Michigan Bovine Tuberculosis Eradication Project

Activities Report 2003

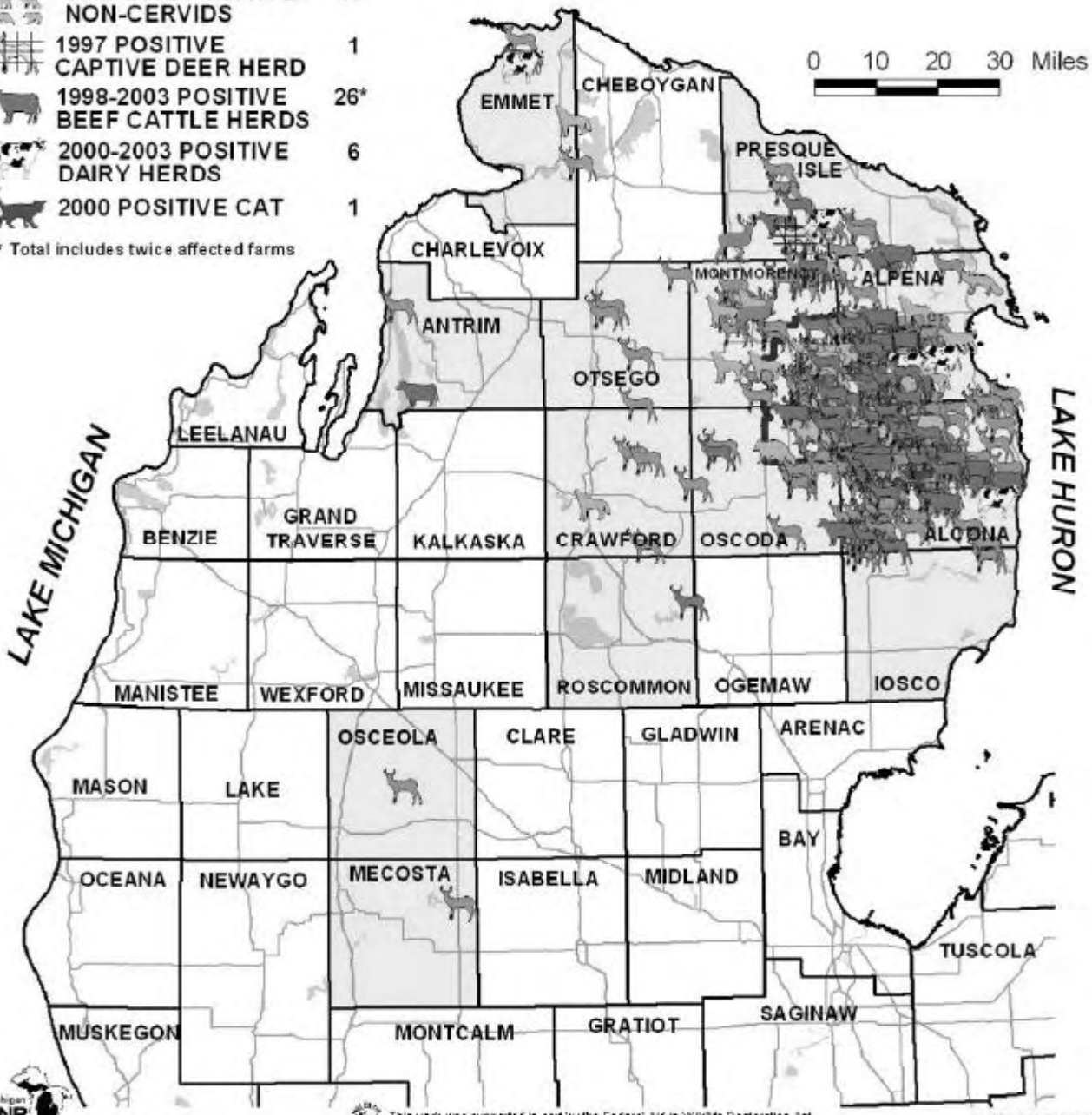
Michigan Department of Agriculture
Michigan Department of Community Health
Michigan Department of Natural Resources
Michigan State University
United States Department of Agriculture

BOVINE TUBERCULOSIS SURVEY RESULTS

	NUMBER
1975 POSITIVE TB DEER	1
1994 POSITIVE TB DEER	1
1995-2002 POSITIVE TB DEER	447
2003 POSITIVE OR SUSPECT TB DEER	32
2000, 2001 & 2003 POSITIVE ELK	3
1996-2002 POSITIVE NON-CERVIDS	40
1997 POSITIVE CAPTIVE DEER HERD	1
1998-2003 POSITIVE BEEF CATTLE HERDS	26*
2000-2003 POSITIVE DAIRY HERDS	6
2000 POSITIVE CAT	1

* Total includes twice affected farms

TB CORE AREA
TB INFECTED COUNTY
HYDROLOGY
COUNTY LINES
HIGHWAYS



Michigan DNR
MICHIGAN DEPARTMENT OF NATURAL RESOURCES

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Bovine Tuberculosis
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Bovine Tuberculosis: Michigan's Eradication Project

Table of Contents

Introduction

2 **1 Work Project Initiatives & Milestones**

6 **2 Federal Split State Status**

7 **3 Michigan Department of Agriculture, Animal Industry Division**

3a Bovine TB Testing of Cattle, Goats and Bison
3b Herds infected with bovine TB in Michigan
3c Livestock testing program in Michigan
3d Surveillance for Bovine TB in cattle, bison, & goats
3e Surveillance for Bovine TB in Privately Owned Cervidae
3f FAIR and the Michigan TB Eradication Program – Review of year one
3g Enforcement Activities

13 **4 Michigan Department of Natural Resources**

4a Summary of Michigan Wildlife TB Surveillance
4b Wildlife Surveillance
4b1 Examination of hunter harvested deer
4b2 Apparent TB prevalence in white-tailed deer in DMU 452
4b3 Hot townships – results of the 2002 DNR bovine TB surveillance in deer & townships map
4c antlerless quotas for northern lower michigan
4d Enforcement Activities
4e Wildlife Bovine TB Eradication Strategy

19 **5 Michigan Department of Community Health**

5a Tuberculosis laboratory report
5b Human skin testing
5c Bovine TB Eradication Coordinator office

23 **6 United States Department of Agriculture**

6a USDA: APHIS Comprehensive TB Strategy
6b USDA: VS within Michigan
6c TB Accredited herds in Michigan
6d USDA WS within Michigan
6e USDA WS National Wildlife Disease Surveillance Plan

28 **7 Michigan State University**

7a North Country Beef Heifer Feed-out Trial
7b Diagnostic Center for Population and Animal Health

29 **8 Collaborative Research Activities**

35 **9 Contacts**

Bovine Tuberculosis: Michigan's Eradication Project

ACTIVITIES REPORT • NOVEMBER 2003

INTRODUCTION

Bovine tuberculosis (TB) is an infectious bacterial disease and poses a risk to domestic livestock, wildlife and public health in the United States (U.S). In 1917, the U.S. government began a comprehensive national bovine TB eradication program. The disease has been nearly eradicated from livestock in the U.S., but areas of infection resurface periodically. Michigan was declared free of bovine TB in 1975 and received Disease Free status in 1979. In 1975 a free-ranging white-tailed deer in Alcona County was confirmed to be bovine TB positive. It was thought to be an anomaly, and no policy was adopted to look for the disease in additional animals.

The 1994 discovery of bovine TB in a free-ranging white-tailed deer in Alpena County, and the subsequent detection of TB in additional deer, cattle and several other mammalian species in Michigan led to a coordinated comprehensive disease eradication program in the Michigan Departments of Agriculture (MDA), Community Health (MDCH) and Natural Resources (MDNR). The State of Michigan *Bovine TB Eradication Project* then joined forces with the United States Department of Agriculture (USDA) and Michigan State University (MSU).

This Activities Report provides an update on the efforts of the Bovine TB Eradication Project partners.

Over the past few years, bovine TB eradication policies have greatly impacted the farming, travel, tourism and hunting communities. Agriculture stakeholders were concerned about the rate and mode of transmission from wildlife to cattle, as well as the economic impact that the loss of the federally accredited TB Free designation would have on the cattle and dairy industries. In 1998, there was concern that the disease was spreading via wildlife to geographic regions other than Northeast Lower Michigan. At the time, surveillance methods to determine how the disease was dispersed in wild white-tailed deer were limted.

The Michigan legislature dedicated funding to the bovine TB eradication project and state departments adopted policies that checked the potential outward spread of disease. Surveillance and data analyses have given a clear illustration of the accomplishments of eradication efforts.

Seventy-eight percent of the disease in the deer herd is concentrated in Deer Management Unit (DMU) 452, a 571 square mile area where the four counties of Alcona, Alpena, Montmorency and Oscoda meet. Genetic research at MSU has revealed a familial relatedness among bovine TB positive deer. The disease is clustered in 12 hot townships and, although there may be a low-level of infection in wildlife outside of the area, the apparent prevalence rate of the disease in deer is not rising.

Livestock producers and private veterinary practitioners have assisted MDA and USDA in bovine TB testing nearly every bison, cattle, goat and privately owned cervid premises in Michigan. The depopulation of farms and necropsies of TB-test positive cattle has shown that, in the majority of cases, veterinarians are finding this disease in the very earliest stages. Producers have been indemnified at fair market value for their livestock.

The investment of financial resources and manpower; the cooperative efforts between departments and agencies; and the exchange of information amongst scientists, policy makers and stakeholders have all resulted in an exceptional disease eradication effort.

MDA is committed to maintaining zones with strict testing, movement and identification requirements and will continue with depopulation of TB exposed livestock herds to ensure eradication of the disease in livestock. DNR is committed and will continue efforts to bring the disease down to an undetectable level in wildlife for a five-year period of continuous testing.

Although additional preventative strategies must be adopted, this effort has shown that Michigan stands prepared in the event of future disease outbreaks.

2000-2003 Work Project Initiatives & Milestones

December 1999: MDNR announces that three TB positive deer are harvested from Antrim, Mecosta and Osceola counties.

March 6-7, 2000: The Bovine TB Eradication Project holds an international bovine TB conference, with guest speakers from Ireland, New Zealand, USDA, MSU, MDA, MDCH, and MDNR.

March 7, 2000: MDA, MDCH and MDNR are granted nearly $20 million in work project funds, by the Michigan Legislature to implement surveillance and eradication strategies to eliminate bovine TB from Michigan's livestock and wild white-tailed deer.

March 13, 2000: From March 2000, through April 2000, a bovine TB in livestock advisory committee meets to review the Animal Industry Act and develop language for statutory changes to the Act that will facilitate the eradication of bovine TB from Michigan.

May 25, 2000: Congress appropriates $6 million from the Agriculture Risk Protection Act to fight bovine TB in Michigan and an additional $6 million from the Commodity Credit Corporation. Monies help establish an office for bovine TB eradication within the Michigan USDA Veterinary Services office under the Area Veterinarian in Charge (AVIC).

June 9, 2000: The Michigan Natural Resources Commission (NRC) bans feeding and baiting in counties where bovine TB has been diagnosed in more than one cervid.

October 31, 2000: Updates to the Animal Industry Act become law, directing MDA and MDNR to move forward with rules and regulations that establish protocols for bovine TB eradication.

December 13, 2000: The Bovine TB Advisory Committee, comprised of agriculture industry leaders, stakeholders and producers, meets to review changes in the Animal Industry Act, and advise the departments on establishing directives for bovine TB eradication.

March 1, 2001: The MDA director designates four Northeast Lower Michigan counties (Alcona, Alpena, Montmorency and Presque Isle) where bovine TB infected herds have been found, as High Risk Areas. They will remain under comprehensive testing and movement requirements. The MDA director also designates, effective March 1, 2001, two Potential High Risk Areas in Emmet and Mecosta counties. In these areas, all farms within a 10-mile radius of a bovine TB positive deer must have a whole herd TB test within six months. Under the Animal Industry Act, High Risk and Potential High Risk Areas may be established to help control the spread of and facilitate the eradication of bovine TB.

A High Risk Area is defined as an area where bovine TB has been diagnosed in domestic livestock. A Potential High Risk Area is an area where bovine TB has been diagnosed in wild, free-ranging cervids only. In a High Risk Area, official identification is required on all cattle, goats, bison or privately owned cervids (livestock) that move off any premises. Annual whole herd testing is required in the High Risk Area, unless the livestock are moved from a registered terminal operation directly to slaughter. All suspect and reactor animals identified through testing are taken to the MSU Animal Health Diagnostic Laboratory (AHDL) for necropsy and further testing, as needed.

March 5-6, 2001: The Bovine TB Eradication Project holds the second international bovine TB conference, with guest speakers from South Africa and Canada, USDA, MSU, MDA, MDNR and MDCH.

June 25, 2001: MDA announces that private veterinary practitioners and MDA/USDA veterinarians completed testing 100 percent of the dairy herds (over 500,000 animals) in the state of Michigan. The U.S. Food and Drug Administration (FDA), USDA and MDA sign an agreement indicating that Michigan's Pasteurized Milk Ordinance (PMO) Dairy Herd Testing Protocol meets strict requirements under the federal order.

October 24, 2001: The USDA Animal and Plant Health Inspection Service (APHIS) awards $1.8 million in grant monies to further bovine TB eradication program activities.

MDA projects, under the agreement, include a two-year pilot project to establish Livestock Electronic Identification (EID) in cattle herds in Northeast Lower Michigan. Additionally, any livestock in a federally accredited dairy herd in Michigan will have the EID tag. The agreement also included a Gamma-Interferon test pilot project, which will use 20,000 blood samples to determine if this test could replace the Comparative Cervical Tuberculin (CCT) test. The Gamma-Interferon test will require less animal handling and results are projected to be available in considerably less time than the CCT test results, which are not available for 72 hours.

December 10, 2001: The Natural Resources Commission announces it will sign a Memorandum of Understanding (MOU) with USDA and MDA to establish criteria for the maintenance of split state status.

Language in the MOU includes a ban on feeding and baiting of wild, free-ranging elk and white-tailed deer in any county in which bovine TB in wild, free-ranging elk or white-tailed deer has been confirmed. The baiting ban may be lifted after TB is not found in wild free-ranging deer or elk in a specific county after two consecutive years. Bovine TB surveillance of free ranging cervids will continue for five years in each specific county after no additional disease is found.

If livestock or wild, free-ranging cervids are found to be positive for bovine TB in a county where previously no positive cervids have been found, stepped-up surveillance of wild, free-ranging cervids will occur during the following hunting season. Large numbers of deer will continue to be examined each year in High Risk counties.

March 10, 2002: MDA establishes various TB zones to help fight bovine TB. These zones require bovine TB identification and testing as well as movement restrictions for Michigan cattle, goats, bison, and privately-owned cervids.

The Infected Zone includes Alcona, Alpena, Montmorency, and Presque Isle counties. The Surveillance Zone includes Cheboygan, Crawford, Iosco, Ogemaw, Oscoda, and Otsego counties; and the Disease Free Zone includes the remaining 73 counties in Michigan's Upper and Lower Peninsula. Official identification is required on all domestic livestock that move from any premises in each of the zones.

In the Infected Zone, the use of EID, which is now provided at no cost by the state through a federal grant, will be strongly encouraged. Annual whole herd testing is required as are permits to move breeding stock and feeder livestock to any premises outside this zone, unless moving directly to slaughter.

Biennial whole herd testing will be required of all herds in the Surveillance Zone. A movement permit will be required to move breeding stock and feeder livestock to any premises outside the Surveillance Zone, unless moving directly to slaughter.

In the Disease Free Zone, all herds located in Antrim, Arenac, Charlevoix, Emmet, Gladwin, Kalkaska, Missaukee, and Roscommon counties are required to have a whole herd test between January 1, 2002, and December 31, 2002.

March 12, 2002: The bovine TB project partners meet for a conference/workshop to discuss research projects and additional risk mitigation strategies.

April 10, 2002: MDCH officials announced that an elderly individual was diagnosed with bovine TB, but died from unrelated causes in February. DNA fingerprinting conducted by the MDCH laboratory determined the strain of *Mycobacterium bovis* found in the individual is the same found in cattle and deer in Northeast Lower Michigan. The source of infection was not identified.

April 17, 2002: The MDA director announces that Oscoda County will be a High Risk Area because a beef bull was found infected with bovine TB. Oscoda County is in the Surveillance Zone, but will now undergo an annual testing regimen for at least a three-year period.

May 31, 2002: The legislature passes additional amendments to the Animal Industry Act, PA 458 of 2002. This act allows MDA to move forward with additional TB regulations and testing plans.

June 6, 2002: The NRC issues a Wildlife Order to assist in the enforcement to eliminate feeding in banned areas where efforts to prosecute have been frustrated by holding the owner or lessee responsible for unlawful winter feeding on their property.

The commission also established early and late antlerless deer seasons in the seven high prevalence bovine TB counties in the northeast Lower Peninsula. The early season begins the second Saturday in October (October 12) and lasts for nine days. The late season is from December 23 through the 31.

Two-for-one antlerless licenses are available in Alcona, Alpena, Crawford, Montmorency, Oscoda, Otsego and Presque Isle counties.

July 12, 2002: The NRC expands the use of Deer Management Assistance (DMA) Permits to include any land-owner in an approved area where there is a serious disease outbreak. A minimum of five permits may be issued to one land owner. The land owner may pass the permit on to a hunter who has purchased a hunting license for the current season.

July 19, 2002: State and federal officials announce that two Emmet County cattle herds tested positive for bovine TB. These herds were outside of the four-county infected zone where TB has previously been found in livestock. Emmet County is designated as a High Risk Area and will undergo an annual herd testing regimen for a three-year period.

August 6, 2002: Michigan submits its application for Split State Status to USDA. In order to prepare for Split State Status, MDA, on March 10, 2002, split Michigan into three zones [under authority of the director of MDA, as prescribed by P.A. 466 of 1988, as amended: Disease Free, Surveillance and Infected. These zones, and the consequent testing, movement, identification, and permitting requirements, serve as the foundation for Michigan's application to USDA.

The area that will eventually be Modified Accredited Advanced is entirely in the Disease Free Zone, except for Emmet County which, due to the discovery of bovine TB in two cattle herds, was designated as a High Risk Area (with the requirement that all cattle, goats, bison and privately owned cervid herds in Emmet county undergo an annual whole herd test).

The Modified Accredited Area, the Infected and Surveillance Zones, are expected to be Alcona, Alpena, Emmet, Cheboygan, Crawford, Ogemaw, Oscoda, Otsego, Montmorency and Presque Isle counties. Two boundary alternatives were submitted for review: (1) use of Iosco, Ogemaw and Oscoda counties as the southern boundary or (2) the natural boundary made up of a national forest, a state forest and the AuSable River.

October 1, 2002: MDA officials establish an updated scientifically based bovine TB surveillance plan for livestock in Michigan's Disease Free Zone. Specifically, the plan establishes a random herd selection TB testing program and relieves the burden of individual testing for farmers moving animals in the disease free areas, as long as herds have undergone one whole herd test before movement.

The Disease Free Zone includes all counties in Michigan except: Alcona, Alpena, Cheboygan, Crawford, Iosco, Ogemaw, Oscoda, Otsego, Montmorency and Presque Isle. Emmet County remains a High Risk county for a three-year period and will be required to undergo annual whole herd tests.

Producers who are selected will be required to have a whole herd TB test conducted on their livestock and fill out a survey noting herd size and location, all animal movement, management practices, and proximity of the herd to bovine TB infected wildlife.

October 1, 2002: The DNR has issued over 33 disease control permits (270 kill tags), and land owners, either in conjunction with USDA Wildlife Services (WS) or alone, have taken approximately 110 deer with disease control permits.

November 30, 2002: Conservation officers responded to 472 baiting complaints, issued 432 warnings and 520 citations. Estimates for the fall harvest for the 5-county area of Alcona, Alpena, Montmorency, Oscoda and Presque Isle, in Northeast Lower Michigan, come in at 57,000 bucks and 47,000 does for a total of 104,000 deer taken.

February 2003: MDA announces the location of an additional Potential High Risk Area, 10 miles north of Gaylord in Livingston Township, Otsego County. Livestock producers within a 10-mile radius of the TB-positive deer must have their livestock tested for bovine TB within six months of the designation.

March 6, 2003: The bovine TB disease prevalence rate in the wild white-tailed deer in DMU 452 (the core area) is 2.8 percent. It is up by half a percent this year but is considered statistically insignificant as the rate is expected to go up and down slightly over the years. A 1998 disease prevalence rate model predicted that the rate of disease in the wild white-tailed deer would be above 6 percent if intervention methods were not taken.

March 26, 2003: The bovine TB eradication efforts have culminated in the testing of over 800,000 cattle bison, goats and privately owned cervids. About 105,000 wild white-tailed deer have been tested for bovine TB since 1995. Of those, 29 cattle herds and one privately owned cervid herd were exposed to at least one animal in the herd with bovine TB. All farms, except two dairies (which have since tested free of the disease) and two dairies currently under the test-and-remove program, have been depopulated. To date, 449 wild white-tailed deer have tested positive.

April 7, 2003: The comment period for USDA to establish two bovine TB zones in Michigan begins. The proposed Split State Status will create two testing and movement zones, Modified Accredited and Modified Accredited Advanced. Modified Accredited counties, Alcona, Alpena, Cheboygan, Crawford, Emmet, Montmorency, Oscoda, Otsego, and Presque Isle, along with portions of Iosco and Ogemaw counties that are north of the southernmost boundary of the Huron National Forest and Au Sable State Forest, remain under strict testing and movement requirements. The Modified Accredited Advanced zone, which is comprised of the remainder of the state, will require an individual animal test for interstate movement. To view a map of the proposed zones, visit **www.michigan.gov/emergingdiseases/**

May 14, 2003: A gathering of scientists and staff from MSU, USDA, MDA, MDCH and MDNR meet to discuss bovine TB research results. With this input, MDNR formulates a pilot project that further targets the TB positive deer in the core area.

June 3, 2003: State animal health officials announce that a beef cow from an Antrim County herd, which had originated from the state's known TB-affected area of Presque Isle County, is bovine TB positive

June 6, 2003: The comment period for the proposed rule to split Michigan into two zones is extended to July 25, 2003.

July 10, 2003: MSU announces that an economic survey finds that white-tailed deer infected with bovine TB are costing Northeast Lower Michigan at least $25 million a year in tourism dollars. The Sunrise Side Travel and Tourism Association and the Northeast Michigan Council of Governments discuss plans to enhance the image of Northeast Michigan by promoting the positive effects on deer herd health and quality that disease eradication efforts have produced.

July 23, 2003: Antrim County is designated as a High Risk Area for Bovine TB. Cattle, goat, bison and cervid producers in the county must have their herds TB tested annually and they all must be cleared for three consecutive years before the designation can be dropped.

August 7, 2003: MDA holds an informational meeting in Antrim County regarding the High Risk designation.

October through November, 2003: The TB project runs a public service announcement and outreach campaign to remind producers that, as established by law, they must have had a one-time whole herd bovine TB test on all bison, cattle, goat and privately owned cervid premises before December 31, 2003.

2 Federal Split State Status

After extensive surveillance of both Michigan's livestock herds and wild white-tailed deer, changes to laws and regulations, and the establishment of a memorandum of understanding, MDA's State Veterinarian submitted the Michigan application for Split State Status to USDA on August 6, 2002.

USDA responded with a comment period regarding the proposal to create two testing and movement zones, Modified Accredited and Modified Accredited Advanced. Modified Accredited counties of Alcona, Alpena, Cheboygan, Crawford, Emmet, Montmorency, Oscoda, Otsego, and Presque Isle, along with portions of Iosco and Ogemaw counties that are north of the southernmost boundary of the Huron National Forest and Au Sable State Forest, would remain under strict testing and movement requirements. The Modified Accredited Advanced zone, which is comprised of the remainder of the state, would require an individual animal test for movement to other states.

Splitting Michigan into two zones is critical for disease management, as resources may then be further targeted to the primary area of concern. Split State Status will also allow livestock that are not in the TB endemic area to move more freely. Ongoing surveillance in Michigan led to the detection of bovine TB in a cattle herd outside of the proposed zone. This discovery caused USDA to extend the comment period.

When Michigan is split into two zones, updates and changes to testing requirements may occur to ensure the most effective disease eradication. The public will be notified through various mechanisms, including the state's bovine TB Web site, as changes occur.

3 Michigan Department of Agriculture
Animal Industry Division

3A BOVINE TB TESTING OF CATTLE, GOATS AND BISON

The overall goal of the bovine TB eradication program is the eradication of bovine TB from Michigan. MDA is involved in testing all cattle, goats, bison, and privately owned cervids in the state, with the requirement that all farms will undergo a whole herd test at least once by December 31, 2003. *Michigan has just under 1 million head of test-eligible cattle at any given time and about 15,500 farms.*

The chart below describes the testing results from all species starting January 1, 2000 through December 1, 2003. Ninety-five percent of all animals tested with the first screening test (caudal fold test) were negative and required no further testing.

Number tested	Number
Total # of animals tested	874,491
Total # of caudal fold negatives	849,930
Total # of caudal fold suspects	39,284
Total # comparative cervical negatives	37,430
Total # of comparative cervical suspects	903
Total # of comparative cervical reactors	179

3B HERDS INFECTED WITH BOVINE TB IN MICHIGAN

Since TB testing of livestock herds began, 33 herds have been found infected with bovine TB, including one privately owned cervid herd, six dairy herds, and 26 beef herds.

Of the 32 TB positive cattle farms, 26 have been depopulated and 16 of those farms have been repopulated.

Four dairy farms not depopulated have been on the test-and-removal program. Of these four dairy farms, two remain on the test-and-remove program and two have completed the program. The quarantine has been released on both dairy farms that tested clear of bovine TB, but the farms remain under annual surveillance testing because of their location in the TB endemic area.

Repopulation of once-infected farms requires strict cleaning, disinfecting, and down time. Two repopulated premises were found, after annual testing, to have bovine TB infected cattle. The bovine TB DNA fingerprinting from these two repopulated farms matches that found in the wild white-tailed deer population and cattle in Northeast Lower Michigan. These farms were again depopulated in 2002.

In previous years, all infected herds have been found in the five-county area located in the northeastern portion of Michigan's Lower Peninsula. However, in 2002, two herds in Emmet County, one beef and one dairy, were diagnosed with bovine TB. Both farms were depopulated.

In 2003, a beef animal from a herd in Antrim County was diagnosed positive for bovine TB. The DNA strain matches that of the bovine TB in Northeast Lower Michigan deer. An epidemiological investigation continues in order to determine how this animal was exposed to TB. The Antrim County cattle have been destroyed and the farm is under quarantine.

As a result of the TB positive diagnosis, and according to state law, Antrim County was designated as a High Risk Area. All cattle, bison, goats, and privately owned cervids in the county must undergo annual whole herd tests until all herds have cleared for three consecutive years.

MDA, USDA and MSU continue to partner in the testing and surveillance of bovine TB in cattle and privately owned cervids. As a result of annual whole herd testing and testing for movement, the bovine TB eradication project partners are finding the disease in its earliest stages, often without visible lesions. In addition, when a herd is depopulated, there is typically only one infected animal, again suggesting these animals are being identified early in the course of the disease. The majority of cases, when necropsied, have no gross lesions. The diagnosis of bovine TB is confirmed through a series of tests at the USDA laboratory in Ames, Iowa.

Additional strategies to prevent cross exposure between cattle and wildlife are being undertaken. Producers use many types of fencing to keep deer away from cattle feed. Round hay bales are stored close to farm premises where human activity discourages deer.

Summary of bovine TB positive cases in cattle and captive deer in Michigan 1996 – 2003

	County	Type of Herd	Herd Size	# CF +	# CC Suspect	# CC +	# Gross Lesions	# Histologic Lesions	PCR+	M. bovis Cultured	Date Diagnosed Positive
1	Presque Isle	Deer	100+	nt	nt	nt	9[b]	9	NT	14	10/27/97
2	Alpena	Beef	-50	3	0	1	1	1	1	1	6/16/98
3	Alcona	Beef	-50	7	2	1	2	3	3	2	12/28/98
4	Alcona	Beef	100+	10	0	1	4	4	2	3	10/19/98
5	Presque Isle	Beef	100+	8	0	5	6	6	4	6	11/10/99
6	Presque Isle	Dairy	100+	8	0	1	1	1	1	1	2/4/00
7	Alpena	Beef	50	3	1	0	1	1	1	0	3/29/00
8	Alcona	Beef	-50	4	0	1	1	1	1	1	6/20/00
9	Alcona	Beef	100+	19	1	2	1	1	1	1	6/23/00
10	Alcona	Beef	100+	17	1	3	3	3	3	1	9/7/00
11	Montmorency	Dairy	100+	10	2	2	0	1	1	0	9/19/00
12	Alcona	Beef	-50	nt	nt	nt	1	1	1	1	9/21/00
13	Alpena	Beef	50+	nt	nt	nt	3	3	3	2	2/2 /01
14	Alpena	Beef	-50	3	0	1	1	1	1	1	2/28/01
15	Alpena	Beef	100+	3	0	1	1	1	1	1	4/10/01
16	Alpena	Beef	50+	33	3	28	32	30	24	28	5/7/01
17	Alcona	Beef	50+	1	0	1	2	2	2	1	5/16/01
18	Alpena	Beef	50+	5	0	2	2	2	1	2	9/6/01
19	Alcona	Beef	-50	1	0	1	2	2	2	2	9/19/01
20	Alcona	Beef	-50	1	0	1	1	1	1	1	12/7/01
21	Oscoda	Beef	-50	1	0	0	1	1	1	1	4/10/02
22	Alpena	Beef	-50	2	0	1	1	1	1	1	5/24/02
23	Alpena	Beef	-50	8	0	5	4	3	3	2	6/12/02
24	Alpena	Beef	-50	8	0	0	2	2	2	2	6/28/02
25	Emmet	Beef	-50	3	0	3	1	1	1	1	7/17/02
26	Emmet	Dairy	50+	10	0	1	1	1	1	1	7/17/02
27	Alcona	Dairy	100+	12	1	0	0	0	0	1	11/22/02
28	Alcona	Beef	-50	4	1	0	0	1	1	1	1/21/03
29	Oscoda	Beef	-50	2	0	2	2	2	2	1	1/27/03
30	Alpena	Dairy	-50	6	1	1	1	1	1	1	3/6/03
31	Antrim	Beef	50+	4	0	1	1	1	1	1	5/23/03
32	Alpena	Beef	-50	5	0	1	1	1	1	pending	11/10/03
33	Alpena	Dairy	50 +	3	1	1	1	1	1	pending	12/29/03
Total			**2808**	**200**	**14**	**68**	**83**	**92**	**68**	**82**	

nt = not tested
Herd size is identified as plus (+) or minus (-) in number to protect the privacy of the owner.

3C LIVESTOCK TESTING PROGRAM IN MICHIGAN

When the USDA changed Michigan's bovine TB classification to non-Modified Accredited (now referred to as Modified Accredited), the clock started ticking for all 3,413 dairy farms in Michigan to have their herds TB tested. Under the Federal Grade A Pasteurized Milk Ordinance, a yearly whole herd TB test was needed in order for producers to sell milk.

In the earlier established movement restriction zone (MRZ) of Northeast Lower Michigan (I-75 east and M-55 north to Lake Huron), MDA made TB testing of dairy herds a high priority to ensure that all 161 farms were tested before October 20, 2000. Historically, farmers were responsible for paying for these tests. The State of Michigan covered the costs of these tests as long as a whole herd test was conducted.

December 31, 2003, marked the deadline for the statewide, legislatively mandated, one-time whole herd test for all bison, cattle, goat and cervid farms.

3D DISEASE SURVEILLANCE FOR BOVINE TB IN LIVESTOCK

Long term surveillance, to ensure that bovine TB is not found in any herds outside the TB endemic area and to ensure that any possible introduction of disease is quickly identified, is of utmost importance. For that reason, a science based testing system was adopted. This surveillance program, developed jointly by MSU, MDA, USDA, and the livestock industry, includes two concurrent types of surveillance: traditional inspection of animals presented at federally licensed slaughter facilities, and a statistically valid, whole herd TB testing program in the disease free area.

This testing program requires the testing of 1,800 Michigan cattle herds, randomly selected every two years. Notification is sent to 900 farms on an annual basis. The first notification went out in December of 2002. Herd owners are encouraged to contact their private veterinary practitioner for testing, or are in the process of being scheduled and tested by state or federal veterinarians.

A risk assessment survey, developed and administered at the time of random herd testing in the Disease Free Zone and during whole herd testing in the Surveillance and Infected zones, is included. This assessment creates a database used to determine what factors are associated with TB test outcomes. The information may be used to develop and refine future surveillance programs.

This is a six-year surveillance program with three phases. Each phase consists of a two-year testing cycle. After each testing cycle, the surveillance strategy will be evaluated and adjusted accordingly. To date, almost 600 herds have been tested under this disease surveillance program.

Other surveillance that continues includes:

- Enhanced slaughter surveillance.
- Whole herd testing to maintain individual herd bovine TB free accreditation.
- Testing of all Michigan cattle, goat and bison herds by December 31, 2003.
- Testing requirements for the bovine TB Infected and Surveillance zones of Michigan remain the same and include annual whole herd testing and individual animal testing for movement (see Milestones- March 10, 2002).

The Disease Free Zone includes all counties in Michigan except: Alcona, Alpena, Cheboygan, Crawford, Iosco, Ogemaw, Oscoda, Otsego, Montmorency and Presque Isle. Emmet and Antrim counties remain High Risk Areas for a three-year period and are required to conduct annual whole herd tests and individual animal tests.

3E SURVEILLANCE FOR BOVINE TB IN PRIVATELY OWNED CERVIDAE

Bovine TB surveillance testing of privately owned cervids (elk, deer or caribou) in Michigan began in 1999 and is now complete. Since 1999, 812 herds have been involved in the TB surveillance programs. Over 31,334 cervids were tested by single cervical injection, and 3,286 animals were inspected under slaughter surveillance. Of the 812 cervid herds, approximately 70 are in Northeast Lower Michigan. At the time of printing, 47 of these herds undergo annual single cervical testing and 22 herds are enrolled in annual slaughter surveillance programs.

MDA completed implementation of a privately owned cervid registration program that includes all species of cervidae owned in Michigan. This program requires adherence to standards that ensure the integrity of the industry, provides control and information necessary to respond to any instances of reportable diseases, and protects the natural resources and wildlife of Michigan.

In April 2002, an application was submitted to USDA seeking Free Status designation of the Michigan privately owned cervid population.

3F THE MICHIGAN FARM ANIMAL IDENTIFICATION RECORDS PROGRAM

The National FAIR (Farm Animal Identification Records) Program began in Michigan November 1, 2002. Electronic ID tags are available to producers at no charge in the TB endemic area or to those statewide with accredited herds. Due to ongoing bovine TB eradication efforts, USDA chose Michigan as a pilot state, granting $1.3 million to develop and implement the electronic ID program. Currently, only a handful of other states and a few European countries are utilizing electronic ID on a regular basis.

Since the state embarked on the federally funded, electronic livestock identification pilot program in Northeast Lower Michigan, more than 90 percent of the area farmers have voluntarily incorporated this new technology and system (see 6c for herd accreditation information).

Although it has long been common for producers to identify their animals, identification has traditionally been with a plastic or metal tag or tattoo. Electronic ID incorporates a tag imbedded with a radio frequency device and marked with a unique, individual number that will not be duplicated on any other animal worldwide. This tag is then linked to a database that includes information specific to that animal, including date of birth, sex, type/species, and TB testing information. This electronic tag dramatically speeds up the location and tracing of livestock – from farm to market – and ensures the most accurate and up-to-date information.

This system provides further assurance to USDA, other states and our trading partners that Michigan cattle have been properly tested and moved; helps ease the burden on testing; and has allowed trace backs and forwards to be done in hours rather than days or weeks, which is critical in any animal disease situation.

Program implementation: The program has been implemented in four phases:
Phase 1: Obtain and load premises ID information into FAIR.

Phase 2: Develop an electronic data recording system. Replace the paper recording system with an electronic recording system using handheld computers, ID tags and laptop computers for data transfer. The database includes premises number, animal ID, RFID, birth date, species, breed, sex, herd management ID, TB testing date, and CFT and CCT test results.

Phase 3: Record animal movement from markets and processing plants. Currently, the livestock markets in Gaylord, Clare, Cass City, Battle Creek, Lake Odessa, Ravenna, Napoleon and St. Louis, Michigan, have ID readers. Seven slaughter plants have ID readers: one in Michigan, one in Illinois, two in Pennsylvania and three in Wisconsin.

Phase 4: Implement movement and permitting system online. Producers will soon be able to enter an animal's electronic identification number into the state's web-based system and quickly verify whether all testing requirements have been met. If so, the permit is granted and they can then choose to print the permit, or receive it by fax or mail.

EID Summary:

Michigan Premises with Radio Frequency ID	1,303
Animals identified with RFID	72,262
RFIDs issued and not identified	73,332
Total tags	145,594
Total identified animals slaughtered to date:	5,887

Electronic ID can be read more easily, is faster and safer for the handler, and causes less stress on the animal. Animal handling time is much shorter using EID and it is easier to determine if an animal was missed during testing.

There will be cost savings as the program switches from a paper to an electronic recording system such as reduced cost for data entry. Retesting time is decreased by as much as 50 percent and cost for trace-backs is decreased substantially.

Electronic ID will play a critical role in protecting the health of Michigan livestock, ensuring the safety of the food supply, maintaining consumer confidence in Michigan food and agricultural products, managing animal diseases, and assisting farmers with data to enhance the genetic improvement of their herds.

3G MDA ENFORCEMMENT ACTIVITIES

The majority of MDA enforcement activities within the TB Program in Michigan have been through follow-up reports from state and federal employees. The reports were regarding illegal movements uncovered during TB testing rounds.

MDA conducted 37 investigations directly related to illegal movements, including movement without obtaining permits to move, illegal importation, and lack of official identification. At this point, 33 first-time violators have received warning citations. One illegal importation of animals from Texas resulted in a fine of over $1,500, and three reports were unfounded.

During meetings with violators, MDA shared information on the requirements to move and test cattle, goats, bison, and privately owned cervids. Violators have been very open with their questions and understand that future violations may result in both fines and criminal charges brought against them.

MDA is looking at additional surveillance information that may assist in the expansion of enforcement activities. Livestock auction markets are monitored to ensure that animals sold for *slaughter only* go to slaughter and not back to a farm.

Livestock that did not meet movement and testing requirements in the Disease Free Zone have been directed to slaughter. MDA requires livestock buyers of *slaughter only* animals to report that the animals were indeed slaughtered. Two *slaughter only* cases were investigated. MDA field staff found that the animals did go to slaughter.

The Michigan State Police Motor Carrier Division assists MDA in stopping and verifying that truckers had the proper paperwork to transport livestock. At this time, no investigation of illegal movement initiated from those stops has been necessary.

With non-compliant or repeat violators, MDA is ready to fine and/or press criminal charges to ensure compliance with livestock movement requirements in Michigan.

As a result of the legislatively mandated three-year program (to test every livestock premises at least one time by December 31, 2003), MDA *may* see additional violations by farms that have not tested. These farms will be quarantined (in the Disease Free Zone) until they have animals tested. The farms that have not yet tested (perhaps one percent) are more than likely backyard hobby farms, since anyone conducting business in Michigan's livestock industry has been informed through mailings, stakeholder and association meetings, radio announcements, newspaper and magazine articles, and web postings.

4 Michigan Department of Natural Resources

4A SUMMARY OF MICHIGAN WILDLIFE TB SURVEILLANCE

In 1975, a nine-year-old female white-tailed deer from Alcona County, and in 1994 a four-year-old male deer from Alpena County were submitted with lesions consistent with and testing positive for bovine TB.

Wild white-tailed deer TB surveillance:

Year	Number of deer positive	Total deer tested
1995	18	403
1996	56	4,967
1997	73	3,720
1998	78	9,057
1999	58	19,500
2000	53	25,858
2001	60	24,278
2002	51	18,100
2003	32*	17,258*
Grand total	481	123,249

*Testing for 2003 is preliminary.

2002: Positive for TB

County	White-tailed deer	Non-cervid wildlife
Alcona	24	
Alpena	9	2 raccoons
Montmorency	11	2 raccoons; 3 coyotes; 1 red fox
Oscoda	5	2 raccoons
Otsego	1	
Presque Isle	1	

2003: Positive for TB

1 positive elk – Presque Isle
2 positive coyotes – Montmorency
32 preliminary positive deer –
Alcona (13), Alpena (9), Montmorency (5), Oscoda (3), Presque Isle (1), Roscommon (1)

Elk Survey (on-going):

- 1,277 elk have been tested from May 1996 to present
- One elk from Montmorency County tested positive for bovine TB in 2000
- One elk from Montmorency County tested positive for bovine TB in 2001
- One elk from Presque Isle County tested positive for bovine TB in 2003
- 134 elk submitted in 2002- all tested negative
- 100 elk submitted in 2003

Moose Survey (on-going):

- 9 moose submitted in 2003 – all negative

Wild carnivore (non-cervid) survey

From February 1996 to the present, 1,513 carnivores, representing 16 animal species, have been tested. Tested animals came mainly from the five-county area. Of the animals tested, 42 tested positive for bovine TB.

SPECIES TESTED	# POSITIVE* FOR BOVINE TB
Badger	0
Black bear	7
Bobcat	4
Cat, Feral	0
Coyote	18
Dog, Feral	0
Fox, gray	0
Fox, red	3
Hare, Snowshoe	0
Mink	0
Opossum	2
Otter	0
Porcupine	0
Raccoon	8
Skunk	0
Weasel	0

DNR employees prepare deer heads for autopsy

4B WILDLIFE SURVEILLANCE

4B1 EXAMINATION OF HUNTER HARVESTED DEER

Wildlife personnel with the MDNR have been examining harvested deer submitted by hunters for over 50 years. This has been an important source of biological data on the status and health of the deer herd. With the discovery of bovine TB in wild deer, a disease surveillance and monitoring program was necessary. The voluntary check of deer by hunters has facilitated this effort. To date, over 123,249 deer samples have been examined or collected and tested for the presence of bovine TB.

Field check stations – Examination of harvested deer

- Located throughout the state, mostly at MDNR offices. During firearm deer season in November there are additional check stations on southbound lanes of major highways, at the Mackinac Bridge, and at other field locations.
- Deer information recorded
  - Date and location of kill recorded, hunter identification
  - Age (determined by examination of teeth); Antlers measured in bucks; lactation noted in does
  - Presence of disease noted and the chest cavity is examined for lesions
- Hunters are asked if they want to submit heads for bovine TB testing

Field check stations – Collection of deer heads

- Check station personnel will remove the antlers and attach a TB tag that includes the hunter's name, address, phone number, and the date and location of kill.
- The hunter receives the tear-off portion on the TB tag with an identification number.
- The hunter will be contacted after the test results are completed.
- Collected deer heads are bagged and brought to MSU's deer head testing facility. Trucks deliver loads of heads throughout the year, but during the peak time, from mid-November to mid-December, several truckloads arrive daily. The most heads received in one day was over 2,800.

Examination of deer heads at MDNR Deer Head Facility

- All personnel in the room wear proper masks, respirators, gloves, coveralls, and boots
- Heads are unloaded and removed from bags.
- Teeth are again examined to verify age; sex is verified
- The numbered tag is clipped from the head, put into a disinfectant bath, rinsed and dried. Tag are entered into the database.
- After the tag is clipped, an identical number remains with the deer head.
- All table surfaces and floors are disinfected with a tuberculocide.
- Heads are put back in bags and delivered to MSU's Diagnostic Center for Population & Animal Health (DCPAH) for examination.

MSU DCPAH – Examination of deer heads

- All personnel in the room wear proper masks, respirators, gloves, coveralls, and boots.
- Heads are unloaded and taken to necropsy on carts designated for TB suspects.
- Heads are examined by trained necropsy personnel from MSU, USDA and MDNR, under the supervision of board certified veterinary pathologists.
    - Each head is examined visually for obvious abnormalities.
    - Three pairs of lymph nodes are examined.
        - Heads with no lesions in these lymph nodes are discarded for incineration.
        - Lymph nodes from heads with visible gross lesions undergo further histological and bacterial testing.
- All surfaces are thoroughly cleaned with a disinfectant designed to kill the TB bacteria.
- Histological sections are prepared on slides with routine stains and stains that specifically highlight the bacteria that causes bovine TB.
- Slides are read by veterinary pathologists.
- Pathology reports are sent directly from MSU DCPAH to MDNR's Rose Lake Wildlife Disease Laboratory via the Internet.

MDCH – Culture of tissues

- Tissues for culture are sent from MSU to MDCH accompanied by a test request form indicating type of tissue, the animal's identification number, and the county of origin.
- Part of the tissue is prepared for culture and part for microscopic examination for acid-fast bacilli.
- The presence of acid-fast bacilli is presumptive evidence of bovine TB and these results are faxed to MSU DCPAH, MDNR and USDA.
- Bovine TB is a slow growing organism and can take up to two months to grow in culture.
- Any bacterial growth is subject to further genetic, biochemical, and DNA testing.

Other species

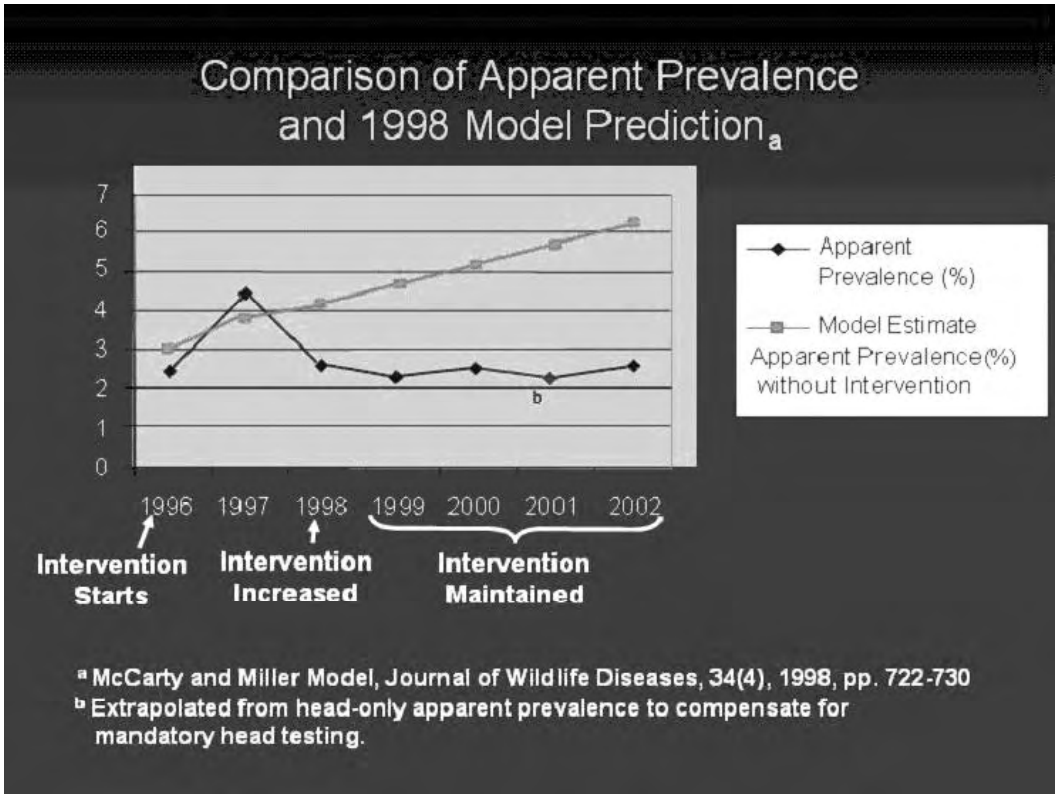
- Elk - there is a mandatory check for all hunter harvested and road-killed elk. Every elk head is submitted for TB testing and follows the same procedures as the deer heads.
- Carnivores and omnivores - the same lymph nodes, along with the lymph nodes throughout the body are examined. All tissues from the carnivores/omnivores, are examined histologically and are cultured regardless of whether or not anything is found on gross examination.

Communication

- Laboratory results are mailed to hunters (postcards) and are available on the Internet.
- Letters are sent to hunters whose deer or elk have suspicious looking lymph nodes explaining that further testing is required.
- The testing protocol is designed to provide rapid and accurate interagency communication of results.
- Location of tested and test-positive deer is displayed in maps that are handed out at meetings and to the public. The TB-related maps include the positive deer map, carnivores tested map, and the all-positive animals map.
- Hunters may check their test results by logging on to: http://www.michigan.gov/bovinetb/

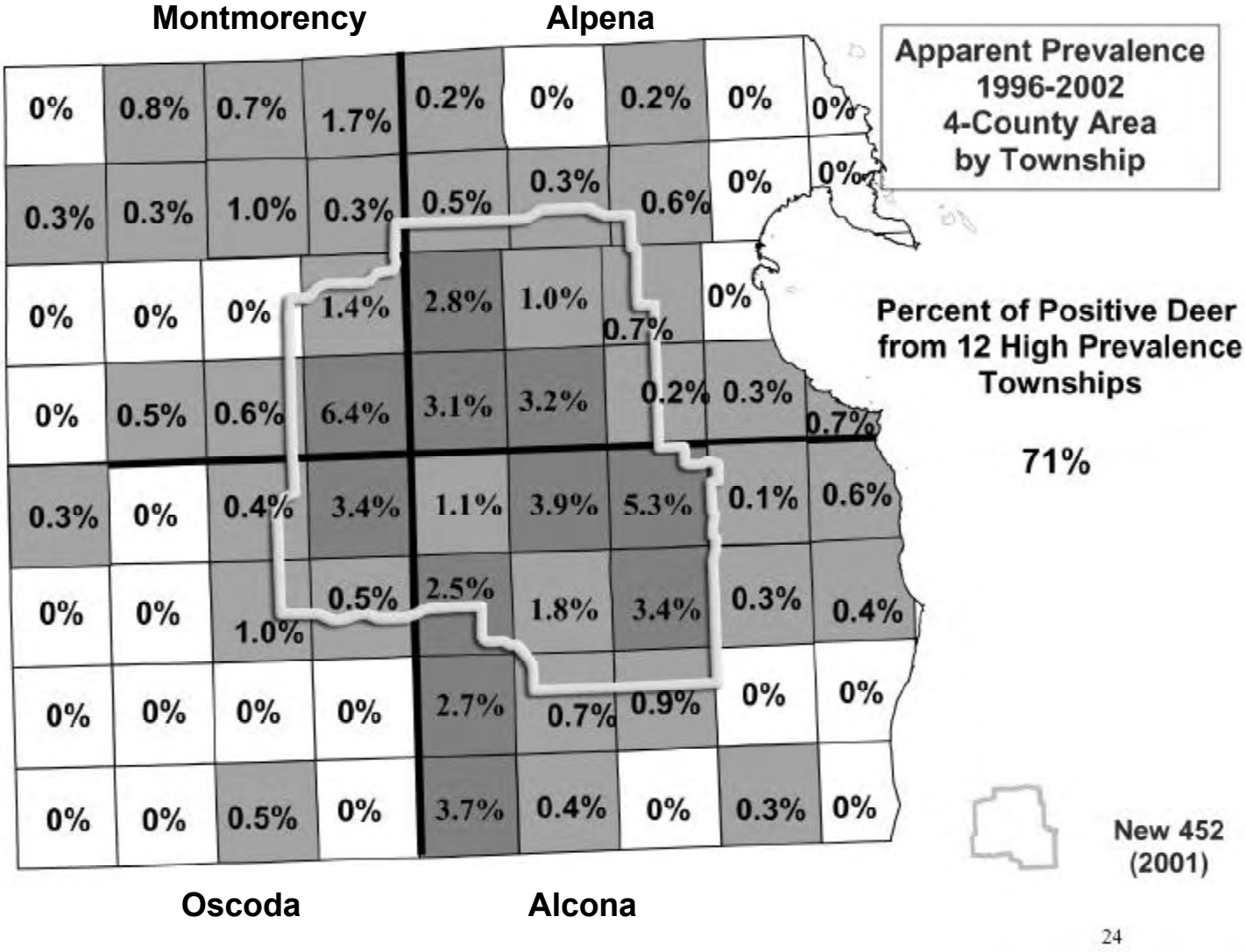
4B2 APPARENT TB PREVALENCE IN WHITE-TAILED DEER IN DMU 452

In 2001, the MDNR Wildlife Division came to the realization that in order to adequately assess the prevalence of disease in the TB endemic area, the DMU 452 boundaries should be moved to the east to include the eastern borders of several townships where TB was found. This changed historically documented percentage rates of disease. What was previously published as 2.3 percent in 2000, changed to 2.6 percent. In 2001, the prevalence rate was reported as 2.3 percent and recently, the harvest numbers indicated a slight, statistically insignificant increase in 2002 to 2.8 percent. What do all these numbers tell us? In 1998, a model prediction of disease prevalence in Michigan's white-tailed deer herd was published in the Journal of Wildlife Diseases. The model predicted the estimated apparent prevalence of disease in the deer herd, without intervention, to be as high as 6.2 percent. Today, with maintained intervention (ban on baiting and feeding and increased antlerless harvest) the overall prevalence of bovine TB in DMU 452 is at the fairly low level of 2.8 percent.



4B3 HOT TOWNSHIPS - RESULTS OF THE 2002 DNR BOVINE TB SURVEILLANCE IN DEER

The following map shows the results of a compilation of bovine TB deer surveillance numbers from 1996 through 2002. The highest percentage of disease comes from 12 townships where the four corners of Alcona, Alpena, Montmorency and Oscoda counties meet. Almost 40 percent of the TB positive deer have been found in Alcona County. Historically, a high percentage of TB reactor cattle came from Alcona. Since 1996, Alpena County has harbored a little over 25 percent of the disease, where Montmorency holds close to 22 percent of the TB positive deer. Oscoda hunters have harvested 36 TB positive deer from that county, which indicates that only 8.05 percent of Michigan's TB positive deer came from Oscoda County.



4C Based on disease surveillance and herd monitoring, the DNR established the following antlerless quotas for Northeast Lower Michigan.

Department of Natural Resources - Wildlife Division

2003 Antlerless Deer Hunting Quotas for: Northeastern Management Unit

DMU:	DMU Name:	Sq. mi. w/o water	Public Land	Private Land:	Total:	Late Antlerless:	Estimated Antlerless Harvest:
1	Alcona County	472.20	3,500	5,000	8,500	Open	2,000
4	Alpena County	392.68	2,000	4,500	6,500	Open	1,500
5	Antrim County	524.60	200	4,000	4,200	Closed	1,400
15	Charlevoix County	388.91	200	2,800	3,000	Closed	1,400
16	Cheboygan County	795.60	300	1,000	1,300	Closed	900
20	Crawford County	562.99	3,000	3,000	6,000	Open	1,800
24	Emmet County	482.89	300	2,000	2,300	Closed	900
35	Iosco County	499.22	1,400	6,000	7,400	Closed	2,600
60	Montmorency County	486.72	2,500	5,500	8,000	Open	1,400
65	Ogemaw County	574.65	1,100	9,000	10,100	Closed	3,000
68	Oscoda County	499.36	3,300	3,000	6,300	Open	1,800
69	Otsego County	525.91	400	1,100	1,500	Open	900
71	Presque Isle County	684.35	1,000	4,000	5,000	Open	2,000
72	Roscommon County	579.52	2,500	3,500	6,000	Closed	2,100
115	Beaver Island	64.62	400	500	900	Closed	200
135	Tawas Unit	66.86	200	600	800	Closed	200
452	Core Area	571.49	600	7,500	8,100	Open	2,300
	Total:	**8,172.57**	**22,900**	**63,000**	**85,900**		**26,400**

4D MDNR ENFORCEMENT ACTIVITIES

During the 2003 harvest, there were 470 baiting violations with enforcement officers issuing a total of 544 tickets. Hunters received 414 warnings and MDNR referred one violation to MDA. Prior to the season, eight public presentations regarding the baiting regulations were made. The MDNR conducted 22 flyovers during the season as well to visuallysurvey the area to determine if the baiting restrictions were being followed.

4E WILDLIFE BOVINE TB ERADICATION STRATEGY

BovineTB is difficult to prevent or treat in wild deer. There is no effective vaccine for disease prevention and no effective medication for treatment. The goal of the bovine TB eradication effort is to eradicate bovine TB in Michigan. The wildlife strategy consists of deer management actions, research, and wildlife disease surveys. Deer management actions (ban on feeding and increased deer harvest) are used to eliminate bovine TB in wildlife, while wildlife disease surveys are used to monitor the apparent prevalence of bovine TB and the geographical spread of the disease.

DEER MANAGEMENT ACTIONS

Baiting Deer and Feeding Deer or Elk - "Baiting" is defined as putting out food materials for deer to attract, lure, or entice them as an aid in hunting. "Feeding" is defined as placing food materials out that attract deer or elk for any other reason, such as recreational viewing.

2003 FEEDING AND BAITING REGULATIONS

In Alcona, Alpena, Crawford, Montmorency, Oscoda, Otsego, and Presque Isle counties:
- All deer baiting is prohibited.
- All deer and elk feeding is prohibited.

In the remainder of the state:

The volume of bait scattered on the ground cannot exceed two (2) gallons at any one hunting site at any time, statewide.

Baiting can occur only from October 1 to January 1.

The bait material may be of any food type.

The bait must be dispersed over a minimum of a 10-foot by 10-foot area. The bait can be scattered directly on the ground by any means, including mechanical spin-cast feeders, provided that the spin-cast feeder does not distribute on the ground more than the maximum volume allowed.

FOR RECREATIONAL VIEWING

All feeding is prohibited in Alcona, Alpena, Crawford, Montmorency, Oscoda, Otsego, and Presque Isle counties.

In the remainder of the state for Recreational Viewing:

The volume of feed on the ground cannot exceed two (2) gallons per residence at any time, statewide.

The feed must be placed within 100 yards of a residence, on land owned or possessed by that person.
The feed must be scattered or dispersed directly on the ground at least 100 yards from any area accessible to cattle, goats, sheep, new world camelids, bison, swine, horses, or privately owned cervidae and no more than 100 yards from a residence.

Any type of food materials can be used.

SUPPLEMENTAL FEEDING is prohibited statewide in Michigan.

Special Deer Hunting Regulations: The harvest strategy is intended to reduce deer numbers in infected counties to a level that can be supported by the natural environment. A second goal is to reduce the average age of deer in the population. Older deer are more likely to be infected with advanced cases of bovine TB, therefore being at risk of transmitting the disease to other deer. In counties where infected deer had been found, the prices of antlerless deer licenses were discounted to help achieve a better antlerless harvest. There were early and late firearm seasons in these counties.

These additional hunting seasons and permits have resulted in an increase in the antlerless deer harvest, and in a decrease in the population.

Estimated Population* of Deer in
Alpena, Alcona, Montmorency, Oscoda, and Presque Isle Counties

Year	TOTAL
1995	161,000
1996	144,000
1997	135,000
1998	133,000
1999	97,000
2000	105,000
2001	99,000
2002	95,000

**From MDNR Sex-Age-Kill Estimated Population, Brent Rudolph and Rod Clute*

By stopping year-round feeding, deer will spread out, and not crowd together at feeding sites. Reducing the overall population in TB-infected counties will decrease deer densities. The combination of these management strategies should reduce the risk of transmitting bovine TB between deer. When transmission is decreased to a point whereby more deer infected with bovine TB die each year than new ones that become infected, the prevalence rate (percent of infected deer) will begin to decline. Over a period of years, the disease will be eliminated from Michigan's wild deer herd and other species of wildlife.

5 Michigan Department of Community Health

SUMMARY OF BOVINE TB WORK

Bovine TB is a bacterial infection that can and has affected humans. MDCH is responsible for the current departmental activities regarding the eradication effort. The importance of eradicating bovine TB is recognized and the objectivity of the department, when it comes to facilitating the development of regulations to control transmission of the disease, remains a high priority.

5A TUBERCULOSIS LABORATORY REPORT

The MDCH TB/Mycology Laboratory provides services to identify, culture, and isolate mycobacterial organisms. The laboratory uses a variety of laboratory techniques including slide examination for acid fast bacilli, culture, isolation, genetic probes, and RFLP – DNA fingerprinting to specifically identify organisms from a wide variety of mammalian species, including humans.

Approximately 300 new cases of TB are diagnosed in Michigan annually. The vast majority of these cases are not caused by the organism that causes bovine TB (*Mycobacterium bovis*), but rather by *Mycobacterium tuberculosis.* The ability of MDCH TB Laboratory to quickly and accurately diagnose TB infection, and specifically identify the type of TB is important not only for patient care and the public health, but also in the efforts to eradicate bovine TB.

The table below shows the number of human TB cases caused by *Mycobacterium tuberculosis* from 1997 to 2002 and the number of human cases caused by *Mycobacterium bovis,* bovine TB, during the same time period. Only the 2002 human case was related to the unique bovine TB strain endemic to Northeast Lower Michigan.

Year	Human TB cases	Human cases caused by bovine TB
1997	373	3
1998	385	2
1999	351	0
2000	287	1
2001	330	0
2002	315	1

The TB/Mycology Laboratory has over 25 years of experience in testing a variety of animals for mycobacterial disease, including deer, elk, cattle, raccoons, opossums, cats, dogs, coyotes, fox, bear, bobcat, badger, elephant, black rhino, chimpanzee, reindeer, otter, camel, turkey, rabbit, capybara, skunk, mink and fish. The laboratory has also provided testing services for collaborative research projects with MDCH, USDA, MSU, MDNR, and MDA.

5B HUMAN TUBERCULIN SKIN TESTING

MDCH recommends tuberculin skin testing (TST) for all individuals living, working, or exposed to herds infected with bovine TB. The department recently received and has provided information to local health departments regarding individuals associated with the past nine cattle production operations. Individuals are being encouraged to have TST conducted at their local health department.

TB positive farms through 6/28/02	25
# of individuals identified	41
# tested	30
# refusing testing	11
# with negative TST	28
# with positive TST	2

A positive skin test does not mean that a person has TB, only that the individual has been exposed to the bacterium. Individuals with a positive response to the TST, are further evaluated to rule out active TB disease.

5C BOVINE TB ERADICATION COORDINATOR OFFICE

MDCH funds the position of Bovine TB Eradication Coordinator and provides operating expenses and housing for the Bovine TB Eradication Project office. The TB eradication coordinator promotes changes in agricultural and deer management practices that will reduce the risk of livestock and wild deer transmitting infection.

Coordinated TB conferences and workshops have led to the development of additional strategies to target TB positive deer, thus retaining the value of the healthy animals and continuous economic investment in the region. Additionally, workshops have helped garner awareness and support from livestock producers. As a result, producers have started looking toward strategic production and marketing practices that may eventually lead to the stabilization of cattle production in the area.

Presentations and updates in Northeast Lower Michigan are ongoing. The TB Eradication Project office is a clearing-house for information available to hunters, farmers and the lay public regarding bovine TB strategies implemented to eradicate the disease.

State and federal staff and research agencies develop and implement monitoring and reporting systems to evaluate the impact and effectiveness of the TB eradication project and this information is disseminated to media representatives and other interested parties. Press releases, brochures, radio public service announcements, activities reports, the Web site and newsletters combine to inform the public. Coordinated satellite conferences and television shows have also been used to disseminate information.

Promoting changes in management practices:

There are livestock stakeholder meetings held in Atlanta, Lansing, and other locations across Michigan where TB issues are discussed and policy changes are introduced.

Meetings with scientists regularly take place; meetings with the division directors of wildlife and animal industry take place once a month, discussions with USDA Wildlife Services and Veterinary Services occur weekly, as do discussions with legislative and policy staff in each department. Continuous updates go to the public information officers in MDA, MDNR and MDCH.

When there is a TB positive farm, DNR is notified so that the field biologist will be ready to provide disease control permits to the producer; USDA WS is notified so that they may offer to remove vermin (for research purposes); MSU is notified and a graduate student makes arrangements to take environmental samples; and MDCH is notified so that the family is contacted and offered TB skin tests.

Discussions regarding the resurgence of round-table meetings with hunt club owners in the TB endemic area are taking place. The MDNR, with MSU and USDA WS, is implementing a pilot project to target TB positive deer at the invitation of property owners.

A 30-minute radio interview, hosted by Michigan Farm Radio and the Sunrise Side Travel and Tourism Association, took place with scientists regarding hot townships and MSU research pertaining to the TB clustering factor and the genetic relatedness of deer. A 30-minute radio show regarding the TB project in general also aired.

The 2003 Scientific Conference took place in March. The meeting was a gathering of state, federal and university partners that work on bovine TB research. Several policy changes are being developed as a result of material that was presented.

Information Dissemination:

- The biannual *Bovine TB Update* newsletter went to 3,000 producers and hunters in Northeast Lower Michigan in the spring and fall of 2003.
- Posting of TB updates and press releases can be found on the bovine TB Web site, **www.michigan.gov/bovinetb**
- Posters on the TB Zones were distributed to saleyards and auctions.
- The farmers' testing guide was recently updated and a Split State Status brochure is in the production process.
- MDNR continuously updates maps.
- Spreadsheets regarding livestock and wildlife testing numbers are updated by the departments and made available.
- The *On Farm Reference Guide* is complete.
    - Approximately 300 binders will be distributed to interested producers, MSU Extension Agents, MDA, USDA and industry representatives.
- For the *2nd Wednesday Scientific Workshop* meeting a 3-1/2 inch three-ring binder, containing published research articles on TB in Michigan, Activities Reports, Issues Papers and reports to the departments (compiled by MSU and MDNR and based on constituent and stakeholder participation) was provided.
- *2003 Bovine TB Activities Report*.

Many newsprint and radio interviews took place in 2003 regarding the overall project, TB positive farms identified earlier in the year, the 2.8 percent prevalence rate in the deer herd, the potential high risk area designation north of Gaylord, the Antrim County TB positive cow, MDNR's plans to conduct the pilot project to target TB positive deer, and the 2003 TB testing deadline for livestock producers.

USDA WS is piloting a free fencing program for producers to mitigate the risk of bovine TB being transmitted between deer and cattle over feed. The TB project arranged for a field day on a participating farm to provide the media with a first hand look at the fencing. Statewide coverage of the program led to 22 farms signing up for fencing.

Monitoring and reporting systems that evaluate the impact and effectiveness of the TB eradication project

- The *Dynamics of Bovine TB in Wild White-tailed Deer in Michigan* report indicates that, with continued intervention and population reduction of the deer population, bovine TB should be down to an undetectable level in white-tailed deer by 2012. This should enable Michigan to move from $2 million a year in deer surveillance to other wildlife surveillance.
- *Communications* – MSU social scientists conducted a telephone survey to determine the level of bovine TB knowledge in the general public. Over 80 percent of the people surveyed knew about bovine TB in Michigan, and 88 percent felt that it was a low or moderate risk. Eighty-two percent of the respondents thought the state should compensate farmers, and 76 percent thought that the farmers and the state were responsible for preventing cattle from acquiring bovine TB.
- *MSU Travel & Tourism Survey* – The *Impact of Bovine TB on Tourism in Michigan* telephone and rest-stop survey revealed that 92 percent of the respondents said that bovine TB had not changed their travel behaviors.
- *MDCH Hunter Health Survey* – The preliminary results of this survey indicated that even though 95 percent of the hunters in Michigan eat venison, only 55 percent cook it thoroughly. The recommendations from this report are to continue to send the public health message that encourages glove use while field dressing deer and to thoroughly cook all venison products. MDNR continues to put these messages in the Hunting and Trapping guide. The project office continues to produce the *Bovine TB in Michigan* brochure as well.
- *MDNR Deer Baiting in NE Lower Michigan Pilot Project* – The MDNR sent out over 7,000 questionnaires and received a 77 percent response rate. About 4,500 hunters used bait in DMU 452 (it was legal only for this pilot project) and harvested over 2,300 deer. The survey concluded that baiting increased hunter success during the archery season, but the difference with non-baiters during the regular firearm season was negligible. Archers avoided hunting in this area because of the baiting ban.
- *MDNR Antlerless Survey* – About 31 percent of the former license buyers indicated they would have been more likely to purchase a license if baiting had been allowed.
- *Michigan Deer Harvest Survey Report* - for the 2002 Season – indicated that the number of hunters in the Northeast Lower Peninsula in 2002 was down by 4.8. The number of hunters taking advantage of the early antlerless harvest was down by 17.6 percent and 9.5 percent of the past archery hunters did not hunt in Northeast Lower Peninsula last year. These are significant changes. The ban on baiting is seen as a contributing factor; however, the deer population in the five-county area is also down to 95,000.

Project partners continue to hold monthly interagency, stakeholder advisory and public meetings wherever and whenever needed.

Additional liaison responsibilities with MSU Extension, MSU researchers in the areas of veterinary medicine, wildlife and natural resources, and the social sciences have developed. USDA WS and USDA Veterinary Services (VS) are also integral partners in the project bringing with them funding, research and services.

6 United States Department of Agriculture

6A USDA COMPREHENSIVE TB STRATEGY

The overall goal of USDA is to eradicate bovine TB from the U.S. This will be accomplished by eliminating bovine TB from the rest of the country (by depopulating existing TB infected herds) and by a comprehensive strategy within the state of Michigan. This collaborative strategy includes:

- Determining if additional cattle or goat herds in Michigan are infected with bovine TB by completing at least one whole herd TB test of every herd within the state.
- Ascertaining whether any additional cattle or goat herds in the bovine TB endemic area have become TB infected by:
    - yearly testing of the herds in the TB endemic area
    - testing of individual animals prior to movement
    - testing herds which were sources of livestock to a TB infected farm
    - testing herds which received animals from a TB infected farm
- Monitoring the geographic area where TB is found in wild deer by assisting with wild deer TB surveys.
- Monitoring the trend in disease prevalence in wildlife in the TB endemic area of Michigan.

6B 2003 ANNUAL UPDATE OF USDA VETERINARY SERVICES ACTVITIES

To accomplish the goal of eradicating bovine TB from Michigan, USDA VS is helping MDA maintain sufficient veterinary and technical staff and provide appropriate equipment for staff to safely test cattle, while maintaining adequate resources, implementing new programs, and participating in bovine TB research. Listed below are the 2003 USDA activities that are part of the bovine TB eradication effort.

- Maintaining sufficient staff to continue the testing and surveillance missions of the USDA
    - Currently 12 Veterinary Medical Officers (VMOs) and 24 Animal Health Technicians (AHTs) are fully devoted to TB duties.
    - Preparing to announce several Animal Health Technician vacancies, as well as two Veterinary Medical Officer vacancies.

- Trucks, chutes, and portable gate trailers have been ordered with a large order recently received.

- Maintaining adequate resources in terms of personnel and equipment in light of state budgetary limitations.

- Integration of state and federal databases to provide the most current and accurate animal, premises, and testing information possible.
    - Federal employees enter individual animal data into the database and work to ensure the accuracy of TB-related data that is transferred among different databases.
    - Data is used to complete reports required to maintain USDA-designated TB program status as well as effectively manage the program.
- Maintain the testing and surveillance for TB in livestock as well as privately owned and free-ranging cervids in conjunction with epidemiological tracing into and out of TB infected herds.
    - A total of 232 trace investigations were conducted during the past year.
    - USDA personnel continue to assist with the processing of hunter-submitted deer samples for TB surveillance.
- Monitor and review herd records for TB accredited-free herds located in Michigan.
    - Currently 88 herds are federally accredited.
    - An additional 317 herds have requested accredited status and are currently being reviewed.

- Implement the Gamma Interferon test in Michigan. This test will be used as a replacement for the Comparative Cervical Test (CCT).
    - Approximately 3,000 samples have been tested by the MSU DCPAH, in order to help validate this test.
    - Steps are currently being taken to initiate the use of this test (e.g., design of a laboratory submission form, protocol being developed for collecting and shipping samples taken) during the coming year.
- Construction of a simulation model for TB for use as a tool for estimating the risk of TB-positive cattle moving out of the endemic area and into the disease-free area.
    - Will provide a quantitative tool for assessing the effects of different surveillance methods and strategies.
    - Can be used to help plan future testing needs and possible outcomes of different intervention methods and strategies.

6C TB HERD ACCREDITATION PROGRAM

TB Herd Accreditation is a voluntary USDA program. Cattle, bison, and goat producers who choose to participate in the program must meet strict testing, movement, and record requirements. These requirements are significantly more rigorous than the current state movement requirements for these species.

The goal of TB Herd Accreditation is to create a trusted marketing tool in which other states and countries feel confident that TB Accredited Herds have been held to the highest standard. Pursuant to this goal, USDA/APHIS/VS in Michigan has interpreted the *Uniform Methods and Rules* (UM&R) in the most stringent fashion and aggressively requires compliance necessary to obtain and maintain the status of an "accredited tuberculosis-free herd".

Herd Accreditation for cattle includes annual whole herd testing for bovine TB of all animals over 24 months of age and testing of any animal other than natural additions less than 24 months of age. Herds are not accredited until they pass at least two whole herd tests with no evidence of bovine TB. Purchased animals require additional testing and quarantine, depending on the state of origin. In addition, any animal that leaves the premises and comes within 30 feet of another bovine animal (e.g., at shows, exhibits, bull tests, etc) requires additional testing and quarantine.

Producers who spend the time and money to become accredited do so with the expectation that other states will recognize the considerable effort made toward assuring that accredited herds in Michigan have been carefully, stringently, and closely monitored and evaluated to assure that they are in full compliance with the letter and intent of the UM&R.

This includes not only identification and trace back of all animals listed on the test chart, validation of all registration numbers in registered animals and strict follow-up on all additions or movements, but also farm visits to assure that animals are appropriately identified and quarantine facilities are available and adequate. Although some states do not currently recognize Michigan's accredited herds, it is likely that with strict enforcement and split state status, this will change. In addition, the only way Michigan cattle can move to Canada is if they come from an "accredited tuberculosis-free herd". The potential marketing advantages to producers who participate in this voluntary program are substantial.

Prior to 1997, there were less than 10 herds in the state participating in the TB Herd Accreditation Program. Currently, there are 88 herds in 43 Michigan counties that have attained the status of "accredited tuberculosis-free herd". Of the 88 herds, 63 are cattle herds and 25 are goat herds. Of the cattle herds, there are 13 dairy herds, 49 beef herds, and one bison herd. One of the accredited beef herds also has an accredited goat herd.

Eaton County has the most accredited herds (10), followed by Ingham (7), Presque Isle (5), and Jackson (4). The following table lists the 88 accredited cattle and goat herds by county.

County	Cattle	Goats		County	Cattle	Goats
Alcona	1			Lenawee	1	2
Allegan	2	1		Livingston		1
Alpena	2			Macomb	1	
Barry	1			Menominee	1	
Berrien	1	2		Monroe		2
Branch	1	1		Montcalm	1	
Calhoun		1		Montmorency	2	
Cass	1	1		Oakland	1	
Cheboygan	1			Ogemaw	1	
Clare	2			Osceola	3	
Clinton	1			Otsego	1	
Eaton	9	1		Ottawa	1	2
Emmet	1			Presque Isle	5	
Genesee		1		Saginaw	1	
Gratiot	1	1		Sanilac	2	
Ingham	6	1		Shiawassee	1	2
Ionia	1			St. Clair		1
Isabella	1			St. Joseph	3	
Jackson	3	1		Tuscola		2
Kent	1			Van Buren	2	1
Lapeer		1				

Producers, particularly seed stock producers, are beginning to recognize the value of accreditation and are taking the necessary steps to have their herd become an "accredited tuberculosis-free herd". Currently there are approximately 317 herds pending accreditation, suggesting that even with strict requirements producers see the value in this voluntary USDA Program.

USDA VS goes to great lengths to assure that private veterinary practitioners and producers are informed of requirements, regulations, and conditions necessary to participate in this voluntary program.

6D USDA WILDLIFE SERVICES IN MICHIGAN

USDA WS provides federal leadership and expertise to resolve conflicts between humans and wildlife. With incidents of wildlife damage on the rise, WS knowledge and skills are increasingly in demand. WS was the entity that helped successfully depopulate the TB positive privately owned cervid facility in Presque Isle County in 1998.

Research by the USDA National Animal Disease Center has demonstrated that deer can transmit TB to one another and to cattle through indirect contact and contaminated feed. Reports suggest improved fencing and feed storage practices could accelerate progress in preventing transmission of TB. As a result, in 2002, WS initiated a pilot project that provides fencing to producers in TB positive counties to exclude deer from stored feed (e.g., hay bales and silage bags). The goal of the pilot project is to develop fencing designs that are both effective and practical in reducing the risk of spread of TB onto farms by infected deer.

Producers are offered either woven wire or electric fencing in a design that suits their particular operation. To date, fences have been constructed on 14 farms with eight more farms scheduled for installation. Five of these farms have had TB positive livestock in the past. WS pays for materials and labor while the producer is responsible for maintenance. The average cost of a fence is approximately $6,500. WS makes monthly site visits to each fence site to document fence performance. So far, the fences have successfully excluded deer and have been generally suitable to farm operations.

Livestock guardian dog with young steer

WS continues to offer assistance to landowners to remove deer under MDNR disease control permits. Heads from harvested deer are submitted to the DNR for TB testing and the meat is donated to charity. Since FY 02, 67 deer have been removed from eight different farms. To date, none of these deer have tested positive.

WS is also conducting investigations of TB positive farms to determine if wildlife patterns and management practices might contribute to transmission. Fourteen of the most recent TB positive farms are included in this effort. Each farm investigation begins with an interview with the landowner and a field survey of the property. After the interview, the property is surveyed monthly for wildlife activity. This information will be summarized and presented to the landowner to help reduce potential risks from wildlife. It is also made available to project partners for analysis.

WS continues to assist the National Wildlife Research Center (NWRC) with wildlife research studies in Northeast Lower Michigan. These studies include:

- Coyotes as a sentinel species: This study explores the feasibility of coyotes serving as an indicator of TB in wildlife. If successful, it may be proposed that coyotes supplement TB surveillance.

Status – Preliminary results from the coyote study have identified approximate home range sizes. VHF Radio-transmitters have been installed on 44 coyotes and GPS receivers placed on 10 coyotes. Average home range size of coyotes is sufficiently small to make them useful sentinels for TB. Now Phase II of the study will determine the relationship of TB prevalence in deer with that in coyotes.

- Wildlife/cattle interaction: This study investigates wildlife behavior in relationship to livestock to reveal potential transmission routes.

Status – The field observations have been completed. Very little direct interaction between deer and cattle was observed; however, there were large numbers of indirect interactions. There were significant observations of deer and turkeys at/or near stored feed.

- Small mammal surveillance study: Small mammals from TB positive farms and hunt clubs are collected and tested to determine the potential for transmission of TB.

Status – Approximately 850 specimens have been submitted to MSU for testing, of which approximately 700 have been completed. Of these, five raccoons, four opossums, and one gray fox have tested positive. Suspects undergoing further testing include two porcupines, one cottontail and one domestic rabbit. This will continue on future TB positive farms where permission from landowners is granted.

- Livestock guard dog study: This study examines the feasibility of specially trained guard dogs to reduce deer intrusions onto farms and thereby widen the barrier between livestock and deer.

Status - Phase one of the study has been completed, which involved testing the guard dogs on two captive cervid facilities with high densities of deer. The dogs were quite successful in warding off deer that were attempting to access feed near livestock. Phase two of the study consists of placing these dogs on livestock farms to test in a "real-world" situation. Three farms have been selected and have received dogs.

WS has collaborated with MSU and MDNR in the field aspects of several studies and participates in many TB related meetings with agency personnel and livestock producers. WS personnel also assist MDNR at deer check stations and in processing deer heads for testing.

6E USDA/APHIS WILDLIFE SERVICES

NATIONAL WILDLIFE DISEASE SURVEILLANCE AND EMERGENCY RESPONSE

It is now widely recognized that countries conducting disease surveillance in wildlife populations are more likely to understand the epidemiology of specific zoonotic diseases, and are better prepared to protect wildlife, domestic animals, and humans. Regular monitoring programs in wildlife are becoming an increasingly important part of national disease eradication.

Consequently, active surveillance for known diseases in wildlife (of economic or public health importance) is particularly beneficial to the national interest. The OIE (World Organization for Animal Health) encourages all countries to develop and maintain wildlife disease surveillance systems, that complement and support agricultural animal disease programs.

As part of its strategic plan, APHIS is focusing on strengthening emergency preparedness and response, and managing issues related to the health of U.S. animal resources and conflicts with wildlife. The strategies to accomplish these objectives include developing a more robust, nationally coordinated pest and disease surveillance system, which involves federal, state, academic, and private industry resources.

APHIS will also continue to enhance its current emergency response infrastructure by incorporating the Incident Command System (ICS) into animal health emergency response plans. Additionally, APHIS and its stakeholders have become increasingly aware of the need to manage and research wildlife diseases, particularly those that are transmissible to humans and domestic species.

Part of a national strategy for monitoring animal diseases and quickly responding to disease introductions must include a national surveillance for wildlife diseases. This surveillance program should have the capability to investigate events of mass morbidity and mortality and new disease syndromes; identify and categorize new pathogens, and monitor the status of known diseases within wildlife populations. A system that combines monitoring, surveillance and response allows for quick detection, containment, and eradication of wildlife diseases. The system is based on a strategic premise that safeguarding the health of animals, humans, plants, and ecosystems makes possible safe agricultural trade and reduces losses to U.S. agricultural and natural resources.

A monitoring system assesses the health and disease status of a given population through ongoing or repeated sampling. In the case of diseases such as rabies, West Nile virus, plague, and tularemia, a comprehensive monitoring system will provide animal and human health officials with data necessary to evaluate threats due to increases in prevalence and distribution, and to assist in evaluating the causes (e.g., natural epizootic vs. intentional release) of such changes. Monitoring will also aid in detecting the unintentional or intentional introduction on foreign animal diseases into wildlife populations.

A surveillance system is similar to a monitoring system in that sampling may be ongoing or repeated. However, a surveillance system implies that directed action will be taken if disease prevalence or incidence exceeds a predefined threshold. Bovine TB, brucellosis, and pseudorabies, are examples of diseases in wildlife that have surveillance programs with management strategies to either reduce or eliminate them in specific populations. Collectively, this program will provide information on the distribution, prevalence, and trends of diseases in populations, and predefined intervention strategies for managing diseases when an unacceptable level of risk to agriculture, wildlife, or human health and safety occurs.

An emergency response system (ERS) is designed to implement the disease management interventions in a rapid response mode in reaction to a foreign disease incursion or epizootic case of an endemic disease. Such a system requires dedicated personnel and equipment, training, and interagency communication and cooperation.

The goal of WS's involvement in disease monitoring, surveillance, and emergency response is to develop and implement a National Wildlife Disease program for the purpose of safeguarding American agriculture, human health and safety, and wildlife populations.

7 Michigan State University

7A NORTH COUNTRY BEEF HEIFER FEED-OUT TRIAL

Determining whether retaining ownership of cattle from birth to slaughter will increase profits for small beef producers is the goal of an organization of livestock producers in Michigan's Northeast Lower Peninsula. North Country Beef (NCB) producers and MSU Extension/MDA Livestock Disease Education Specialist John Molesworth, DVM, are participating in a retained ownership demonstration project.

NCB producers once had a viable market for the young, high quality beef animals that came off their farms. The diagnosis of bovine Tuberculosis (TB) in the wild deer population and subsequently in cattle herds has caused the beef industry in the Northeast Lower Peninsula to experience market loss.

Bovine TB is generally not a food safety concern, but a market access impediment. Inspection and processing of all meat offered for sale to consumers follows stringent food safety requirements that guard against a variety of organisms. The proper handling and cooking of beef reduces the health risks of TB and other pathogens to virtually zero.

However, because of the occurrence of bovine TB in this region, long established markets are no longer available and calves and breeding stock sales do not return fair market value to the producer.

Fourteen NCB cooperative members are conducting a custom feeding demonstration project with 130 calves, in partnership with MSU, to demonstrate to beef producers in Michigan, specifically in the Northeast region of Michigan's Lower Peninsula, that retained ownership, from birth to slaughter can be profitable.

This one-year pilot project establishes structures and protocols that will assure market access for NCB cooperative members. The final product, a business and marketing plan, will help achieve long-term sustainability of farms in the Northeast Lower Peninsula.

7B DIAGNOSTIC CENTER FOR POPULATION AND ANIMAL HEALTH
(formerly the Animal Health Diagnostic Laboratory)

In a continuing effort to ensure Michigan has state-of-the-art diagnostic and scientific capabilities and long-term capability to effectively handle animal and public health issues like bovine TB, the state allocated $58 million for the construction of a new animal health diagnostic facility - - the Diagnostic Center for Population and Animal Health, formerly known as the Animal Health Diagnostic Laboratory. This facility, housed on the campus of MSU, will help Michigan identify, track and eradicate diseases like bovine TB. It is slated to be completed in the spring of 2004.

8 Collaborative Research Activities

EDITOR'S NOTE: Past activities reports listed bovine TB research projects, but gave no conclusions. The following abstracts are findings from the past three years.

ENVIRONMENTAL AND FARM MANAGEMENT FACTORS ASSOCIATED WITH TB ON CATTLE FARMS IN NORTHEASTERN LOWER MICHIGAN.
KANEENE, JB; BRUNING-FANN, CS; GRANGER, L; MILLER, R; PORTER-SPALDING, B

An analysis of a survey sent to Northeast Lower Michigan farmers in conjunction with risk analyses of 17 TB positive farms has resulted in the identification of management factors that may be associated with decreased risk of TB on farms.

Decreased risk factors included the use of electrified and barbed wire fencing (deer exclusion factors) and a higher percent of open pastureland surrounding farms.

The farms with more intense cattle and human interaction (barns, feedlots, barnyards) where animals are managed and dealt with daily, also seemed to contribute to the deer exclusion factor.
The study was published in the Journal of the American Veterinary Medical Association: JAVMA 221(6):837-842

THE POTENTIAL ROLE OF PIGEONS IN THE LATERAL TRANSMISSION OF BOVINE TB
FITZGERALD, SD; ZWICK, LS; BERRY, DE; CHURCH, SC; KANEENE JB AND REED, WM

Pigeons may have a role in the transmission of bovine TB to mammals through contaminated droppings. Pigeons are known to eat the undigested seeds in cow manure. They also roost on the rafters of barns, often above where hay is stored. An experiment involving 18 pigeons was conducted at MSU to see if TB infected birds could indeed transmit disease through fecal material. Three out of 12 birds demonstrated fecal shedding of *M. bovis. "*Wholesale destruction of these birds is not necessary, but increased biosecurity measures, such as screening off openings in barns, better overhead coverage of feed bunkers, and trapping of excess pigeons may be prudent precautionary actions*,"* wrote Dr. Fitzgerald in the Journal of *Avian Diseases*, February 18, 2003.

THE ROLE OF EXTENSION IN BOVINE TB
GRIFFORE, R; PHENICE, L; WALKER, R; CAROLAN, M.

Eighteen County Extension Directors were interviewed by phone in Michigan's northern Extension region. In general, they were well informed about bovine TB and its impact on farming and Michigan's rural economy, and they were interested in receiving pertinent, up-to-date information. Communication was acknowledged as one of the key issues related to bovine TB. Some mentioned the need for better communication among Michigan government agencies and between these agencies and farm families. Extension can play a significant role in providing information to Michigan's farm families and to Michigan's policy makers. Both farmers and policy makers need information with which to make decisions. Members of farm families need effective social support. Extension can provide all these important elements.
The MSU Agricultural Experiment Station provides support for this ongoing research.

PUBLIC VIEWS REGARDING BOVINE TB: A STATEWIDE SURVEY

GRIFFORE, R; PHENICE, L.

A random sample of the Michigan population was interviewed for an MSU survey. The results of the survey indicate that almost 80 percent of Michigan residents had heard of bovine TB. About 88 percent of respondents considered bovine TB to be a low or moderate risk to public health in Michigan. Approximately 82 percent said that Michigan should compensate farmers partially or fully if their cattle must be destroyed due to bovine TB. Nearly 76 percent of respondents said that the farmer and the State of Michigan are both primarily responsible for preventing cattle from acquiring bovine TB from deer.

The MSU Agricultural Experiment Station provided support for this 2002 research.

PREVALENCE OF MYCOBACTERIUM BOVIS INFECTION IN CERVIDS ON PRIVATELY OWNED RANCHES

KANEENE, JB; VANDERKLOK, M; BRUNING-FANN, CS;PALMER, M; WHIPPLE, D; SCHMITT, S; MILLER, R

Data collected from the privately owned cervid testing and surveillance program conducted by MDA were reviewed to determine the prevalence of bovine TB in the 96 cervid ranches in Northeast Lower Michigan. These properties in the TB-affected area could easily be surrounded by the reservoir of bovine TB in the free-ranging white-tailed deer herd. All ranches in the five-county area where TB is endemic in the wild deer herd, as well as all ranches in the buffer zone bordered by M-55 to the south and I-75 to the west, were tested.

In the time that the TB testing and slaughter surveillance were conducted (1995-2000), 328 wild white-tailed deer from the area were infected with bovine TB. Only one deer ranch out of the 96 tested was infected with bovine TB. That particular ranch had purchased 108 wild free-ranging white-tailed deer from the State of Michigan when the property was fenced in 1992. Eight of the 21 deer found to be infected on this ranch did not have gross or obvious lesions.

These results were published by Palmer et. al (JAVMA 216(12):1921-1924, 6/15/2000)

Editor's Note:
One concern of the researchers is that the bacterium may be missed if only those deer heads, under the slaughter surveillance program, with obvious lesions in the lymph glands of the head are turned in for culturing. The cost of lab testing every deer head each year is prohibitive. For this reason, MDNR consistently publishes "apparent" prevalence rates from the surveillance data.

THE ECONOMIC IMPACT OF BOVINE TB ON THE TOURISM INDUSTRY IN NORTHEAST MICHIGAN

HOLECEK, D; BRISTOR, TF

The MSU Tourism Resource Center conducted three surveys, including: interviews of 900 travelers who stopped at the Clare, Dundee and New Buffalo Welcome Centers; a random telephone survey of 2,024 households from Michigan's prime travel market area in Michigan, Ontario, Ohio, Indiana, Illinois and Wisconsin; and a mail-in survey of 791 Lower Peninsula resident deer hunters.

The results of the surveys showed the distribution of the impact of bovine TB between hunters and non-hunters who visit Michigan. They found that awareness of bovine TB was low across the general population which included other states (telephone survey), but of those who were actually traveling in Michigan (welcome centers), nearly 27 percent knew about TB in Northeast Lower Michigan. Nearly all hunters are aware of bovine TB (hunter mail-in survey), but unless they think they are at risk, the majority of them are not likely to change their hunting behavior.

Survey estimates indicate approximately 45,000 hunters have chosen to hunt elsewhere in Michigan. The economic impact of bovine TB to the region was estimated to be $25 million annually. The same survey also points out that Northeast Lower Michigan receives $1.28 billion annually in tourism dollars.

The 2002/2003 study was sponsored by: Northeast Michigan Council of Governments (NEMCOG); Michigan's Sunrise Side Travel Association; MSU Travel, Tourism & Recreation Center; and USDA Rural Development.

EXPERIMENTAL AEROSOL INOCULATION OF MYCOBACTERIUM BOVIS IN NORTH AMERICAN OPOSSUMS (DIDELPHIS VIRGINIANA).

FITZGERALD, SD; ZWICK, LS; DIEGEL, KL; BERRY, DE; CHURCH, SV; SIKARSKIE, JG; KANEENE, JB; REED, WM.

MSU researchers evaluated the susceptibility of North American opossums to aerosol inoculation of bovine TB at two dose levels in order to gain information on disease pathogenesis, fecal shedding of the organism, and the potential role that opossums play in the spread of this disease in nature. Lungs were the most frequently infected tissues, with nine of 12 inoculated opossums positive for *M. bovis* on culture. Fecal shedding of *M. bovis* was uncommon at both inoculation doses. While opossums were highly susceptible to aerosol inoculation of *M. bovis*, they did not become emaciated or develop widely disseminated lesions. From this study, opossums may transmit TB by aerosol infection to other opossums in close contact and serve as a source of infection to carnivores that feed upon them, however, transmission of the disease to large herbivores by fecal shedding or direct contact may be less likely.

This was originally published in the Journal of Wildlife Diseases. 2003 Apr;39(2):418-23.

EPIDEMIOLOGIC INVESTIGATION OF MYCOBACTERIUM BOVIS IN A POPULATION OF CATS.

KANEENE JB, BRUNING-FANN CS, DUNN J, MULLANEY TP, BERRY D, MASSEY JP, THOEN CO, HALSTEAD S, SCHWARTZ K.

The objective was to determine whether cats exposed to a bovine TB positive cat at a private residence were infected, whether the tuberculin skin test can identify cats infected with *M. bovis*, and whether an ELISA could identify TB-infected cats.

Twenty potentially bovine TB exposed cats, including offspring, were administered a tuberculin skin test and monitored for 72 hours. Blood and fecal samples were collected. The cats were humanely euthanatized, and postmortem examinations were performed. Tissues were examined grossly and histologically for signs of mycobacteriosis. Pooled tissue samples and fecal samples were submitted for mycobacterial culture. Blood samples were examined for evidence of TB by use of a comparative ELISA.

Four cats had positive responses for the ELISA, and two cats had suspicious responses. All tuberculin skin tests yielded negative results. No gross or histologic lesions of TB were detected in any tissues, and mycobacteria were not isolated from tissues or feces obtained from the 20 cats.

All cats that had positive or suspicious responses for the ELISA were offspring of the cat with bovine TB. Evidence of TB was not seen in other cats at the residence, the owner, or the attending veterinarian. The most likely source of TB in the infected cat was through the consumption of *M. bovis*-infected wildlife carcasses or offal. Because *M. bovis* is endemic in wildlife in Northeast Lower Michigan, there is a risk of exposure to TB in companion animals, their owners, and attending veterinarians.

Article published in the American Journal of Veterinary Residency. 2002 Nov;63(11):1507-11.

EPIDEMIOLOGY OF MYCOBACTERIUM BOVIS IN FREE-RANGING WHITE-TAILED DEER, MICHIGAN, USA, 1995-2000.

O'Brien, DJ; Schmitt, SM; Fierke, JS; Hogle, SA; Winterstein, SR; Cooley, TM; Moritz, WE; Diegel, KL; Fitzgerald, SD; Berry, DE; Kaneene, JB.

An endemic area of bovine TB currently affecting wild white-tailed deer in Northeast Lower Michigan, constitutes the first self-sustaining outbreak of the infection in free-ranging North American cervids. Given this precedent, epidemiologic insights gained from the outbreak afford the opportunity to guide not only current surveillance and intervention but also control efforts for future outbreaks involving wildlife reservoirs.

Specific objectives were to evaluate retrospective data from field surveillance conducted from 1995 to 2000, to determine apparent prevalence, trends in apparent prevalence, and the effects of various factors on the odds of being M. bovis positive.

Data were gathered from post-mortem examinations of 62,560 wild deer collected from all 83 Michigan counties. Records of survey method, sex, age, geographic area and infection status as determined by mycobacterial culture were subjected to trend analysis and multivariable logistic regression.

Apparent prevalence for the period was 0.54 percent (336/62,560) statewide. Prevalence varied widely with geographic area, but significantly decreased since 1995 in the core area of the outbreak, which coincided with implementation of control strategies. Significant risk factors were geographic area, sex, age, and the sex-by-age interaction. The survey method by which deer were obtained for testing was not a predictor of infection.

Results to date suggest an outbreak characterized by broad areas of very low prevalence surrounding focal areas where prevalence is sometimes orders-of-magnitude higher (e.g., deer originating from the core area were up to 147 times more likely to be TB positive than deer from other areas). Results also identify older male deer as most likely to be *M. bovis* positive (OR=11.3, 95% CI 3.2, 40.3 for bucks > or =5 years vs. does < or =1.5 years), an observation consistent with the biology and behavior of the species.

Synthesizing these results with those of other ongoing investigations, the researchers hypothesize a two-stage model of disease transmission where TB is maintained at very low prevalence in matriarchal groups, with primary dissemination of the disease attributable to the dispersal and movements of bucks (as well as to the large aggregations of animals created by human activities).

Entire research paper appears in Preventative Veterinary Medicine. 2002 May 30;54(1):47-63.

BOVINE TUBERCULOSIS IN FREE-RANGING CARNIVORES FROM MICHIGAN.

Bruning-Fann, CS; Schmitt, SM; Fitzgerald, SD; Fierke, JS; Friedrich, PD; Kaneene, JB; Clarke, KA; Butler, KL; Payeur, JB; Whipple, DL; Cooley, TM; Miller, JM; Muzo, DP.

Bovine TB surveillance of carnivores and omnivores was conducted in Michigan from 1996 through 2000. Of the 294 animals examined, lymph nodes from six coyotes, two adult male raccoons, one adult male red fox and one 1.5-year-old male black bear were bovine TB positive. One adult male bobcat with histologic lesions suggestive of TB was negative on culture but positive for organisms belonging to the *Mycobacterium tuberculosis* complex when tested by polymerase chain reaction (PCR).

These free-ranging carnivores/omnivores probably became infected with *M. bovis* through consumption of tuberculous deer. Other species included in the survey were opossum, gray fox and badger; these were negative for *M. bovis*.

Full research paper published in the Journal of Wildlife Diseases. 2001 Jan;37(1):58-64.

MYCOBACTERIUM BOVIS EXPOSURE AS A RECREATIONAL RISK FOR HUNTERS: RESULTS OF A MICHIGAN HUNTER SURVEY

Wilkins, MJ; Bartlett, PC; Frawley, B; O'Brien, DJ; Miller, CE; Boulton, ML.

TB caused by *Mycobacterium bovis* (bovine TB) is endemic in the white-tailed deer population of northeastern Michigan. Hunters may be exposed to *M. bovis* via skin exposure while field dressing deer or by ingestion of undercooked venison. The most common health advice offered has been to wear gloves while field dressing deer and to cook venison products thoroughly.

Data were collected to quantify these self-protective activities and to characterize hunters practicing these activities. MDCH surveyed 1,833 hunters who had successfully harvested deer in or near Michigan's bovine TB endemic area. The survey response rate was 78 percent. Most hunters (89 percent) reported field-dressing deer; and 43 percent wore gloves. Most hunters (95 percent) reported eating venison, and 55 percent reported their venison was always cooked thoroughly.

Several hunter characteristics, including older age, female, higher awareness level, and area of residence, were significantly associated with the practice of these self-protective activities. The survey results suggest that hunters should receive consistent advice encouraging glove use while field dressing deer and the thorough cooking of venison products before consumption.

Originally published in the International Journal of Tuberculosis Lung Disease. 2003 Oct;7(10):1001-9.

EVALUATION OF THE INFLUENCE OF SUPPLEMENTAL FEEDING OF WHITE-TAILED DEER ON THE PREVALENCE OF BOVINE TUBERCULOSIS IN THE MICHIGAN WILD DEER POPULATION.

Miller, R; Kaneene, JB; Fitzgerald, SD; Schmitt, SM.

A retrospective study was conducted to test the hypothesis that supplemental feeding of white-tailed deer from 1995 to 1997 was associated with the prevalence of bovine TB in free-ranging deer in northeastern Michigan.

Bovine TB prevalence data were obtained from an ongoing surveillance program, while data relating to supplemental feeding and other risk factors were collected via in-person interviews. Of the 389 potential participants, 59 percent agreed to participate in the study. Results showed that supplemental feeding of deer was associated with bovine TB in white-tailed deer.

Specific risk factors associated with increasing risk for bovine TB were locating feed sites in areas with high levels of hardwood forests, other large-scale feeding sites in the area, the number of deer fed per year, the numbers of feed sites spreading grain, the quantity of grains provided at the site, and the quantity of fruits and vegetables provided.

Conversely, factors associated with decreasing risk of bovine TB were locating feed sites in areas with low levels of hardwood forests, and the percentage of sites providing grain in any form. In general, factors attracting deer to feeding locations were seen to increase TB risk. The results of this study suggest that banning the practice of supplemental feeding is a valid policy for control of bovine TB in free-ranging white-tailed deer.

Published in the Journal of Wildlife Diseases. 2003 Jan;39(1):84-95.

INDIRECT TRANSMISSION OF BOVINE TB: AN INVESTIGATION OF THE SURVIVAL OF MYCOBACTERIUM BOVIS IN THE ENVIRONMENT IN NORTHEAST LOWER MICHIGAN

Amanda E. Fine, VMD, Ph.D. Candidate, Department of Large Animal Clinical Sciences, College of Veterinary Medicine, Michigan State University

The long-term objective of this study is to understand the epidemiology of bovine TB in Northeast Lower Michigan and describe how the disease is being transmitted among and between white-tailed deer and cattle. The goal of this study is to

investigate the potential for the indirect transmission of bovine TB through contaminated environmental substrates. This will be done by collecting and testing environmental samples (feces, feed, soil and water) in bovine TB positive areas in Michigan including TB-affected cattle farms and areas with a high apparent prevalence of TB in wildlife within the five-county TB endemic area.

Progress To Date: The laboratory protocols for processing environmental samples in the laboratory have been established and are in the process of being validated. Ten TB-affected farms, in collaboration with MDA and USDA WS, have been identified and sampled. All of the samples have been processed to date. Four wildlife areas have been identified for sampling thus far and the collected samples have been processed. Results of bacterial culture are pending.

FALSE NEGATIVE STUDY

Only rarely are diagnostic tests of any kind completely accurate. Nearly all will incorrectly classify a small percentage of the samples tested as negative when, in reality, they were positive. Such results are termed "false negatives". Since 1995, over 123,000 wild deer and nearly 1300 elk in Michigan have been tested for bovine TB using post-mortem exams of lymph nodes in the head.

Animals with visible evidence of disease in these nodes are submitted for additional testing, including mycobacterial culture, the definitive test of infection. Those without such evidence are considered negative. These methods were adopted because of the limited laboratory capacity, funding and personnel available to test the enormous number of heads submitted each year.

While it has long been acknowledged that such methods likely underestimate the true proportion of TB infected deer (termed "prevalence") to some extent, until recently, the very limited scientific data available disagreed markedly as to just how much. Investigators from MDNR, MDCH, and MSU AHDL, conducted a research study to determine the false negative rate for TB testing currently performed on wild deer. The study population consisted of about 700 hunter-harvested deer taken in six townships in the TB core area of Northeast Lower Michigan in the fall of 2001. The study subjected deer heads that tested negative by current methods to mycobacterial culture.

The study results will be published in March 2004 in Volume 40, Issue 1, of the Journal of Wildlife Diseases. The results provide a best possible estimate (given current test methods) of the true prevalence of TB in the tested population of wild deer, and validate the effectiveness and cost efficiency of the current surveillance program. A similar study in Michigan's elk is currently underway. Questions concerning the studies can be directed to Dr. Dan O'Brien, MDNR Rose Lake Wildlife Disease Laboratory, at (517) 373-9358.

DYNAMICS OF BOVINE TB IN WHITE-TAILED DEER IN MICHIGAN

This report (number 3363) is an exploratory analysis of MDNR's data on bovine TB infection in wild white-tailed deer collected in the northeastern Lower Peninsula between 1995 and 2000.

The aims of this analysis were to quantify the geographic spread of TB infected deer in Michigan and to investigate key factors influencing the prevalence of disease within the core of the infected area.

Researchers found no evidence of progressive expansion of the TB-infected area since the mid-1990s – the wider distribution of infected deer on the latest MDNR maps is a consequence of more widespread surveillance in recent years. The extent to which deer are infected varies considerably within the core area, with the most heavily infected townships being those that had the highest deer densities and most extensive winter feeding activities in the mid-1990s.

A preliminary computer model suggests that hunters' current efforts to reduce the deer population and halt feeding and baiting in the core area will reduce TB levels in the deer but are unlikely to completely eradicate the disease, at least in the short-term.

The analysis was undertaken by Dr. Graham Hickling, who was on sabbatical from Lincoln University, New Zealand. He has since been appointed as an Associate Professor in the Department of Fisheries and Wildlife at MSU, where he will continue his research on TB and other wildlife disease issues.

8 Contacts

The following people have information available regarding fencing, disease control permits, epidemiological investigations, TB testing zones and MSU Extension services. Feel free to contact their offices to have information mailed to you.

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