ Yes
    2 ☐ No

38. How much does it concern you that these animals have also been found with bovine TB? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure

39. Some people have said that bovine TB spreads in the ways described below. Please indicate whether you think these proposed means of bovine TB spread are true or false. (Circle one response for each.)

	Bovine TB spreads...	**1 Definitely True**	**2 Probably True**	**3 Unsure**	**4 Probably False**	**5 Definitely False**
a.	...between deer by nose-to-nose contact.	DT	PT	U	PF	DF
b.	...between livestock by nose-to-nose contact.	DT	PT	U	PF	DF
c.	...between deer and livestock by nose-to-nose contact.	DT	PT	U	PF	DF
d.	...from one deer to other deer on infected feed.	DT	PT	U	PF	DF
e.	...from one livestock animal to other livestock animals on infected feed.	DT	PT	U	PF	DF
f.	...from deer to livestock, or livestock to deer, on infected feed.	DT	PT	U	PF	DF

40. Please indicate how much you support or oppose the following actions: (Circle one response for each.)

		1 Strongly Support	**2 Support**	**3 Unsure**	**4 Oppose**	**5 Strongly Oppose**	**6 Don't Care**
a.	Further reduction in the number of deer in Northeast Michigan in order to slow the spread of bovine TB	SS	S	U	O	SO	DC
b.	Destruction of livestock animals that are found to be bovine TB-positive in the future	SS	S	U	O	SO	DC

41. Which, if any, of the activities currently used to eradicate bovine TB would you NOT support, EVEN IF you were convinced that the action(s) made an essential contribution to bovine TB eradication? (Check all that apply.)
    1 ☐ A ban on baiting deer
    2 ☐ A ban on feeding deer
    3 ☐ A reduction in white-tailed deer numbers
    4 ☐ Destruction of any livestock animal found to be bovine TB-positive
    5 ☐ Destruction of an *entire herd* of livestock if one or more animals were found to be bovine TB-positive

42. Are there actions that you believe should be taken to eradicate bovine TB other than those listed in question number 41 above? Please describe them here. ___

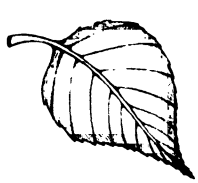
_____

_____

_____

43. Have *you* or has *anyone in your immediate family* been hurt financially due to the bovine TB issue or eradication strategies in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 45)***

44. To what degree would you say you/they have been hurt financially? (Check one.)
    1 ☐ A great deal
    2 ☐ Somewhat
    3 ☐ Slightly
    4 ☐ Unsure

45. As new information is discovered about bovine TB in Michigan, would you like to be informed about it? (Check one.)

1 ❒ Yes
2 ❒ No ***(If 'No', please skip to question 47)***

46. How would you prefer that new information be communicated to you? (Check all that apply.)
    1 ❒ Directly through a newsletter
    2 ❒ Over mass-media, such as the television, newspaper or radio
    3 ❒ Over the internet
    4 ❒ Through public meetings
    5 ❒ Through wildlife, agriculture, or medical professionals
    6 ❒ Through local clubs or organizations
    7 ❒ From friends or family
    8 ❒ Other (please specify)_____

47. Please answer the following questions by circling one response for each.

		1 Yes	2 No
a.	Have you ever personally talked to someone from a state agency about a bovine TB-related issue?	Y	N
b.	Have you ever attended a bovine TB-related public meeting?	Y	N

48. There is already some information available about each of the following topics on bovine TB and related issues. Which of these topics would you like to know more about? (Check all that apply.)
    1 ❒ General information about the bovine TB issue in Michigan
    2 ❒ Research on bovine TB transmission
    3 ❒ Information about the bovine TB testing process for livestock
    4 ❒ Methods to attract wildlife to your property without supplemental feed
    5 ❒ Information on how to identify bovine TB lesions in deer

This next set of questions deals with two of the State Agencies that have been involved with eradicating bovine TB, the Michigan Department of Natural Resources (DNR), and the Michigan Department of Agriculture (MDA).

49. Please indicate how much you agree or disagree with each of the following statements.

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	The **MDA** provides accurate information on agriculture issues.	SA	A	U	D	SD
b.	The **MDA** cares about farmers' concerns.	SA	A	U	D	SD
c.	The **MDA** cares about sportsmen's concerns.	SA	A	U	D	SD
d.	The **MDA** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD
e.	In general, the **DNR** manages natural resources in a scientifically sound manner.	SA	A	U	D	SD
f.	The **DNR** provides accurate information on natural resource issues.	SA	A	U	D	SD
g.	The **DNR** cares about sportsmen's concerns.	SA	A	U	D	SD
h.	The **DNR** cares about farmers' concerns.	SA	A	U	D	SD
i.	The **DNR** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD

BACKGROUND INFORMATION

In order for us to more fully understand people's responses to the previous questions, we need to know a few things about your background. Remember that your responses are completely confidential and that neither your name nor your address will be directly linked to your responses in any way.

50. How many years have you lived in Northeast Michigan? _____YEARS

51. In what county do you currently live? _____COUNTY

52. Do you own property in Northeast Michigan? (Check one.)

1 ☐ Yes
2 ☐ No ***(If 'No', please skip to question 55)***

53. Approximately how many acres do you own? _____ ACRES

54. Which of the following uses do you make of this land? (Check all that apply.)

1 ☐ Residence
2 ☐ Agricultural Production
3 ☐ Recreation
4 ☐ Investment
5 ☐ Other (please specify)_____

55. Do you currently raise any livestock? (Check one.)

1 ☐ Yes
2 ☐ No

56. Are you employed for pay? (Check one.)

1 ☐ Yes
2 ☐ No ***(If 'No', skip to question 59)***

57. Please indicate the economic sector that best describes the one in which you work: (Check one.)

1 ☐ Service (Hotels, Restaurants, etc.)
2 ☐ Retail Trade
3 ☐ Wholesale Trade
4 ☐ Manufacturing/Construction
5 ☐ Finance, Insurance, and Real Estate
6 ☐ Agriculture Services, Forestry, Fishing
7 ☐ Government (Local, State, Federal)
8 ☐ Transportation and Public Utilities
9 ☐ Other (please specify)_____

58. Are you the owner or general manager of your place of employment? (Check one.)

1 ☐ Yes
2 ☐ No

59. Do you have access to the internet at home or at work? (Check one.)
    1 ❒ Yes
    2 ❒ No

60. Are you male or female?
    1 ❒ Male
    2 ❒ Female

61. In what year were you born? 19____

Thank you for your participation!
If you have any other comments that you would like to share with us, please use the space below (or add additional sheets if necessary).

Please use the enclosed addressed and stamped envelope or return this survey to:

Bovine TB Opinion Survey
13 Natural Resources Building
Michigan State University
East Lansing, MI 48824-1222

This survey deals with the bovine tuberculosis (TB) issue in Michigan and related topics such as agriculture and wildlife. Remember, you don't have to be very familiar with the bovine TB issue in order to answer the survey. We are interested in everyone's responses.

YOUR OPERATION

First, we would like to know a little about your farming operation.

1. Which of the following best describes you? (Check one.)
   - 1 ❒ Full-time farmer- farming is my primary occupation *(Please skip to Question 4)*
   - 2 ❒ Part-time farmer- farming is not my primary occupation
   - 3 ❒ Retired farmer/Not a farmer ***(Please skip to Question 7)***

2. In which economic sector are you otherwise employed? (Check one.)
   - 1 ❒ Service (Hotels, Restaurants, etc.)
   - 2 ❒ Retail Trade
   - 3 ❒ Wholesale Trade
   - 4 ❒ Manufacturing/Construction
   - 5 ❒ Finance, Insurance, and Real Estate
   - 6 ❒ Agriculture Services, Forestry, Fishing
   - 7 ❒ Government (Local, State, Federal)
   - 8 ❒ Transportation and Public Utilities
   - 9 ❒ Other (please specify)_____

3. Are you the owner or general manager of your place of employment? (Check one.)
   - 1 ❒ Yes
   - 2 ❒ No

4. How would you characterize your operation? (Check one.)
   1 ❒ Beef Operation
   2 ❒ Dairy Operation
   3 ❒ Poultry Operation
   4 ❒ Swine Operation
   5 ❒ Grain/Produce Operation
   6 ❒ Other (please specify)_____

5. How long have you been a producer in Northeast Michigan? (Check one.)
   1 ❒ Less than 1 year
   2 ❒ 1-5 years
   3 ❒ 6-10 years
   4 ❒ 11-20 years
   5 ❒ 21-30 years
   6 ❒ More than 30 years

6. Which of the following items do you grow for cash crops (crops sold for profit)? (Check all that apply.)
   1 ❒ Wheat and/or rye
   2 ❒ Corn
   3 ❒ Beans
   4 ❒ Hay
   5 ❒ Other (please specify)_____

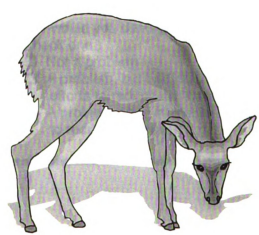
WHITE-TAILED DEER

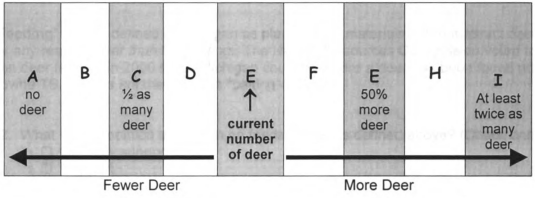
Next, we would like to know about some of your opinions on white-tailed deer and deer management.

7. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

Deer management in Northeast Michigan should...

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	...minimize crop losses due to deer.	SA	A	U	D	SD
b.	...prevent deer from disturbing or destroying natural plant communities.	SA	A	U	D	SD
c.	...maintain the highest possible deer harvest (success) rate for hunters.	SA	A	U	D	SD
d.	...ensure car-deer accident rates are as low as possible.	SA	A	U	D	SD
e.	...keep deer as physically healthy as possible.	SA	A	U	D	SD
f.	...maximize the money that deer hunters bring to Northeast Michigan's economy.	SA	A	U	D	SD





8. In the figure above, **E** represents the current number of deer in the county in which you live. Choose the letter above the line which is closest to the number of deer you think would be a reasonable goal just before the 2001 deer hunting season *in the county in which you live.* (Circle one letter or check not sure.)

   A B C D E F G H I ____ NOT SURE

9. Please check **all** who are allowed to hunt deer on your farm. (Check all that apply.)
   - 1 ❒ No one (including myself)
   - 2 ❒ Me and/or my immediate family
   - 3 ❒ Friends and neighbors
   - 4 ❒ Non-aquaintances who ask permission
   - 5 ❒ My land is open to anyone who wants to hunt, they need not ask permission
   - 6 ❒ Friends and neighbors who pay a fee or lease my land
   - 7 ❒ Non-aquaintances who pay a fee or lease my land

10. Has your operation experienced any crop damage caused by deer? (Check one.)
    - 1 ❒ Yes →
    - 2 ❒ No
    - 3 ❒ Unsure

    11. How would you describe this crop damage? (Check one.)
        - 1 ❒ Not a problem
        - 2 ❒ A problem, but I do not to intend to put forth efforts to reduce the losses
        - 3 ❒ A problem and I intend to increase my efforts to reduce the losses

"**Feeding**" deer is defined in Michigan as placing food materials out that attract deer for any reason *other than for hunting.* The Natural Resources Commission voted to ban deer feeding in 2000 for all Michigan counties where a deer has been found with bovine TB. (This is *not* the same as "baiting".)

12. What is your opinion of the ban on feeding deer as defined above? (Check one.)
    1 ☐ Strongly support
    2 ☐ Support
    3 ☐ Unsure
    4 ☐ Oppose
    5 ☐ Strongly oppose
    6 ☐ Don't care

13. Before the feed ban, did you feed deer on property in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 15)***

14. How important was feeding deer to you before the feed ban? (Check one.)
    1 ☐ Very important
    2 ☐ Important
    3 ☐ Somewhat important
    4 ☐ Not important
    5 ☐ Unsure

15. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is important for people to feed deer in order to keep deer alive through winters in Northeast Michigan.	SA	A	U	D	SD
b.	DNR Conservation Officers will strongly enforce the *feed ban* in 2000.	SA	A	U	D	SD

"Baiting" deer is defined in Michigan as putting out food materials for deer to attract, lure, or entice them *as an aid in hunting*. The Natural Resources Commission also voted to ban baiting for the 2000 hunting season in all Michigan counties where a deer has been found with bovine TB.

16. What is your opinion of the ban on baiting deer as defined above? (Check one.)
    1 ❒ Strongly support
    2 ❒ Support
    3 ❒ Unsure
    4 ❒ Oppose
    5 ❒ Strongly oppose
    6 ❒ Don't care

17. Would you support a statewide ban on baiting deer? (Check one.)
    1 ❒ Yes
    2 ❒ No
    3 ❒ Unsure

18. Please indicate how much you agree or disagree with each of the following statements about baiting. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	Baiting deer is an acceptable hunting practice.	SA	A	U	D	SD
b.	Even with bait ban, most hunters I know enjoy hunting in Northeast Michigan as much as they used to.	SA	A	U	D	SD
c.	DNR Conservation Officers will strongly enforce the *bait ban* in the 2000 deer hunting season.	SA	A	U	D	SD
d.	The government has unfairly restricted people's rights by banning deer baiting and deer feeding.	SA	A	U	D	SD

BOVINE TUBERCULOSIS

The following set of questions deals with bovine tuberculosis (TB) and the attempts to eradicate the bovine TB disease in Michigan.

19. Do you support *the overall goal* to eradicate bovine TB in wildlife and domestic livestock in Michigan? (Check one.)
    1 ❒ Yes, I *strongly support* the overall goal to eradicate bovine TB.
    2 ❒ Yes, I *support* the overall goal to eradicate bovine TB.
    3 ❒ I am *unsure* of my opinion about the overall goal to eradicate bovine TB.
    4 ❒ No, I *oppose* the overall goal to eradicate bovine TB.
    5 ❒ No, I *strongly oppose* the overall goal to eradicate bovine TB.
    6 ❒ I have *no opinion* about the overall goal to eradicate bovine TB.

20. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is possible to eradicate bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB issue has hurt the economy in Northeast Michigan.	SA	A	U	D	SD

21. For the following statements about bovine TB, please indicate whether you think the statement is True or False, or whether you are Unsure. (Circle one response for each.)

		1 True	2 False	3 Unsure
a.	There is a vaccine that can be used to keep animals from getting bovine tuberculosis.	T	F	U
b.	Less than 25 deer have been found with bovine TB in Michigan since 1995.	T	F	U
c.	Animals that have bovine TB almost always show visible signs of the disease in their organs and lymph tissue.	T	F	U
d.	Most states in the US have found bovine TB in their wildlife.	T	F	U
e.	All dairy herds in the State of Michigan must now be tested for bovine TB every year until Michigan regains its bovine TB-free status.	T	F	U

22. Do you believe that humans can get bovine tuberculosis? (Check one.)

1 ☐ Yes
2 ☐ No ***(If 'No', please skip to question 25)***
3 ☐ Unsure ***(If 'Unsure', please skip to question 25)***

23. In your opinion, what is the chance that some person will get bovine TB in Northeast Michigan if the disease is not eradicated? (Check one.)

1 ☐ Extremely high
2 ☐ High
3 ☐ Low
4 ☐ Extremely low
5 ☐ Unsure

24. How much does this concern you? (Check one.)

1 ☐ Very much
2 ☐ Somewhat
3 ☐ Not very much
4 ☐ Not at all
5 ☐ Unsure

25. These next statements deal with the finding of bovine TB in some Michigan white-tailed deer. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that deer have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB disease is a serious threat to the health of the deer herd in Michigan.	SA	A	U	D	SD
c.	It is important for hunters in Northeast Michigan to have the deer they harvest checked for signs of bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has discouraged a large number of people from coming to Northeast Michigan to hunt.	SA	A	U	D	SD
e.	The bovine TB issue has discouraged a large number of people who live in Northeast Michigan from hunting.	SA	A	U	D	SD

26. These next statements deal with the finding of bovine TB in some Michigan livestock. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that livestock have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	Bovine TB in wild deer is a serious threat to the health of livestock in Michigan.	SA	A	U	D	SD
c.	It is appropriate that farmers be required to have their livestock tested for bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has caused too much hardship for farmers in Northeast Michigan.	SA	A	U	D	SD
e.	Beef and milk from Northeast Michigan are safe to consume.	SA	A	U	D	SD

In addition to livestock and deer, small numbers of other animals, including bear, fox, coyote, raccoon, and bobcat, have been found with bovine TB in Northeast Michigan.

27. Before this survey, were you aware that any animals besides livestock and deer have been found with bovine TB? (Check one.)
    1 ☐ Yes
    2 ☐ No

28. How much does it concern you that these animals have also been found with bovine TB? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure

29. Some people have said that bovine TB spreads in the ways described below. Please indicate whether you think these proposed means of bovine TB spread are true or false. (Circle one response for each.)

	Bovine TB spreads...	**1 Definitely True**	**2 Probably True**	**3 Unsure**	**4 Probably False**	**5 Definitely False**
a.	...between deer by nose-to-nose contact.	DT	PT	U	PF	DF
b.	...between livestock by nose-to-nose contact.	DT	PT	U	PF	DF
c.	...between deer and livestock by nose-to-nose contact.	DT	PT	U	PF	DF
d.	...from one deer to other deer on infected feed.	DT	PT	U	PF	DF
e.	...from one livestock animal to other livestock animals on infected feed.	DT	PT	U	PF	DF
f.	...from deer to livestock, or livestock to deer, on infected feed.	DT	PT	U	PF	DF

30. Please indicate how much you support or oppose the following actions: (Circle one response for each.)

		1 Strongly Support	**2 Support**	**3 Unsure**	**4 Oppose**	**5 Strongly Oppose**	**6 Don't Care**
a.	Further reduction in the number of deer in Northeast Michigan in order to slow the spread of bovine TB	SS	S	U	O	SO	DC
b.	Destruction of livestock animals that are found to be bovine TB-positive in the future	SS	S	U	O	SO	DC

31. Which, if any, of the activities currently used to eradicate bovine TB would you NOT support, EVEN IF you were convinced that the action(s) made an essential contribution to bovine TB eradication? (Check all that apply.)
    1 ☐ A ban on baiting deer
    2 ☐ A ban on feeding deer
    3 ☐ A reduction in white-tailed deer numbers
    4 ☐ Destruction of any livestock animal found to be bovine TB-positive
    5 ☐ Destruction of an *entire herd* of livestock if one or more animals were found to be bovine TB-positive

32. Are there actions that you believe should be taken to eradicate bovine TB other than those listed in question number 31 above? Please describe them here. ____

_____

_____

_____

33. Have *you* or has *anyone in your immediate family* been hurt financially due to the bovine TB issue or eradication strategies in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 35)***

34. To what degree would you say you/they have been hurt financially? (Check one.)
    1 ☐ A great deal
    2 ☐ Somewhat
    3 ☐ Slightly
    4 ☐ Unsure

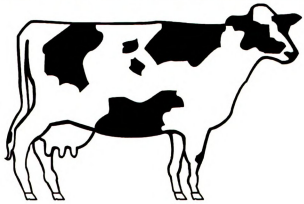
35. Do you currently raise any livestock? (Check one.)

1 ☐ Yes

2 ☐ No ***(If 'No', please skip to question 41)***

36. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I believe it is important to have my livestock tested for bovine TB.	SA	MA	U	D	SD
b.	I believe that the sooner Michigan's livestock are tested for bovine TB, the quicker Michigan can regain its bovine TB-free status.	SA	MA	U	D	SD
c.	I am concerned about whether veterinarians will be available to test my animals.	SA	MA	U	D	SD
d.	I am confused by the bovine TB testing process and how test results are interpreted.	SA	MA	U	D	SD
e.	I feel I understand my options if one of my animals tests positive for bovine TB.	SA	MA	U	D	SD



37. Have any of your livestock been tested for bovine TB? (Check one.)
   1 ☐ Yes
   2 ☐ No ***(If 'No', please skip to question 41)***

38. Do you believe that you have been adequately reimbursed for your testing costs? (Check one.)
   1 ☐ Yes
   2 ☐ No

39. Did you have any animals injured while they were being tested for bovine TB? (Check one.)
   1 ☐ Yes
   2 ☐ No

40. How would you describe the professionalism of the people who tested your animals? (Check one.)
   1 ☐ Extremely professional
   2 ☐ Professional
   3 ☐ Somewhat professional
   4 ☐ Not at all professional
   5 ☐ Unsure

41. In past years have you sold produce that other people used for deer bait and/or deer feed? (Check one.)
   1 ☐ Yes
   2 ☐ No

42. As new information is discovered about bovine TB in Michigan, would you like to be informed about it? (Check one.)
   1 ☐ Yes
   2 ☐ No ***(If 'No', skip to question 44)***

43. How would you prefer that new information be communicated to you? (Check all that apply.)
   1 ☐ Directly through a newsletter
   2 ☐ Over mass-media, such as the television, newspaper or radio
   3 ☐ Over the internet
   4 ☐ Through public meetings
   5 ☐ Through wildlife, agriculture, or medical professionals
   6 ☐ Through local clubs or organizations
   7 ☐ From friends or family
   8 ☐ Other (please specify)_____

44. Please answer the following questions by circling one response for each.

		1 Yes	2 No
a.	Have you ever personally talked to someone from a state agency about a bovine TB-related issue?	Y	N
b.	Have you ever attended a bovine TB-related public meeting?	Y	N

45. There is already some information available about each of the following topics on bovine TB and related issues. Which of these topics would you like to know more about? (Check all that apply.)
    1 ❒ General information about the bovine TB issue in Michigan
    2 ❒ Research on bovine TB transmission
    3 ❒ Information about the bovine TB testing process for livestock
    4 ❒ Methods to attract wildlife to your property without supplemental feed
    5 ❒ Information on how to identify bovine TB lesions in deer

This next set of questions deals with two of the State Agencies that have been involved with eradicating bovine TB, the Michigan Department of Natural Resources (DNR), and the Michigan Department of Agriculture (MDA).

46. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	The **MDA** provides accurate information on agriculture issues.	SA	A	U	D	SD
b.	The **MDA** cares about farmers' concerns.	SA	A	U	D	SD
c.	The **MDA** cares about sportsmen's concerns.	SA	A	U	D	SD
d.	The **MDA** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD
e.	In general, the **DNR** manages natural resources in a scientifically sound manner.	SA	A	U	D	SD
f.	The **DNR** provides accurate information on natural resource issues.	SA	A	U	D	SD
g.	The **DNR** cares about sportsmen's concerns.	SA	A	U	D	SD
h.	The **DNR** cares about farmers' concerns.	SA	A	U	D	SD
i.	The **DNR** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD

BACKGROUND INFORMATION

In order for us to more fully understand people's responses to the previous questions, we need to know a few things about your background. Remember that your responses are completely confidential and that neither your name nor your address will be directly linked to your responses in any way.

47. How many years have you lived in Northeast Michigan? _____YEARS

48. In what county do you currently live? _____COUNTY

49. Do you own property in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 52)***

50. Approximately how many acres do you own? _____ ACRES

51. Which of the following uses do you make of this land? (Check all that apply.)
    1 ☐ Residence
    2 ☐ Agricultural Production
    3 ☐ Recreation
    4 ☐ Investment
    5 ☐ Other (please specify)_____

52. Do you regularly hunt deer in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', skip to question 54)***

53. Approximately how many years have you been a deer hunter? _____YEARS

54. Is anyone in your immediate family a deer hunter? (Check one.)
    1 ☐ Yes
    2 ☐ No

55. Do you have access to the internet at home or at work? (Check one.)
    1 ☐ Yes
    2 ☐ No

56. Are you male or female?
    1 ☐ Male
    2 ☐ Female

57. In what year were you born? 19____

Thank you for your participation!
If you have any other comments that you would like to share with us, please use the space below (or add additional sheets if necessary).

Please use the enclosed addressed and stamped envelope or return this survey to:

Bovine TB Opinion Survey
13 Natural Resources Building
Michigan State University
East Lansing, MI 48824-1222

This survey deals with the bovine tuberculosis (TB) issue in Michigan and related topics such as wildlife and agriculture. Remember, you don't have to be very familiar with the bovine TB issue in order to answer the survey. We are interested in everyone's responses.

YOUR BUSINESS

First, we would like to know a little about the business that you own/manage.

1. In what economic sector would you classify the business that you own/manage? (Check one.)
   - 1 ❒ Service (Hotels, restaurants, etc.)
   - 2 ❒ Retail trade
   - 3 ❒ Wholesale trade
   - 4 ❒ Manufacturing/Construction
   - 5 ❒ Finance, Insurance, and Real Estate
   - 6 ❒ Agriculture Services, Forestry, and Fishing
   - 7 ❒ Mining
   - 8 ❒ Transportation and Public Utilities
   - 9 ❒ Other (please specify)_____

2. How important are non-resident deer hunters (people who come from outside of Northeast Michigan to hunt) and those who travel with them to the success of your business? (Check one.)
   - 1 ❒ Very important
   - 2 ❒ Important
   - 3 ❒ Somewhat important
   - 4 ❒ Not important
   - 5 ❒ Unsure

3. How important are hunting-related activities/purchases from local hunters to the success of your business? (Check one.)
   - 1 ❒ Very important
   - 2 ❒ Important
   - 3 ❒ Somewhat important
   - 4 ❒ Not important
   - 5 ❒ Unsure

4. In the past 2 years, has the number of resident and non-resident deer hunters in your area... (Check one.)

1 ☐ ...increased? ***(If 'Increased', please skip to question 8)***
2 ☐ ...stayed the same? ***(If 'Stayed the same', please skip to question 8)***
3 ☐ ...decreased?

5. How much, if at all, has this affected the success of your business? (Check one.)
   1 ☐ Very much
   2 ☐ Somewhat
   3 ☐ Not very much
   4 ☐ Not at all
   5 ☐ Unsure

6. Why do you think you have seen a decrease in hunters in your area? (Check all that apply.)
   1 ☐ Hunters believe there are less deer in the area.
   2 ☐ People in general are less interested in hunting.
   3 ☐ Hunters are concerned about bovine TB.
   4 ☐ Hunters don't like the bait ban.
   5 ☐ Other (please specify)

   _____

7. Check the number of the reason above that you believe is the **most important** reason why there has been a decline in hunters in your area. (Check one.)
   1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

For the remaining survey questions, please answer with your personal opinion rather than on behalf of your business.



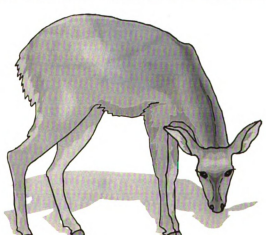

WHITE-TAILED DEER

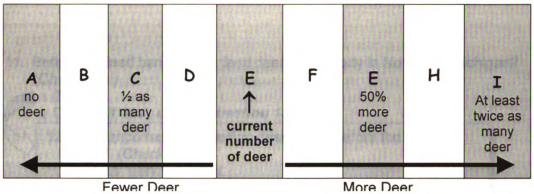
Next, we would like to know about some of your opinions on white-tailed deer and deer management.

8. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

Deer management in Northeast Michigan should:

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	...minimize crop losses due to deer.	SA	A	U	D	SD
b.	...prevent deer from disturbing or destroying natural plant communities.	SA	A	U	D	SD
c.	...maintain the highest possible deer harvest (success) rate for hunters.	SA	A	U	D	SD
d.	...ensure car-deer accident rates are as low as possible.	SA	A	U	D	SD
e.	...keep deer as physically healthy as possible.	SA	A	U	D	SD
f.	...maximize the money that deer hunters bring to Northeast Michigan's economy.	SA	A	U	D	SD



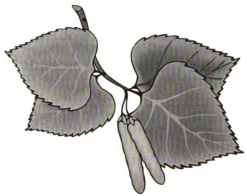


9. In the figure above, **E** represents the current number of deer in the county in which you live. Choose the letter above the line which is closest to the number of deer you think would be a reasonable goal just before the 2001 deer hunting season *in the county in which you live.* (Circle one letter or check not sure.)

A B C D E F G H I ___ NOT SURE

"**Feeding**" deer is defined in Michigan as placing food materials out that attract deer for any reason *other than for hunting.* The Natural Resources Commission voted to ban deer feeding in 2000 for all Michigan counties where a deer has been found with bovine TB. (This is *not* the same as "baiting".)

10. What is your opinion of the ban on feeding deer as defined above? (Check one.)
    1 ❒ Strongly support
    2 ❒ Support
    3 ❒ Unsure
    4 ❒ Oppose
    5 ❒ Strongly oppose
    6 ❒ Don't care



11. Before the feed ban, did you feed deer on property in Northeast Michigan? (Check one.)

1 ☐ Yes
2 ☐ No ***(If 'No', skip to question 13)***

12. How important was feeding deer to you before the feed ban? (Check one.)
    1 ☐ Very important
    2 ☐ Important
    3 ☐ Somewhat important
    4 ☐ Not important
    5 ☐ Unsure

13. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is important for people to feed deer in order to keep deer alive through winters in Northeast Michigan.	SA	A	U	D	SD
b.	DNR Conservation Officers will strongly enforce the *feed ban* in 2000.	SA	A	U	D	SD

"**Baiting**" deer is defined in Michigan as putting out food materials for deer to attract, lure, or entice them *as an aid in hunting*. The Natural Resources Commission voted to ban baiting for the 2000 hunting season in all Michigan counties where a deer has been found with bovine TB.

14. What is your opinion of the ban on baiting deer as defined above? (Check one.)
    1 ☐ Strongly support
    2 ☐ Support
    3 ☐ Unsure
    4 ☐ Oppose
    5 ☐ Strongly oppose
    6 ☐ Don't care

15. Would you support a statewide ban on baiting deer? (Check one.)
    1 ☐ Yes
    2 ☐ No
    3 ☐ Unsure

16. Please indicate how much you agree or disagree with each of the following statements about baiting. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	Baiting deer is an acceptable hunting practice.	SA	A	U	D	SD
b.	Even with bait ban, most hunters I know enjoy hunting in Northeast Michigan as much as they used to.	SA	A	U	D	SD
c.	DNR Conservation Officers will strongly enforce the *bait ban* in the 2000 deer hunting season.	SA	A	U	D	SD
d.	The government has unfairly restricted people's rights by banning deer baiting and deer feeding.	SA	A	U	D	SD

BOVINE TUBERCULOSIS

The following set of questions deals with bovine tuberculosis (TB) and the attempts to eradicate the bovine TB disease in Michigan.

17. Do you support *the overall goal* to eradicate bovine TB in wildlife and domestic livestock in Michigan? (Check one.)
    1 ☐ Yes, I *strongly support* the overall goal to eradicate bovine TB.
    2 ☐ Yes, I *support* the overall goal to eradicate bovine TB.
    3 ☐ I am *unsure* of my opinion about the overall goal to eradicate bovine TB.
    4 ☐ No, I *oppose* the overall goal to eradicate bovine TB.
    5 ☐ No, I *strongly oppose* the overall goal to eradicate bovine TB.
    6 ☐ I have *no opinion* about the overall goal to eradicate bovine TB.

18. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is possible to eradicate bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB issue has hurt the economy in Northeast Michigan.	SA	A	U	D	SD

19. For the following statements about bovine TB, please indicate whether you think the statement is True or False, or whether you are Unsure. (Circle one response for each.)

		1 True	2 False	3 Unsure
a.	There is a vaccine that can be used to keep animals from getting bovine tuberculosis.	T	F	U
b.	Less than 25 deer have been found with bovine TB in Michigan since 1995.	T	F	U
c.	Animals that have bovine TB almost always show visible signs of the disease in their organs and lymph tissue.	T	F	U
d.	Most states in the US have found bovine TB in their wildlife.	T	F	U
e.	All dairy herds in the State of Michigan must now be tested for bovine TB every year until Michigan regains its bovine TB-free status.	T	F	U

20. Do you believe that humans can get bovine tuberculosis? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 23)***
    3 ☐ Unsure ***(If 'Unsure', please skip to question 23)***

21. In your opinion, what is the chance that some person will get bovine TB in Northeast Michigan if the disease is not eradicated? (Check one.)
    1 ☐ Extremely high
    2 ☐ High
    3 ☐ Low
    4 ☐ Extremely low
    5 ☐ Unsure

22. How much does this concern you? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure

23. These next statements deal with the finding of bovine TB in some Michigan white-tailed deer. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that deer have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB disease is a serious threat to the health of the deer herd in Michigan.	SA	A	U	D	SD
c.	It is important for hunters in Northeast Michigan to have the deer they harvest checked for signs of bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has discouraged a large number of people from coming to Northeast Michigan to hunt.	SA	A	U	D	SD
e.	The bovine TB issue has discouraged a large number of people who live in Northeast Michigan from hunting.	SA	A	U	D	SD

24. These next statements deal with the finding of bovine TB in some Michigan livestock. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that livestock have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	Bovine TB in wild deer is a serious threat to the health of livestock in Michigan.	SA	A	U	D	SD
c.	It is appropriate that farmers be required to have their livestock tested for bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has caused too much hardship for farmers in Northeast Michigan.	SA	A	U	D	SD
e.	Beef and milk from Northeast Michigan are safe to consume.	SA	A	U	D	SD

In addition to livestock and deer, small numbers of other animals, including bear, fox, coyote, raccoon, and bobcat, have been found with bovine TB in Northeast Michigan.

25. Before this survey, were you aware that any animals besides livestock and deer have been found with bovine TB? (Check one.)
    1 ☐ Yes
    2 ☐ No

26. How much does it concern you that these animals have also been found with bovine TB? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure

27. Some people have said that bovine TB spreads in the ways described below. Please indicate whether you think these proposed means of bovine TB spread are true or false. (Circle one response for each.)

	Bovine TB spreads...	1 Definitely True	2 Probably True	3 Unsure	4 Probably False	5 Definitely False
a.	...between deer by nose-to-nose contact.	DT	PT	U	PF	DF
b.	...between livestock by nose-to-nose contact.	DT	PT	U	PF	DF
c.	...between deer and livestock by nose-to-nose contact.	DT	PT	U	PF	DF
d.	...from one deer to other deer on infected feed.	DT	PT	U	PF	DF
e.	...from one livestock animal to other livestock animals on infected feed.	DT	PT	U	PF	DF
f.	...from deer to livestock, or livestock to deer, on infected feed.	DT	PT	U	PF	DF

28. Please indicate how much you support or oppose the following actions: (Circle one response for each.)

		1 Strongly Support	2 Support	3 Unsure	4 Oppose	5 Strongly Oppose	6 Don't Care
a.	Further reduction in the number of deer in Northeast Michigan in order to slow the spread of bovine TB	SS	S	U	O	SO	DC
b.	Destruction of livestock animals that are found to be bovine TB-positive in the future	SS	S	U	O	SO	DC

29. Which, if any, of the activities currently used to eradicate bovine TB would you NOT support, EVEN IF you were convinced that the action(s) made an essential contribution to bovine TB eradication? (Check all that apply.)
    1 ❒ A ban on baiting deer
    2 ❒ A ban on feeding deer
    3 ❒ A reduction in white-tailed deer numbers
    4 ❒ Destruction of any livestock animal found to be bovine TB-positive
    5 ❒ Destruction of an *entire herd* of livestock if one or more animals were found to be bovine TB-positive

30. Are there actions that you believe should be taken to eradicate bovine TB other than those listed in question number 29 above? Please describe them here. ___

31. Have *you* or has *anyone in your immediate family*, been hurt financially due to the bovine TB issue or eradication strategies in Northeast Michigan? (Check one.)
    1 ❒ Yes
    2 ❒ No ***(If 'No', please skip to question 33)***

32. To what degree would you say you/they have been hurt financially? (Check one.)
    1 ❒ A great deal
    2 ❒ Somewhat
    3 ❒ Slightly
    4 ❒ Unsure

33. As new information is discovered about bovine TB in Michigan, would you like to be informed about it? (Check one.)

1 ❒ Yes
2 ❒ No ***(If 'No', please skip to question 35)***

34. How would you prefer that new information be communicated to you? (Check all that apply.)
    1 ❒ Directly through a newsletter
    2 ❒ Over mass-media, such as the television, newspaper or radio
    3 ❒ Over the internet
    4 ❒ Through public meetings
    5 ❒ Through wildlife, agriculture, or medical professionals
    6 ❒ Through local clubs or organizations
    7 ❒ From friends or family
    8 ❒ Other (please specify)_____

35. Please answer the following questions by circling one response for each.

		1 Yes	2 No
a.	Have you ever personally talked to someone from a state agency about a bovine TB-related issue?	Y	N
b.	Have you ever attended a bovine TB-related public meeting?	Y	N

36. There is already some information available about each of the following topics on bovine TB and related issues. Which of these topics would you like to know more about? (Check all that apply.)
    1 ❒ General information about the bovine TB issue in Michigan
    2 ❒ Research on bovine TB transmission
    3 ❒ Information about the bovine TB testing process for livestock
    4 ❒ Methods to attract wildlife to your property without supplemental feed
    5 ❒ Information on how to identify bovine TB lesions in deer

This next set of questions deals with two of the State Agencies that have been involved with eradicating bovine TB, the Michigan Department of Natural Resources (DNR), and the Michigan Department of Agriculture (MDA).

37. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	The **MDA** provides accurate information on agriculture issues.	SA	A	U	D	SD
b.	The **MDA** cares about farmers' concerns.	SA	A	U	D	SD
c.	The **MDA** cares about sportsmen's concerns.	SA	A	U	D	SD
d.	The **MDA** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD
e.	In general, the **DNR** manages natural resources in a scientifically sound manner.	SA	A	U	D	SD
f.	The **DNR** provides accurate information on natural resource issues.	SA	A	U	D	SD
g.	The **DNR** cares about sportsmen's concerns.	SA	A	U	D	SD
h.	The **DNR** cares about farmers' concerns.	SA	A	U	D	SD
i.	The **DNR** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD

BACKGROUND INFORMATION

In order for us to more fully understand people's responses to the previous questions, we need to know a few things about your background. Remember that your responses are completely confidential and that neither your name nor your address will be directly linked to your responses in any way.

38. How many years have you lived in Northeast Michigan? _____YEARS

39. In what county do you currently live? _____ COUNTY

40. Do you own property in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 43)***

41. Approximately how many acres do you own? _____ ACRES

42. Which of the following uses do you make of this land? (Check all that apply.)
    1 ☐ Residence
    2 ☐ Agricultural Production
    3 ☐ Recreation
    4 ☐ Investment
    5 ☐ Other (please specify)_____

43. Do you currently raise any livestock? (Check one.)
    1 ☐ Yes
    2 ☐ No

44. Do you regularly hunt deer in Northeast Michigan? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', skip to question 46)***

45. Approximately how many years have you been a deer hunter?
    YEARS

46. Is anyone in your immediate family a deer hunter? (Check one.)
    1 ☐ Yes
    2 ☐ No

47. Do you have access to the internet at home or at work? (Check one.)
    1 ☐ Yes
    2 ☐ No

48. Are you male or female?
    1 ☐ Male
    2 ☐ Female

49. In what year were you born? 19____

Thank you for your participation!
If you have any other comments that you would like to share with us, please use the space below (or add additional sheets if necessary).

Please use the enclosed addressed and stamped envelope or return this survey to:

Bovine TB Opinion Survey
13 Natural Resources Building
Michigan State University
East Lansing, MI 48824-1222

This survey deals with the bovine tuberculosis (TB) issue in Michigan and related topics such as wildlife and agriculture. Remember, you don't have to be very familiar with the bovine TB issue in order to answer the survey. We are interested in everyone's responses.

WHITE-TAILED DEER

First, we would like to know about some of your opinions on white-tailed deer and deer management.

1. Please indicate how much you agree or disagree with each of the following statements. (Circle one response for each.)

Deer management in Northeast Michigan should...

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	...minimize crop losses due to deer.	SA	A	U	D	SD
b.	...prevent deer from disturbing or destroying natural plant communities.	SA	A	U	D	SD
c.	...maintain the highest possible deer harvest (success) rate for hunters.	SA	A	U	D	SD
d.	...ensure car-deer accident rates are as low as possible.	SA	A	U	D	SD
e.	...keep deer as physically healthy as possible.	SA	A	U	D	SD
f.	...maximize the money that deer hunters bring to Northeast Michigan's economy.	SA	A	U	D	SD

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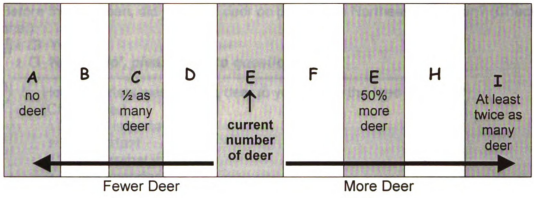
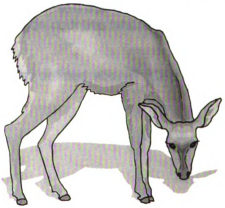


2. In the figure above, **E** represents the current number of deer in the county in which you live. Choose the letter above the line which is closest to the number of deer you think would be a reasonable goal just before the 2001 deer hunting **season** *in the county in which you live.* (Circle one letter or check not sure.)

A B C D E F G H I ____ NOT SURE

"Feeding" deer is defined in Michigan as placing food materials out that attract deer for any reason *other than for hunting.* The Natural Resources Commission voted to ban deer feeding in 2000 for all Michigan counties where a deer has been found with bovine TB. (This is *not* the same as "baiting".)

3. What is your opinion of the ban on feeding deer as defined above? (Check one.)
   1 ☐ Strongly support
   2 ☐ Support
   3 ☐ Unsure
   4 ☐ Oppose
   5 ☐ Strongly oppose
   6 ☐ Don't Care



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4. Before the feed ban, did you feed deer on property in Northeast Michigan? (Check one.)
   1 ☐ Yes
   2 ☐ No ***(If 'No', please skip to question 6)***

5. How important was feeding deer to you before the feed ban? (Check one.)
   1 ☐ Very important
   2 ☐ Important
   3 ☐ Somewhat important
   4 ☐ Not important
   5 ☐ Unsure

6. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is important for people to feed deer in order to keep deer alive through winters in Northeast Michigan.	SA	A	U	D	SD
b.	DNR Conservation Officers will strongly enforce the *feed ban* in 2000.	SA	A	U	D	SD

"**Baiting**" deer is defined in Michigan as putting out food materials for deer to attract, lure, or entice them *as an aid in hunting*. The Natural Resources Commission voted to ban baiting for the 2000 hunting season in all Michigan counties where a deer has been found with bovine TB.

7. What is your opinion of the ban on baiting deer as defined above? (Check one.)
   1 ☐ Strongly support
   2 ☐ Support
   3 ☐ Unsure
   4 ☐ Oppose
   5 ☐ Strongly oppose
   6 ☐ Don't care

8. Would you support a statewide ban on baiting deer? (Check one.)
   1 ☐ Yes
   2 ☐ No
   3 ☐ Unsure

9. Please indicate how much you agree or disagree with each of the following statements about baiting. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	Baiting deer is an acceptable hunting practice.	SA	A	U	D	SD
b.	Even with bait ban, most hunters I know enjoy hunting in Northeast Michigan as much as they used to.	SA	A	U	D	SD
c.	DNR Conservation Officers will strongly enforce the *bait ban* in the 2000 deer hunting season.	SA	A	U	D	SD
d.	The government has unfairly restricted people's rights by banning deer baiting and deer feeding.	SA	A	U	D	SD

BOVINE TUBERCULOSIS

The following set of questions deals with bovine tuberculosis (TB) and the attempts to eradicate the bovine TB disease in Michigan.

10. Do you support *the overall goal* to eradicate bovine TB in wildlife and domestic livestock in Michigan? (Check one.)
    1 ❒ Yes, I *strongly support* the overall goal to eradicate bovine TB.
    2 ❒ Yes, I *support* the overall goal to eradicate bovine TB.
    3 ❒ I am *unsure* about my opinion about the overall goal to eradicate bovine TB.
    4 ❒ No, I *oppose* the overall goal to eradicate bovine TB.
    5 ❒ No, I *strongly oppose* the overall goal to eradicate bovine TB.
    6 ❒ I have *no opinion* about the overall goal to eradicate bovine TB.

11. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	It is possible to eradicate bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB issue has hurt the economy in Northeast Michigan.	SA	A	U	D	SD

12. For the following statements about bovine TB, please indicate whether you think the statement is True or False, or whether you are Unsure. (Circle one response for each.)

		1 True	2 False	3 Unsure
a.	There is a vaccine that can be used to keep animals from getting bovine tuberculosis.	T	F	U
b.	Less than 25 deer have been found with bovine TB in Michigan since 1995.	T	F	U
c.	Animals that have bovine TB almost always show visible signs of the disease in their organs and lymph tissue.	T	F	U
d.	Most states in the US have found bovine TB in their wildlife.	T	F	U
e.	All dairy herds in the State of Michigan must now be tested for bovine TB every year until Michigan regains its bovine TB-free status.	T	F	U

13. Do you believe that humans can get bovine tuberculosis? (Check one.)
    1 ☐ Yes
    2 ☐ No ***(If 'No', please skip to question 16)***
    3 ☐ Unsure ***(If 'Unsure', please skip to question 16)***

14. In your opinion, what is the chance that some person will get bovine TB in Northeast Michigan if the disease is not eradicated? (Check one.)
    1 ☐ Extremely high
    2 ☐ High
    3 ☐ Low
    4 ☐ Extremely low
    5 ☐ Unsure

15. How much does this concern you? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure

16. These next statements deal with the finding of bovine TB in Michigan white-tailed deer. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that deer have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	The bovine TB disease is a serious threat to the health of the deer herd in Michigan.	SA	A	U	D	SD
c.	It is important for hunters in Northeast Michigan to have the deer they harvest checked for signs of bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has discouraged a large number of people from coming to Northeast Michigan to hunt.	SA	A	U	D	SD
e.	The bovine TB issue has discouraged a large number of people who live in Northeast Michigan from hunting.	SA	A	U	D	SD

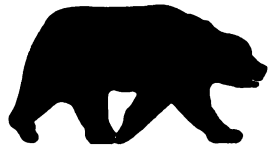
17. These next statements deal with the finding of bovine TB in some Michigan livestock. Please indicate how much you agree or disagree with the following statements. (Circle one response for each.)

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	I am concerned that livestock have been found with bovine TB in Northeast Michigan.	SA	A	U	D	SD
b.	Bovine TB in wild deer is a serious threat to the health of livestock in Michigan.	SA	A	U	D	SD
c.	It is appropriate that farmers be required to have their livestock tested for bovine TB.	SA	A	U	D	SD
d.	The bovine TB issue has caused too much hardship for farmers in Northeast Michigan.	SA	A	U	D	SD
e.	Beef and milk from Northeast Michigan are safe to consume.	SA	A	U	D	SD

In addition to livestock and deer, small numbers of other animals, including bear, fox, coyote, raccoon, and bobcat, have been found with bovine TB in Northeast Michigan.

18. Before this survey, were you aware that any animals besides livestock and deer have been found with bovine TB? (Check one.)
    1 ☐ Yes
    2 ☐ No

19. How much does it concern you that these animals have also been found with bovine TB? (Check one.)
    1 ☐ Very much
    2 ☐ Somewhat
    3 ☐ Not very much
    4 ☐ Not at all
    5 ☐ Unsure



20. Some people have said that bovine TB spreads in the ways described below. Please indicate whether you think these proposed means of bovine TB spread are true or false. (Circle one response for each.)

	Bovine TB spreads...	1 Definitely True	2 Probably True	3 Unsure	4 Probably False	5 Definitely False
a.	...between deer by nose-to-nose contact.	DT	PT	U	PF	DF
b.	...between livestock by nose-to-nose contact.	DT	PT	U	PF	DF
c.	...between deer and livestock by nose-to-nose contact.	DT	PT	U	PF	DF
d.	...from one deer to other deer on infected feed.	DT	PT	U	PF	DF
e.	...from one livestock animal to other livestock animals on infected feed.	DT	PT	U	PF	DF
f.	...from deer to livestock, or livestock to deer, on infected feed.	DT	PT	U	PF	DF

21. Please indicate how much you support or oppose the following actions:
(Circle one response for each.)

		1 Strongly Support	2 Support	3 Unsure	4 Oppose	5 Strongly Oppose	6 Don't Care
a.	Further reduction in the number of deer in Northeast Michigan in order to slow the spread of bovine TB	SS	S	U	O	SO	DC
b.	Destruction of livestock animals that are found to be bovine TB-positive in the future	SS	S	U	O	SO	DC

22. Which, if any, of the activities currently used to eradicate bovine TB would you NOT support, EVEN IF you were convinced that the action(s) made an essential contribution to bovine TB eradication? (Check all that apply.)
   1 ☐ A ban on baiting deer
   2 ☐ A ban on feeding deer
   3 ☐ A reduction in white-tailed deer numbers
   4 ☐ Destruction of any livestock animal found to be bovine TB-positive
   5 ☐ Destruction of an *entire herd* of livestock if one or more animals were found to be bovine TB-positive

23. Are there actions that you believe should be taken to eradicate bovine TB other than those listed in question number 22 above? Please describe them here.

24. Have *you* or has *anyone in your immediate family* been hurt financially due to the bovine TB issue or eradication strategies in Northeast Michigan? (Check one.)

1 ❒ Yes
2 ❒ No ***(If 'No', please skip to question 26)***

25. To what degree would you say you/they have been hurt financially? (Check one.)
    1 ❒ A great deal
    2 ❒ Somewhat
    3 ❒ Slightly
    4 ❒ Unsure

26. As new information is discovered about bovine TB in Michigan, would you like to be informed about it? (Check one.)

1 ❒ Yes
2 ❒ No ***(If 'No', skip to question 28)***

27. How would you prefer that new information be communicated to you? (Check all that apply.)
    1 ❒ Directly through a newsletter
    2 ❒ Over mass-media, such as the television, newspaper or radio
    3 ❒ Over the internet
    4 ❒ Through public meetings
    5 ❒ Through wildlife, agriculture, or medical professionals
    6 ❒ Through local clubs or organizations
    7 ❒ From friends or family
    8 ❒ Other (please specify)_____

28. Please answer the following questions by circling one response for each.

		1 Yes	2 No
a.	Have you ever personally talked to someone from a state agency about a bovine TB-related issue?	Y	N
b.	Have you ever attended a bovine TB-related public meeting?	Y	N

29. There is already some information available about each of the following topics on bovine TB and related issues. Which of these topics would you like to know more about? (Check all that apply.)
    1 ☐ General information about the bovine TB issue in Michigan
    2 ☐ Research on bovine TB transmission
    3 ☐ Information about the bovine TB testing process for livestock
    4 ☐ Methods to attract wildlife to your property without supplemental feed
    5 ☐ Information on how to identify bovine TB lesions in deer

These next few questions deal with two of the State Agencies that have been involved with eradicating bovine TB, the Michigan Department of Natural Resources (DNR), and the Michigan Department of Agriculture (MDA).

30. Please indicate how much you agree or disagree with each of the following statements.

		1 Strongly Agree	2 Agree	3 Unsure	4 Disagree	5 Strongly Disagree
a.	The **MDA** provides accurate information on agriculture issues.	SA	A	U	D	SD
b.	The **MDA** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD
c.	In general, the **DNR** manages natural resources in a scientifically sound manner.	SA	A	U	D	SD
d.	The **DNR** provides accurate information on natural resource issues.	SA	A	U	D	SD
e.	The **DNR** has done a good job dealing with the bovine TB issue.	SA	A	U	D	SD

BACKGROUND INFORMATION

In order for us to more fully understand people's responses to the previous questions, we need to know a few things about your background. Remember that your responses are completely confidential and that neither your name nor your address will be directly linked to your responses in any way.

31. How many years have you lived in Northeast Michigan? _____YEARS

32. In what county do you currently live? _____ COUNTY

33. Do you own property in Northeast Michigan? (Check one.)
    1 ❒ Yes
    2 ❒ No ***(If 'No', please skip to question 36)***

    34. Approximately how many acres do you own? _____ ACRES

    35. Which of the following uses do you make of this land? (Check all that apply.)
        1 ❒ Residence
        2 ❒ Agricultural Production
        3 ❒ Recreation
        4 ❒ Investment
        5 ❒ Other (please specify)_____

36. Do you currently raise any livestock? (Check one.)
    1 ❒ Yes
    2 ❒ No

37. Do you regularly hunt deer in Northeast Michigan? (Check one.)
    1 ❒ Yes →
    2 ❒ No ***(If 'No', skip to question 39)***

    38. Approximately how many years have you been a deer hunter?
    _____YEARS

39. Is anyone in your immediate family a deer hunter? (Check one.)
    1 ❒ Yes
    2 ❒ No

40. Do you have access to the internet at home or at work? (Check one.)
    1 ❒ Yes
    2 ❒ No

41. Are you employed for pay? (Check one.)

1 ☐ Yes
2 ☐ No ***(If 'No', please skip to question 44)***

42. Please indicate the economic sector that best describes the one in which you work: (Check one.)

1 ☐ Service (Hotels, Restaurants, etc.)
2 ☐ Retail Trade
3 ☐ Wholesale Trade
4 ☐ Manufacturing/Construction
5 ☐ Finance, Insurance, and Real Estate
6 ☐ Agriculture Services, Forestry, Fishing
7 ☐ Government (Local, State, Federal)
8 ☐ Transportation and Public Utilities
9 ☐ Other (please specify)_____

43. Are you the owner or general manager of your place of employment? (Check one)

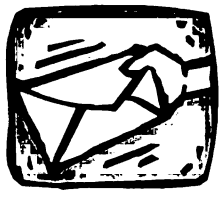
1 ☐ Yes
2 ☐ No

44. Are you male or female?

1 ☐ Male
2 ☐ Female

45. In what year were you born? 19____

Thank you for your participation!
If you have any other comments that you would like to share with us, please use additional sheets and mail them with your completed suvey.



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