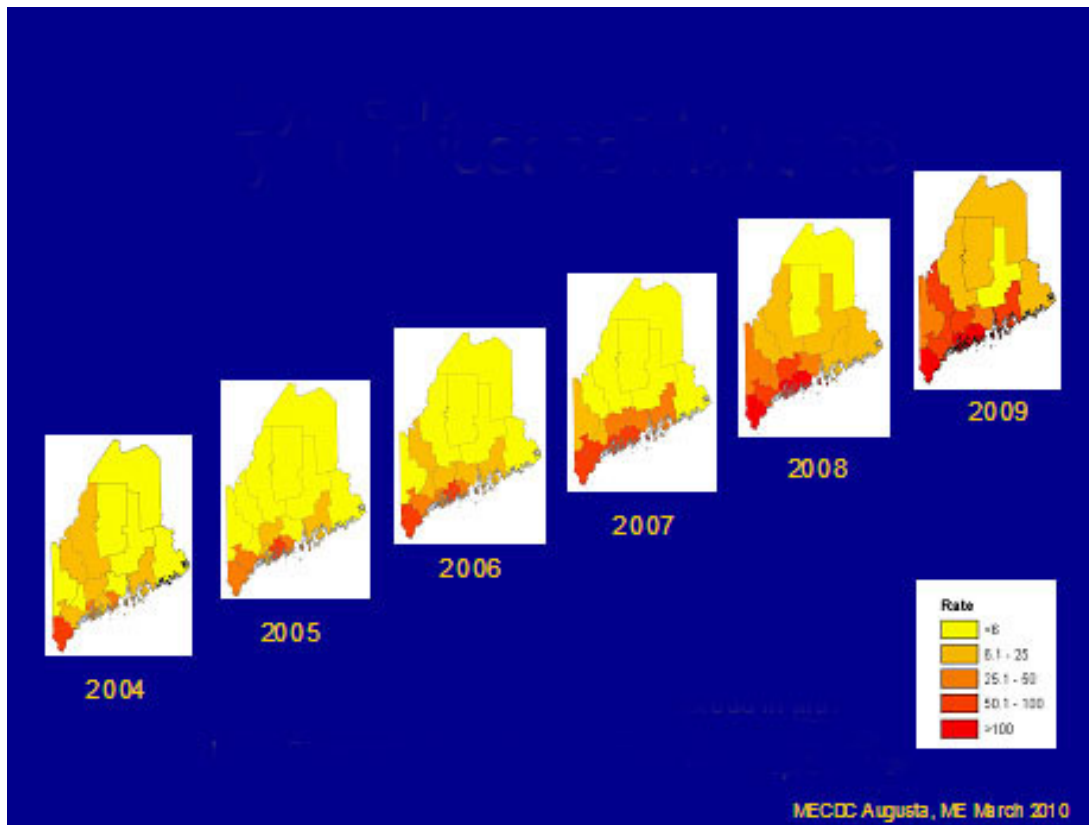


TICK-BORNE DISEASES ON ISLESBORO

The Problem, The Causes, The Solutions

REPORT AND RECOMMENDATIONS TO THE ISLESBORO BOARD OF SELECTMEN



Town of Islesboro
Tick-Borne Disease Prevention Committee

May 2011

MISSION OF THE TICK-BORNE DISEASE PREVENTION COMMITTEE

The mission of the Tick-borne Disease Prevention Committee, established by the Islesboro Board of Selectmen in April 2010, is to provide information to the Selectmen about tick-borne diseases and to make recommendations about the prevention of these diseases on Islesboro.

COMMITTEE MEMBERS

Laura Houle, Chair

Andrew Coombs

Linda Gillies, Secretary

Col. (Retired) Philo Hutcheson

Seth Wilbur

Alison Wood, PA-C

Ex Officio: Jeffrey Grossman, Islesboro Town Manager

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SUMMARY OF THE REPORT'S KEY FINDINGS AND RECOMMENDATIONS

The Problem: Tick-Borne Diseases on Islesboro

PART 1

- In recent years, there has been a dramatic increase in the number of cases of Lyme disease and other tick-borne diseases in the United States, particularly in the northeast and upper mid-west.
- The State of Maine, including Islesboro, is part of the tick-borne disease epidemic.
- Where there are no predators and sufficient vegetation for browsing, islands are vulnerable to rapid increases in deer populations.
- On Islesboro the number of cases of Lyme disease, number of infected ticks and the deer population have increased considerably in the past decade.
- This development is cause for concern and action because tick-borne diseases, which can have debilitating and long-term consequences, are serious for humans, dogs and other domestic animals.
- While early treatment with antibiotics is effective, delayed or inadequate treatment can lead to chronic symptoms such as disabling joint pain, fatigue, neurological problems and cognitive difficulties.
- Four different diseases can be transmitted by the blacklegged (or deer) tick, Lyme disease being the most common.

The Causes: Ticks and Deer on Islesboro

Part 2

- Humans and domestic animals contract tick-borne diseases from the bite of a blacklegged tick (*Ixodes scapularis*) or deer tick, which has a two-year life cycle.
- Immature ticks become infected when they feed on mice, chipmunks and other small animals which carry the bacteria for Lyme and other diseases.
- Adult ticks feed and breed on a variety of medium-to-large-sized mammalian hosts, including dogs, cats and people, but their principal host is the white-tailed deer.

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- *If ticks ready to feed and breed cannot find a large host, usually a deer, they cannot develop and produce eggs and soon die out. An area can have many small rodents carrying the Lyme bacteria, but if there are no ticks to transmit those bacteria, Lyme and other diseases are greatly reduced or disappear. It's only when there are deer to serve as breeding hosts for the ticks that tick-borne diseases become a threat.*
- There are direct correlations between the number of deer and the number of deer ticks in a given area.

The Solutions: Preventing Tick-Borne Diseases on Islesboro

Part 3

- The key to reducing the incidence of tick-borne disease is to reduce the number of infected ticks as well as human contact with infected ticks.
- Prevention measures include personal protection, pesticide use, landscape management and wildlife management.
- Deer management is the most effective preventative measure for large areas. If deer herd density is maintained at 10 or less per square mile, tick numbers are lowered to levels that greatly decrease the risk of disease.
- Other communities, including many coastal islands, have tried various approaches to tick-borne disease prevention and have found deer herd management to be the most effective.
- Prevention measures on Islesboro to date have consisted primarily of information distribution about Lyme disease by the Health Center. There is an expanded archery season for hunting deer that has brought the current deer population on Islesboro to an estimated 48 deer per square mile and on 700 Acre Island to 52 deer per square mile.

Additional Consequences of a Large Deer Population on Islesboro

Part 4

- Dogs and other domestic animals can be infected with tick-borne diseases.
- Browsing deer cause extensive damage to Islesboro's environment by eating indigenous plants and hardwood saplings in the forest and garden plants in cultivated areas.
- Deer have caused vehicle accidents.

The Committee's Conclusions and Recommendations

Part 5

The committee concludes that the prevention measures currently in effect on Islesboro are not sufficient to address the threat of tick-borne disease on the island.

The committee unanimously recommends that the Town of Islesboro should institute a tick-borne disease prevention program consisting of four principal components:

- Personal Protection
- Pesticide Use
- Landscape Management
- Wildlife Management. A deer management program with the goal of reducing the deer herd on Islesboro and 700 Acre Island to 10 or less deer per square mile over a period of years.
 - Initially, in addition to the existing expanded archery season, there should be a special hunting season. The special season would be approximately two weeks in length and would include the use of firearms.
 - A long-term deer control plan should be developed.
 - The Town should establish a permanent committee to develop and oversee the program, both in the short-term and the long-term.
 - The Maine Department of Inland Fisheries and Wildlife, which would authorize the program, would assist its development and implementation.

PART 1

THE PROBLEM: TICK-BORNE DISEASES ON ISLESBORO¹

In recent years, there has been a dramatic increase in the number of cases of Lyme disease and other tick-borne diseases in the United States, particularly in the northeastern states and the upper mid-west. The State of Maine, including Islesboro, is part of this epidemic. This development is cause for real concern because tick-borne diseases, which can have debilitating and long-term consequences, are serious. This section describes the characteristics of the diseases and where Lyme disease can be found nationally, in the State of Maine and on Islesboro.

CHARACTERISTICS OF THE DISEASES

Four different diseases can be transmitted by the blacklegged ticks (*Ixodes scapularis*), also known as deer ticks. Lyme disease is the most common; anaplasmosis and babesiosis have been diagnosed with increasing frequency in the eastern United States, including Maine. Powassan encephalitis is a rare, but serious, viral disease.

Lyme disease (*borreliosis*). Identified in Lyme, CT in the 1970's, Lyme disease is the most common tick-borne disease in the Northern Hemisphere. It is caused by spirochete bacteria *Borrelia burgdorferi*. Spirochetes are inoculated into the skin by the bite of the deer tick. They replicate locally, causing a characteristic rash (erythema migrans), then spread throughout the body (*Attachment A*).

Lyme disease can affect virtually any system in the body, producing a range of symptoms. Early manifestations of infection may include fever, headache, sore swollen joints, stiff neck, and facial paralysis (Bell's palsy). Approximately eighty percent of people develop an enlarging, circular rash around the bite. Antibiotic treatment is almost universally successful when given early. Late, delayed or inadequate treatment can lead to chronic and disabling symptoms including arthritic joints, localized numbness or weakness, severe fatigue and cognitive difficulties. These symptoms can last for months and sometimes years. Fatality rates are extremely low to nonexistent.

The incubation period from infection to the onset of symptoms is usually 3-30 days. Lyme disease can be difficult to diagnose, for not all patients with Lyme disease will have the diagnostic rash, and many of the symptoms are not specific to Lyme disease but can occur in other diseases as well.

¹ The medical information is taken from several sources including the Maine Center for Disease Control website, www.maine.gov/dhhs/boh/ddc/epi/vector-borne/lyme (known hereafter as MCDC website), the Nantucket Tick-borne Disease Committee, *Report to the Nantucket Board of Health and Selectmen*, 2009 (known hereafter as Nantucket Report) and Barbara Roth-Schechter, Ph.D., *Report by the Dover Board of Health Concerning the Health Hazard of Lyme Disease, its Relationship to Deer Ticks and Deer Density*, January 2010 (known hereafter as Dover, MA Report).

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Children, who may be more likely to be exposed to vector ticks because of where they play, are particularly prone to contract Lyme disease. People who have had the disease do not acquire long-lasting immunity and may be re-infected. While the cost of antibiotic therapy at the early stage of Lyme disease is modest, diagnosis and treatment at later stages can involve many thousands of dollars.

Anaplasmosis. *Anaplasma phagocytophilum* bacteria enter the bloodstream from the bite of a deer tick. The organisms concentrate in circulating granulocyte white blood cells and travel throughout the body. These cause low white blood cell and platelet counts and elevated liver enzymes. Fever, chills, headache, loss of appetite, nausea, fatigue and muscle pain are the most common symptoms. Fatality rates are rare except in the elderly or immunocompromised patients who develop symptoms. Treatment with appropriate antibiotics is virtually always promptly curative and there are no long-term effects.

Both Lyme disease and anaplasmosis also affect dogs and horses.

Babesiosis. *Babesia microti* is a protozoan that enters the bloodstream after inoculation from a deer tick bite. It infects red blood cells and multiplies like the protozoan that causes malaria, leading to destruction of infected red blood cells. There may be enlargement of the liver and spleen. Healthy individuals can develop flu-like symptoms of fever, chills, muscle or joint pain, nausea, vomiting and fatigue. Especially in persons who have previously lost their spleens or have underlying immunologic diseases or malignancies, the disease may be severe, leading to failure of multiple organs such as lungs, kidneys or heart and may end fatally. Diagnosis is usually made by finding the organisms in red blood cells or by specialized blood tests. Treatment with combinations of appropriate anti-protozoa antibiotics is usually curative.

THE INCIDENCE OF LYME DISEASE

Nationally. The incidence of Lyme disease and other tick-borne diseases is increasing dramatically throughout several parts of the United States, particularly in the northeast (*Attachment B*). The Center for Disease Control reports the following number of cases in the northeast region²:

State	1995	2000	2005	2009		
				Confirmed	Probable	Total
Connecticut	1548	3773	1810	2751	1405	4,156
Maine	45	71	247	791	179	970
Massachusetts	171	1158	2336	4019	1237	5,256
New Hampshire	28	84	265	996	419	1,415
New Jersey	1703	2459	3363	4598	375	4,973
New York	4438	4329	5565	4134	1517	5,651
Rhode Island	345	675	39	150	85	235
Vermont	9	40	54	323	85	408

² www.cdc.gov/ncidod/dvbid/lyme/ld_rptdLymeCasesbyState.htm

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For a complete national listing, please see *Attachment C*.

Lyme Disease on Coastal Islands (other than in Maine)

Because of their isolation, islands that have sufficient vegetation for browsing and no predators are vulnerable to rapid deer population growth and corresponding incidence of tick-borne disease. Examples are:

- Shelter Island, New York. 12.1 sq. miles; year-round pop. 2,200, seasonal pop. 6,000. In 1999 the island had 80 deer/sq. mile. There were 925 cases of Lyme disease, the adjacent “mainland” town of East Hampton had 494 cases.³
- Nantucket, MA. 50 sq. miles; year-round pop. 10,000, seasonal pop. 40,000. 2007 – 50 deer per square mile. 2007 – 190 cases Lyme disease, 2008 – 435 cases.
- Martha’s Vineyard. 87.5 sq. miles; year-round pop. 15,000, seasonal pop. 60,000. 2010 – 50 deer per square mile. One in five year-round residents and one in ten seasonal residents have experienced a tick-borne illness.⁴

State of Maine. As indicated in the chart above, like the other northeastern coastal states, Maine is experiencing a significant growth in the number of confirmed cases of Lyme disease. For the increase in the state 2005-09, please see *Attachment D*; for the county numbers, please see *Attachment E*).

Another indicator of the increase in deer ticks in Maine is the number of ticks submitted to the Vector-borne Disease Laboratory in Portland. Ticks submitted in the years 1989-2010 is documented in *Attachment F*.

Islesboro

Although the deer tick can infect people with a number of diseases, in humans only cases of Lyme disease have been diagnosed on so far on Islesboro. The first case of Lyme disease was identified by the Islesboro Health Center in 2003.

YEAR	NUMBER OF CASES	NOTES
2003	1	
2004	0	
2005	3	
2006	4	
2007	7	

³ www.shelter-island.org/deerandtick/report.html

⁴ www.marthasvineyardlyme.org/

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2008	18	9 year-round residents, 6 seasonal residents, 1 frequent visitor to the island
2009	7	1-2 “possible” cases
2010	9	1-2 “possible” cases

It is not known what caused the spike in the number of Lyme disease cases in 2008. As the first deer count was not taken until 2010, estimated deer figures are not available. The considerable number of deer taken by hunters in 2008 (see *Attachment H*) indicates that the deer population was high.

PART 2

THE CAUSES: TICKS AND DEER ON ISLESBORO

Humans and domestic animals contract tick-borne diseases from the bite of a blacklegged tick (*Ixodes scapularis*) or deer tick. The two-year life of the blacklegged tick is dependent on obtaining a blood meal from a mammal or bird at three different stages – as larvae, as nymphs and as adults.

This section describes the life-cycle of the deer tick, facts about the deer tick and statistics about the numbers of infected ticks and deer on Islesboro.

GENERAL INFORMATION ABOUT THE DEER TICK⁵

The Life Cycle of the Deer Tick

Year One

- Female deer ticks deposit their eggs in leaf litter around the end of May – about 3000 per female. Tiny (smaller than the head of a pin), six-legged larvae hatch out in early August in southern Maine, later in northern and eastern parts of the state. The larvae are uninfected when hatched.
- The larvae molt and become nymphs after feeding on small mammals and birds.
- Some of those animals will have been infected by ticks in the previous year and carry the disease bacteria. When the new larvae feed on them, they in turn become infected, thus maintaining the disease cycle.
- A number of larvae feed in their first year and molt into eight-legged nymphs; others feed and molt their second year. All first-year larvae and nymphs overwinter in leaf litter.

Year Two

- In the spring, unfed larvae who have overwintered find a host and then molt into nymphs.
- Ticks who became nymphs in their first year also find a host. If not already infected as larvae, they may become so by feeding on an infected host during year two.
- Once fed, nymphs drop to leaf litter and in late September molt to either male or female adults.
- At that point both males and females seek medium-size and large animal hosts, but are primarily found on deer. Deer do not get infected with Lyme disease. As the females feed to obtain the nourishment they will need to develop eggs, they mate

⁵Information about the deer tick is taken from several sources, including the Nantucket Report, pp. 13-14, the Dover, MA report, pp. 1-2 and John Moran, *Dealing with Deer Ticks*, 2009, webpages.charter.net/balplanman/Interests/DeerTick.html

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males. Males wait on the deer for more females. Once engorged, the females drop off the deer to overwinter in the leaf litter. Females that did not find a host also overwinter and are active again in the spring. All females lay their eggs in the spring, starting the life cycle again.

- *If ticks ready to feed and breed cannot find a large host, usually a deer, they cannot develop and produce eggs and soon die out. An area can have many small rodents carrying the Lyme bacteria, but if there are no ticks to transmit those bacteria, Lyme and other diseases are greatly reduced or disappear. It is only when there are deer to serve as breeding hosts for the ticks that tick-borne diseases become a threat.*

Please see *Attachment G* for a chart of the deer tick's life cycle.

Tick Bites

Ticks have the capacity to bite and infect humans during both year one and year two of the life cycle. Most new Lyme disease cases in humans are caused by bites from infected nymphs during the summer, when they are only about 1/32" in size and are frequently not seen by humans until they have been attached long enough (>36 hours) to transmit the disease agents. Humans often see adults that swell to 1/8" in size and remove them before they have fed long enough to transmit disease. This is not the case for dogs and other domestic animals, which are frequently infected during the adult season.

THE NUMBER OF INFECTED DEER TICKS ON ISLESBORO

For over a decade the Town has been aware that in order to ascertain whether tick-borne diseases are a threat to Islesboro's population, it is essential to estimate the number of infected ticks on the island. To do this work, staff of the Vector-borne Disease Laboratory at the Maine Medical Center Research Institute in Portland were enlisted to conduct tick surveys on the island in 1997, 2007, 2009 and 2010. They measured the abundance of deer ticks by collecting them off vegetation with "flags" consisting of one square meter of light-colored corduroy attached to a ~150 cm pole. The surveys were done at the height of the adult deer tick season, from the middle of October through the first week of November, on dry days when the temperature exceeded 42 degrees Fahrenheit. Ticks were counted as the number collected per hour per person. Ticks were then identified and examined in the laboratory by staining gut contents with a fluorescent dye that attaches to the Lyme spirochete and examining them using a fluorescence microscope. By multiplying the number of ticks collected per hour by the percent infected, the lab derives an entomologic risk index, an estimate of the likelihood of exposure to infected ticks.⁶

DATE	# OF TICKS FOUND PER HOUR	% OF TICKS INFECTED WITH LYME BACTERIA
Fall 1997	0.49	None
Fall 2006	3.5	24%

⁶ Peter W. Rand, MD, Vector-borne Disease Laboratory, *Islesboro Deer Tick Survey*, November 2010.

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Fall 2009	5.0	48.4%
Fall 2010	8.3	49.4%

The chart above makes it clear that the number of deer ticks on Islesboro is increasing and that currently almost half of the ticks are infected with the Lyme bacteria.

THE NUMBER OF DEER ON ISLESBORO

The Town has also recognized that just as tick counts are essential to gauging the risk of tick-borne disease, so are deer counts. Current research by medical and wildlife management agencies both public and private suggests that if a given area has *10 or less deer per square mile*, there is little risk of exposure to tick-borne disease. The only way to determine the number of deer on the island is to use the most reliable deer number estimation techniques available.

What techniques will work in a forested environment such as Islesboro's? There are two primary ways: 1) counting fresh deer pellets on the ground 2) counting deer from the air. In the first method, professional biologists establish transects covering the area to be surveyed. For each transect, pellet group search plots are laid out at 66-foot intervals. The counting team then counts and records the number of deer pellets in each plot. Deer density is estimated from deer pellet group plot data. The aerial method, developed in Quebec, Canada and known as the Potvin Survey, involves a visual survey from helicopters. Observers in a helicopter follow transects that have been established over the survey area, counting deer that are sighted.

In 2009 Islesboro decided to take a deer count and approved the funds for it. Because there was doubt that the deer would be visible through the island's thick forest canopy from the air, the pellet survey method was chosen.

The first pellet count was taken on March 15-18, 2010. The survey was designed and carried out by Stantec Consulting, a wildlife management company based in Topsham, ME. Stantec set up the 32 transects in advance, and tick committee members secured access permission from landowners. While a large part of the pellet counting was done by two Stantec wildlife biologists, Michael Johnson and Tom Tetreau, they were assisted by 17 Islesboro volunteers, including the 9-member 9th grade biology class and their teacher. Using a 95 percent confidence interval, the population density was determined to be 62 (+/- 6) deer per square mile. Based on the size of Islesboro, this calculates to approximately 744 deer on the island.⁷

In 2010, the Maine State Department of Inland Fisheries and Wildlife (MDIF&W) received a grant to conduct helicopter surveys of deer using the Potvin Survey technique. In January 2011 the department attempted a count on Islesboro and 700 Acre Island, but snow conditions at the time were such that deer stayed close to the spruce and fir cover and did not flush upon the helicopter's approach. The ability to detect deer was low and the survey did not provide a reliable estimate.

⁷ Stantec Consulting, *Islesboro Deer Population Estimate Report*, May 2010, p. 1.

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Stantec Consulting took a second Town-funded deer count on April 11-14, 2011. In addition to Islesboro, 700 Acre Island was included in the survey. This time Stantec wildlife biologists Michael Johnson and Tom Tetreau worked on their own (as the pellet count did not correspond to the 2010/11 science curriculum at Islesboro Central School, students and other volunteers did not participate). They surveyed 42 randomly-placed transects on Islesboro (different from the 2010 transects) and 13 transects on 700 Acre. Using a 95 percent confidence interval, Stantec determined the population density to be 48 (+/- 4) deer per square mile on Islesboro and 53 (+/- 4) deer per square mile on 700 Acre Island. Based on the size of each island, this calculated to a total deer population of approximately 528 deer and 62 deer, respectively.

PART 3

THE SOLUTIONS: PREVENTING TICK-BORNE DISEASES ON ISLESBORO

Reducing the incidence of tick-borne disease is dependent on reducing human contact with infected ticks.

This section includes descriptions of known prevention measures as well as examples of preventative actions that have been taken in other parts of the country, in 20 Maine coastal communities and on Islesboro.⁸

GENERAL INFORMATION ABOUT TICK-BORNE DISEASE PREVENTION

Personal Protection

Attention to protective clothing and personal care is the first line of defense against tick-borne disease. Measures include:

- Wearing of light colored clothing so that ticks can be seen, and tucking pant legs into socks.
- Use of tick repellents (DEET, Picaridin, etc) and those containing permethrin, which, in addition to repelling ticks, kills them and is long-lasting on clothing.
- Tick checks after being outside. Removing ticks is the surest method of protection.

Pesticide Use

Pesticides for ticks are known as acaricides. The most commonly used are synthetic pyrethrin compounds (pyrethroids) such as permethrin, bifenthrin and cyhalothrin. Newly available are botanical compounds made with herb oils.

- Sprays. Sprays, either synthetic or botanical, are applied in May or early June to target nymphal ticks, the stage most likely to transmit tick-borne disease. Adults may be targeted by spraying in the fall (or in the spring if no fall application was made). These sprays, which must be applied by a licensed applicator, are suitable for small areas; they are effective and inexpensive. However, synthetic sprays are likely to be toxic to fish and other aquatic organisms, generally less so to mammals, birds and other wildlife. Botanical compounds made with the oils of such herbs as rosemary, peppermint and wintergreen, being “food grade,” are minimally harmful to the environment.
- The Four Poster Tickicide Device consists of a central bin containing whole kernel corn as bait. When deer feed on the bait, the device forces them to rub their heads, necks and ears against permethrin-impregnated applicator rollers.

^{8 8} Information about tick-borne disease prevention methods has been taken from a number of sources including the Nantucket Report, pp. 15-29 and the Dover, MA Report.

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Some studies have shown the device to be effective in reducing tick density. A study conducted by the U. S. Department of Agriculture in five eastern states showed a 71% reduction in nymphal ticks after 5 years. Another study in Connecticut failed; sufficient ticks remained to reproduce and cause disease. Further experiments are currently being conducted and studied in Massachusetts and New York.

The technique is expensive – a single unit, which covers 52 acres, costs \$500-\$600 to buy and install. In addition, because deer congregated at feeding stations are at risk of spreading chronic wasting disease, the MDIF&W is unlikely to give a permit for these devices.

- Damminix Tick-tubes® are cardboard tubes filled with cotton balls treated with permethrin that mice collect to build their nests. Ticks that feed on nesting mice in the spring and fall are exposed to permethrin.

The effectiveness of Damminix tubes is uncertain. Two studies in Connecticut and New York State failed to show any reduction in the number of infected, host-seeking nymphs when this product was used for a three-year period in woodland and residential areas; a Massachusetts study reported reductions.

- “Bait box” systems, which attract mice and apply an acaricide to their bodies when they enter, have not been extensively tested. One of these products, Maxforce®, has been removed from the market for design modification.
- Vita-Rack Lick Site®. Provides nutrients and vitamins for deer and also helps to control ticks.

Landscape Modification. Landscapes can be modified so as to be less hospitable to small animals, deer and deer ticks.

- Deer ticks are rarely found in open, mowed, grassy areas. They must live where the humidity stays above 90%. They like forest edges with low shrubs, thick leaf litter and an overhead canopy to provide shade. They are particularly abundant around invasive plants like barberry and honeysuckle.
- Residential properties can be made safer by removing brush and leaf litter, cutting out invasives and moving children’s playgrounds away from the woods.

Wildlife Management

- Deer Management. Information generated from scientific studies and successful reduction programs indicates that if deer herd density is reduced to 10 deer per square mile or below, tick numbers can be lowered to levels that greatly decrease risk of human disease.

- Immuno-contraception. Contraceptive vaccines are effective when administered to contained deer, but for control of free-roaming wild deer their use is highly labor-intensive, expensive and inefficient. The Maine Department of Inland Fisheries & Wildlife does not consider fertility control to be a safe and effective means of controlling wild populations of deer.⁹
- Biological Control. The use of predators, parasites and pathogens has been examined for tick control, including chalcid wasps, fungi and nematodes. Such biological controls have not been extensively tested and may have unintended consequences.

PREVENTION MEASURES TAKEN BY COMMUNITIES OUTSIDE OF MAINE

- Examples of successful deer management programs
 - Great Island, West Yarmouth, MA. In the 1980's the deer density was reduced through hunting from 30-50/sq. mile to fewer than 6 deer/sq. mile. Tick numbers and Lyme disease infection rates were significantly reduced from greater than 3 cases per 100 to less than 0.1 per 100 people. Between 1986 and 2010, there have been 2 cases of Lyme disease and one case of babesiosis on the island.
 - Mumford Cove, CT. After an immune-contraception project failed, in 2000 controlled hunts were started, reducing the deer density by 92%, from about 100/sq. mile to 10-12/sq. mile. Subsequent Lyme disease incidence decreased from 30 case/year to 2-3/year within three years.
 - Crane Beach, Ipswich, MA. Crane Beach is a conservation and recreation property without a residential human population. Through controlled hunting the deer population was reduced in the years 1985-1991 from 100 deer/sq. mile to <10 deer/sq. mile with resulting statistically significant reduction in tick densities on mice.
- An unsuccessful deer reduction program
 - In Bernard's Township New Jersey, which is surrounded by several other towns and has few impediments to deer movement, a three-season reduction program only brought the estimated population of 118/sq. mile to 63/sq. mile. This had no apparent effect on the numbers of tick and Lyme disease incidence.
- An experimental program the 4-Poster Device (permethrin)
 - Shelter Island in New York, 12.1 square miles. In 2008 the residents of Shelter Island, which has abundant deer and many cases of Lyme Disease (see Part 2), began a four-year program using the 4-Poster Tickicide Device, which lures deer with corn to a unit where their heads, necks and ears are swathed with permethrin, killing the

⁹ Maine Department of Inland Fisheries and Wildlife, *Deer Reduction Protocol*, June 2001

ticks. The total to install and maintain the program over four years will be \$1,125,000, paid through the Town budget and private fundraising.¹⁰ The New York State Department of Environmental Conservation and the Cornell Extension will prepare a study about the program at a cost of \$1,167,000, also funded through a combination of public and private money. Parts of Fire Island are also included in this study.

PREVENTION MEASURES TAKEN BY MAINE COASTAL COMMUNITIES

Preparation of this report included research about 20 Maine coastal communities other than Islesboro, 17 islands and three mainland townships. They fall into four MDIF&W regions: A - southern Maine, B – mid-coast, C - Mount Desert area, and F – Orono area. While all communities were concerned about the threat of Lyme disease, in many cases the catalyst for action was environmental degradation as a result of deer browsing. The following narrative summarizes the experience of these communities with tick-borne diseases, environmental damage and deer control. Information about prevention measures taken to date on Islesboro is covered in the next section.

- Region A (Portland area)
 - Cape Elizabeth. 15 sq. miles, pop. 9,068. Hunting is not permitted in the Town of Cape Elizabeth. However at the Ram Island Farm, a privately owned, 2,250 acre property controlled by the Sprague Corp. which is “dedicated to the maintenance and preservation of this beautiful area,” MDIF&W staff works with the Sprague Corp. to maintain the deer at 20-25 per square mile. Hunters are given permits to use shotguns (not rifles); they are allowed to use bait and to hunt at night. They may also take coyotes.
 - Casco Bay.
 - Five Islands (Cliff, Cushing, Diamond, Long, Peak’s). These islands range in size from 1.4 to 4 sq. miles with year-round populations of 200-1,000. Until the late 1990’s there was no hunting in the Casco Bay islands, several of which are under the jurisdiction of the City of Portland. By that time the deer populations on the islands were as high as 150 per sq. mile. Concerned about environmental degradation caused by the deer and also the threat of Lyme disease, the Casco Bay Deer Management Committee was formed. Within the next few years each of the Portland islands and Long Island (which had seceded from the city) had instituted a deer reduction program intended to keep the deer level at approximately 10 deer per sq. mile. In most cases, at the beginning sharpshooters were brought in; now there is an annual controlled hunt.
 - Wells. The Wells National Estuarine Research Reserve protects 2,250 acres of salt marsh, freshwater wetland, beach, dune, forest and field. In the early 2000’s IF&W

¹⁰ Shelter Island Task Force, Executive Summary, www.shelter-island.org/deerandtck/report.html

became concerned that over-browsing by deer was impacting the Reserve's wildlife habitat, particularly forest ecology. In 2001, 30 members of the Maine Bowhunters Association were selected for an expanded archery season on the Reserve. This program continues, and deer pellet group surveys are underway.

- Region B (mid-coast)

- Lincolnville/Northport/Belfast. 95.1 sq. miles, pop. 9,754. This area is governed by standard Maine State hunting regulations, which include firearms and bow and arrow. There is considerable hunting.

Statistics for the incidence of Lyme disease in this area were not available because of lack of access to town-based Lyme case data from the Maine Center for Disease Control. However, according to a MCDC report to the State Legislature in February 2011, in Waldo County the Lyme case rate (per 100,000) in Waldo County has risen from 2.6 in 2005 to 65.3 in 2010. In neighboring Knox County the rate was 169.6 in 2009¹¹ (*Attachment E*). The Maine CDC is concerned about the rapid rise of Lyme disease in the mid-coast region.

- Matinicus. 1.6 sq. miles. Year-round pop. 51. The island has no deer. There have been no cases of Lyme disease.
- Monhegan. 0.9 sq. miles. Year-round pop. 75, seasonal pop. 200, with several hundred day-trippers per day. The white-tailed deer was introduced to Monhegan in 1955; by 1996 there were approximately 100 deer per square mile. Lyme disease was first noticed in the 1980's and by 1996, 13% of year-round residents had contracted the disease. Norway rats were the primary hosts for the deer tick. Led by Monhegan Associates, the conservation organization on the island, residents resolved to address the deer problem, enlisting the assistance of the Vector-borne Disease Laboratory and the Department of Inland Fisheries and Wildlife. Initially deer were treated with a chemical compound (ivermectin) that would kill ticks feeding on them. When this had little effect, the community decided to eliminate deer from the island. From November 1996 to March 1999 - through relaxed hunting regulations, professional sharpshooting, poaching and natural deaths - all deer were removed from the island. Funding for the Vector-borne Disease Laboratory's work was provided by the Center for Disease Control in Fort Collins, CO. According to the Laboratory, the deer reduction work was paid for by Lincoln County. With the absence of deer in the fall of 1999, when host-seeking adults from the previous tick generation remained, both the density of host-seeking ticks and infection prevalence rose. By the summer of 2003, however, no sub-adult ticks were found on rats, and the number of ticks flagged in an hour has dropped from 15 to less than one. There have been no new signs of deer. From 2001 through 2010 there was only one reported case of Lyme disease.
- North Haven. 11.6 sq. miles. Year-round pop. 381, seasonal pop. 1,000. Maine State hunting regulations. According to Town Manager Joe Stone, there are many deer and

¹¹ <http://www.maine.gov/dhhs/boh/ddc/epi/vector-borne/lyme/2011-lyme-legislature.pdf>

significant hunting. Few areas are posted, and there are many off-island hunters. According to the North Haven Health Clinic, there were 6 cases of Lyme disease in 2007, 4 cases in 2008 and “a handful” of cases in 2010.

- Vinalhaven. 24 sq. miles. Year-round pop 1,300; seasonal pop. 3,300. Like North Haven, Vinalhaven is governed by Maine State hunting regulations. There is strong support for hunting by local and mainland hunters. According to a staff member at the Medical Center, there have been a few cases of Lyme disease diagnosed recently, but not enough to cause concern
- Region C (Mount Desert area)
 - Cranberry Isles. 42.1 sq. miles. Year-round pop. 117. With an unacceptably high deer population and the resulting environmental degradation, in 1998 the Town of Cranberry Isles considered the restoration of deer hunting. Fearful of a large influx of off-island hunters, residents defeated the resolution. The Town then worked with MDIF&W to develop a management strategy that provided for a one-year, tightly controlled special hunt that allowed island residents to designate off-island hunters. The resolution passed in 1999, and the special hunt was held in 2000. As of 2001, deer hunting became the primary management tool for Cranberry Isles. Subsequently, the State passed Legislation that allowed other island communities to restore hunting on islands by rule-making authority of the Commissioner of the MDIF&W. The approach of initially reducing the deer population through a controlled, special hunt prior to restoring regular deer hunting as the primary tool for managing deer became a model for working with other coastal island communities that had been closed to deer hunting (see Frenchboro and Swan’s).
 - Deer Isle. 29.7 sq. miles. Year-round pop. 1,876. There are many deer and extensive hunting with firearms and bow and arrow during the hunting season. Residents and their pets wear orange vests during this time. According to the Island Medical Center, while a good number of island residents come in with tick bites, very few test positive. Most people who are diagnosed with Lyme disease come from Isle au Haut (see below).
 - Frenchboro. 7 sq. miles. Year-round pop. 70. Due to a high density of deer and concerns about environmental degradation and Lyme disease, Frenchboro worked with the MDIF&W to establish a deer management strategy similar to that used on Cranberry Isles. As a result, Frenchboro had special deer reduction hunts in 2001 and 2002. In 2003, the island was opened to regular deer hunting, including expanded archery, special archery, regular firearms and muzzle-loading seasons, as a means to maintain deer populations at a reduced level.
 - Isle au Haut. 10 sq. miles. Year-round pop. 40/60; seasonal pop. 300. As two-thirds of Isle au Haut is national park, the island is legally closed to deer hunting. Illegal hunting activity on parts of the island may help to keep the deer population down. There are also coyotes, which are deer predators. Field collections by the

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Maine Medical Center tick researchers showed an 8-fold increase in deer ticks, 1991-2003. As Isle au Haut has no health clinic, Lyme disease statistics are not available but two island residents with whom we spoke, one of whom has contracted the disease “a few times,” said that there are quite a number of cases each year. According to them, an RN who lives there keeps supplies of antibiotics and administers them to people who have Lyme disease symptoms. Others go to the clinic on Deer Isle for treatment.

- Mount Desert. 108 sq. miles. Year-round pop. 10,000. The first collection of infected deer ticks in Maine was made near Bar Harbor in 1986. Because of many deer and an increase in the numbers of Lyme disease cases, in 2006, the Town of Mt. Desert held a public referendum to decide on whether to establish a deer reduction program. Despite compelling public testimony and efforts by a Town-appointed deer committee charged with working cooperatively with MDIF&W to explore management options, a proposal to restore deer hunting as a tool to regulate deer populations was turned down. Three members of the Acadia National Park staff were diagnosed with Lyme disease in 2010. While there is anecdotal evidence of Lyme disease cases in other parts of the island, these cannot be confirmed because of lack of access to town-based Lyme case data from the Maine Center for Disease Control.
- Swan’s Island. 14 sq. miles. Year-round pop. 205; seasonal pop. 700. The catalyst for Swan’s controlled deer reduction program was an accident in the late 1990’s involving two teenagers whose car hit a deer and turned over. The fire truck on the way to the rescue also had a collision with a deer. In 1999 there was a public vote to restore deer hunting according to the model first used at Cranberry Isles. Open deer hunting was restored in 2004. From 1994 to 2007, the MMC Vector-borne Disease Laboratory measured an increase in flagged ticks per hour, from 0.0 to 8.7.
- Region F (Orono area)
 - Marsh Island/Orono. 24 sq. miles, pop. 7,538. Being a populated area, State hunting regulations do not apply. In 2008 IF&W worked with the Town of Orono and the City of Old Town to develop a deer reduction program. They enlisted the Maine Bowhunters Association (MBA), selecting archers from MBA’s Bowhunters Landowners Information Program (BLIP). The first hunt was December 1-13, 2008. 17 archers in the first week and 14 archers in the second week participated. 8 deer (5 males and 3 females) were harvested. In 2009 the hunt was moved to October and was extended to 3 weeks; 46 deer were harvested. In 2010 the hunt took place from September 27 – October 16; 40 deer harvested.

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Summary. The following is a summary of the 20 Maine coastal communities researched for this report, 17 islands and three townships.

	Number of communities per category
• No deer, no tick-borne disease	1
○ Matinicus	
• All deer eradicated. One Lyme case in 12 years since	1
○ Monhegan	
• Many deer, limited hunting, considerable tick-borne disease	2
○ Isle au Haut	
○ Mount Desert	
• Deer controlled through use of Maine State hunting regulations	5
○ Chebeague	
○ Deer Isle	
○ Lincolnville/Northport/Belfast	
○ North Haven	
○ Vinalhaven	
• Many deer until instituted a successful, ongoing controlled deer reduction program	11
○ Cape Elizabeth (Ram Island Farm/Sprague Preserve)	
○ Casco Bay Islands (Cliff, Cushing, Diamond, Long, Peak's)	
○ Cranberries	
○ Frenchboro	
○ Marsh Island/Orono	
○ Swan's	
○ Wells Reserve	

PREVENTION MEASURES TAKEN BY ISLESBORO

Size and population: 14.2 sq. miles. Year-round pop. 662, seasonal pop. 2,268.¹²

Information/Education

Concerned about the increase in the number of cases of Lyme disease on Islesboro, since 2006 the Islesboro Health Center has consistently engaged in a program to disseminate information about tick-borne diseases and how to protect against them. This program has included:

- A public forum held in 2006 - "Tick Talk," moderated by Dr. Peter Rand of the Vector-borne Disease Laboratory

¹² Numbers from the draft Islesboro Comprehensive Plan of 2010.

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- A presentation to the board of Selectmen by Dr. Rand in 2009
- Individual counseling by Health Center staff
- Articles about personal protection in the Islesboro Island News
- Notices on bulletin boards at several locations around the island
- Special mailings included with the monthly Town Calendar

Deer Harvest

Hunting laws on Islesboro go back to 1939, when a closed season was established that prohibited hunting deer on the island. In 1959 the closed season was continued except for hunting with bow and arrow during October and November. In 2003 the closed season was once again continued but allowed for an expanded archery season beginning in September till the end of the regular firearms season in Waldo County, usually the last Saturday in November.

Records of the deer harvest on Islesboro go back to 1992, when a total of 33 deer were taken. That figure rose to 232 in 2009; it dropped to 146 in 2010 (*Attachment H*).

PART 4

ADDITIONAL CONSEQUENCES OF A LARGE DEER POPULATION ON ISLESBORO

Although this report is concerned primarily with tick-borne diseases in humans on Islesboro, the committee feels it is appropriate to include information about the additional consequences of a large deer population on the island.

TICK-BORNE DISEASE IN DOMESTIC ANIMALS

Dogs. In March 2009, the Vector-borne Disease Laboratory offered to undertake a survey of island dogs to determine if they were infected with Lyme disease or anaplasmosis. Six veterinarians from Rockland to Belfast participated in the study. Sixty-five dogs from Islesboro were tested, along with 573 off-island dogs. Although 75% of Islesboro dogs had been vaccinated against Lyme disease and 86% had been treated with tick control products, nine (13.8%) were Lyme positive and two (3.1%) had been exposed to the agent of anaplasmosis; one dog had been exposed to both diseases. Of five dogs that had not been vaccinated or treated with a control product, four were Lyme positive. The percent of Islesboro dogs testing positive for both Lyme disease and anaplasma is similar to that of dogs in surrounding mainland towns.

Please see *Attachment I* for a map of where dogs participating in the survey resided on Islesboro.

Other Animals. Horses get Lyme disease, and it can be serious and expensive. In 2008 the Vector-borne Disease Laboratory tested 192 in York, Cumberland, Kennebec and Knox Counties. Overall 21 (10.9%) had been exposed to Lyme, but in some towns, particularly in south coastal Maine, the seroprevalence was high (50% in York, 80% in Cape Elizabeth). Cats may be exposed, but few have symptoms. Cats, however, can feed female deer ticks, allowing them to hatch out ~3000 tick eggs each spring. Cattle and goats can also be infected.¹³

DAMAGE TO THE ENVIRONMENT

In recent years public agencies, wildlife associations and private landowners have documented that an overabundance of deer is harmful to the woodlands of the northeast, for browsing deer eat native wildflowers and hardwood saplings. According to the Quality Deer Management Association, one white-tailed deer eats approximately 2,000 pounds (one ton) of vegetation in a year.¹⁴ When deer population exceeds 20 deer per sq. mile, there is little or no seedling regeneration. This allows invasive species such as Japanese barberry and bush honeysuckle, which deer do not eat, to fill the void and dominate the ecosystem. As the invasives grow, the deer continue to eat the native plants that they prefer, giving the invasives a perpetual advantage.

¹³ Peter W. Rand, email of 4/26/11 to Linda Gillies

¹⁴ Madeline Bodin, "Too Many Whitetails?" Northern Woodlands. Winter 2010, p. 1.

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As forest composition changes, animals are affected, especially songbirds. The National Audubon Society reports that when deer populations exceed 20 per sq. mile, eastern wood pewees, indigo buntings, least flycatchers are negatively impacted. At 40 deer per sq. mile eastern phoebes and robins and ground nesters such as woodcock and whippoorwills are greatly reduced.¹⁵

Stantec's reports on the deer surveys of 2010 and 2011 both include a section on the damage caused to Islesboro's environment by browsing deer. The following is from the 2011 report.¹⁶

In addition to the human health concerns associated with the Lyme disease, the high deer density on Islesboro also has significant ecological implications. Most of Islesboro's forested habitat is currently composed of mature softwood stands dominated by red spruce (*Picea rubens*), balsam fir (*Abies balsamea*), and northern white cedar (*Thuja occidentalis*) with scattered eastern hemlock (*Tsuga canadensis*), larch (*Larix laricina*), and white pine (*Pinus strobus*) also present. Some mixed hardwood and softwood stands and hardwood stands are also found on the island. Dominant mature hardwood species include quaking aspen (*Populus tremuloides*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), paper birch (*Betula papyrifera*), and yellow birch (*B. alleghaniensis*). Forested wetlands are also common on the island and dominated primarily by eastern white cedar, red maple, and balsam fir. Deer browse lines are readily evident on many tree species, creating open "park like" understory conditions throughout the island (Appendix C; Photo 3).

Field observations by Stantec indicate the current deer density exceeds the carrying capacity of the island's forest communities and is not sustainable over the long term. Present high deer population levels are significantly impacting the general ecological and silvicultural health of the island forests, and in particular, current forest regeneration. These observed impacts include loss of potential future regeneration and shifts in existing and future forest structures, an overall decrease in diversity of woody and non-woody vegetative species, and the continued establishment and spread of invasive plant species that are resistant to deer browsing, i.e., Japanese barberry (*Berberis thunbergii*) and bush honeysuckle (*Lonicera morrowi*) (Appendix C; Photos 4 and 5). Little or no regeneration of northern white cedar, oak, and northern hardwood tree species is presently occurring due to the continued, high browsing pressure of the deer. Balsam fir regeneration is being strongly impacted (Appendix C, Photo 6), and impacts on red spruce growth, which is not a preferred browse species, are also occurring (Appendix C, Photos 7 through 9). These impacts are already resulting in a shift from the more recent, diverse, forest structure to one that will be largely dominated by red spruce (Appendix C, Photo 10). This shift is being expedited by blowdowns that were commonly observed on many areas of Islesboro and 700 Acre Island (Appendix C; Photos 11 and 12). The majority of Islesboro's forests have matured since the turn of the 20th century when the island was more widely used for agricultural purposes. These mature forest stands are now particularly susceptible to blowdowns due to the combination of shallow and/or wet soil conditions in many areas and the frequent exposure to high winds off the water. Deer browse is especially impacting regeneration of forest and establishment of invasive plant species in these blowdown areas.

VEHICLE ACCIDENTS

Public Safety Officer Fred Porter reports that in past years there have been approximately 15 accidents involving deer and cars annually. In the last one-two years, however, the number of incidents has decreased dramatically to one-two a year.

¹⁵ Bodin, p. 2.

¹⁶ Stantec Consulting, *Islesboro Deer Population Estimate Report*, April 2011, pp. 2-3

PART 5

THE COMMITTEE'S CONCLUSIONS AND RECOMMENDATIONS

The Tick-borne Disease Prevention Committee has come to the following conclusions.*

- Islesboro is part of the tick-borne disease epidemic that has developed in the United States, particularly in the northeast and upper mid-west.
- In the past year on Islesboro the number of cases of Lyme disease, the number of infected ticks that cause the disease, and the deer population that provides nourishment and a breeding ground for the ticks have reached high levels.
 - New cases of Lyme disease: 9 confirmed, 1-2 possible.
 - Deer ticks found to be infected: 49.4 percent.
 - 48 deer per square mile on Islesboro and 53 deer per square mile on 700 Acre Island, well exceeding the “safe” number for Lyme disease of 10 deer per square mile.
- These numbers are cause for concern and action because tick-borne diseases, which can have debilitating and long-term consequences, are serious for humans, dogs and other domestic animals.
- The prevention measures currently in effect on Islesboro are not sufficient to address the threat of tick-borne disease on the island.

The committee unanimously recommends that the Town of Islesboro should institute a tick-borne disease prevention program consisting of four principal components:

- Personal Protection. The Islesboro Health Center should continue and expand its efforts to inform Islesboro residents about personal protection against the possibility of tick bites.
 - Risk awareness
 - Protective clothing
 - Frequent tick checks
- Pesticide Use. The Health Center should provide information/education to residents about the use of sprays in small areas, particularly those made from “food grade” botanical compounds.
- Landscape Management. The Health Center should provide information/education to residents about landscape management. Landscapes can be modified so as to be less hospitable to small animals, deer and deer ticks.

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- Wildlife Management. Islesboro should institute a deer management program with the goal of reducing the deer herd on Islesboro and 700 Acre Island to 10 or less deer per square mile. The program would be implemented over a period of years. During that time, a long-range plan for deer control on Islesboro and 700 Acre Island would have to be developed.
 - Our research indicates that the most appropriate way to begin to meet the goal is to establish a locally-controlled special hunting season as described in Section 3 of the MDIF&W's Deer Protocol of June 2001.¹⁷ The special hunting season would last for approximately two weeks and would include the use of firearms. Under the terms of the Protocol, participation in this deer management option is restricted to “landowners, landowner-designees, or to local residents.”
 - The special hunt would be in addition to Islesboro's expanded archery season.
 - The Town should establish a permanent committee to develop and oversee the deer management program, both in the short-term and the long-term.
 - During the preparation of this report committee members worked closely with staff from the Maine Department of Inland Fisheries and Wildlife and discussed the possibility of a special hunt. However, the committee has not formally presented a proposal to the Department, pending approval from the Town. The Department would authorize the program and would assist in its development and implementation.

*In accordance with the committee's mission, this report's conclusions and recommendations relate only to tick-borne disease prevention. However, we note that during our research it became evident that in addition to impacting the health of humans and domestic animals, browsing deer cause extensive damage to Islesboro's environment by eating indigenous plants and hardwood saplings in the forested habitats and garden plants in cultivated areas.

¹⁷ Maine Department of Inland Fisheries and Wildlife, *Actions to Remedy Nuisance Problems Resulting from Locally High Deer Densities, Deer Reduction Protocol*, June 27, 2001, p. 3.

PART 6

FREQUENTLY ASKED QUESTIONS

- Q.** Lyme disease is easily treated and therefore why get excited?
- A.** Yes, treatments are available. However, delay in treating Lyme disease can result in serious long-term problems including central nervous system, cardiac and arthritic complications. Unfortunately, there will sometimes be delays, or error in diagnosis, and these complications will continue to occur.
- Q.** Isn't the problem mice and other small rodents, not deer?
- A.** Indeed, mice, chipmunks, squirrels, birds, etc., carry the bacteria that causes Lyme and other diseases and they (not deer) infect the ticks. However – *and this is really important to understand* – in the reproductive stage, adult deer ticks primarily feed and breed on deer. If they cannot find a host they cannot develop and produce eggs and soon die out. An area can have many small rodents carrying the Lyme bacteria, but if there are no ticks to transmit those bacteria, Lyme and other diseases are greatly reduced or disappear. It's only when there are deer to serve as breeding hosts for the ticks that tick-borne diseases become a threat. Any efforts at reduction of small mammals in an area where there are deer, for example by poisoning, would alter the predator-prey relationship of the area, an example of “the law of unintended consequences,” and in any event would be futile.
- Q.** Why not use a contraceptive for deer?
- A.** The Maine Department of Inland Fisheries & Wildlife does not consider contraceptive techniques for population control in wild, free-roaming deer to be safe and effective.
- Q.** What about killing the ticks with a pesticide when they are on the deer?
- A.** The 4-Poster Tickicide Device, which applies a pesticide to deer as they reach through the posters to eat corn, has been used effectively in some communities. Shelter Island, which is slightly smaller than Islesboro in terms of square miles, is currently experimenting with them. However, this approach is expensive and high maintenance. Each device, which costs approximately \$500, can cover about 52 acres; it must be replenished on a regular basis. An island the size of Islesboro, which has 8,297 acres, would require 157 units at a total initial cost of \$78,500.
- Q.** Some people on Islesboro say they've seen fewer deer in the last year or so. Could the herd be reducing on its own through hunting and severe winters?
- A.** Stantec reports that there are less deer than last year - 48 deer per square mile, as opposed to 62 in 2010. That is still a large number, and given the overall upward trend in the island's deer population in recent years, does not indicate a rapid downward trend. According to the biologists, deer findings this year indicate that because of severe winter weather, the deer have changed their habitats and have gone deeper into the woods, where the forest canopy offers shelter from the deep snow. Thus they have been less visible along the roads and in populated areas.

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Q. We have heard that the idea is to remove *all* deer from Islesboro, the way they did on Monhegan. Is that true?

A. There are no plans to remove all the deer from Islesboro. The committee proposes reducing Islesboro's deer population from 48 deer per square mile to 10 deer per square mile over time.

Q. We have heard that sharpshooters may be involved. Is that true?

A. In the preliminary work that the committee has done, there is no plan to use sharpshooters. Rather, they are recommending a locally-managed special hunting season, in addition to the existing expanded archery season. The special hunt would be overseen by staff of the State Department of Inland Fisheries and Wildlife and would be strictly regulated and monitored.

PART 7

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The committee warmly thanks the many people who were generous with their time and expertise as we prepared this report. We are particularly indebted to members of the staff of the Vector-borne Disease Laboratory at the Maine Medical Center Research Institute in Portland. Dr. Peter Rand, Senior Investigator, and others at the lab reviewed several drafts of the report and modified it in important ways. From the outset, staff members at the Maine Department of Inland Fisheries and Wildlife were most helpful.

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PART 8

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PART 9

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Much of the information gathered for this report comes from the following publications. We consulted many other articles and reports available on the internet and too numerous to site here.

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Dr. Kirby Stafford, Deer Herd Reduction and Lyme Disease, www.youtube.com/watch?v=Z_fNtkOLdvc

PART 10

THE TICK-BORNE DISEASE PREVENTION COMMITTEE

ESTABLISHMENT OF THE COMMITTEE BY THE TOWN OF ISLESBORO

While Islesboro health professionals have been aware of tick-borne diseases in the area since the early 2000's, real concern about them began in 2008, when the Islesboro Health Center diagnosed 18 new cases of Lyme disease, a considerable increase from previous years. In order to learn more about the disease and possible measures to prevent further cases, the Health Center Advisory Board (HCAB) set up a five-member "tick committee." Committee members researched several aspects of the tick-borne disease issue and in December 2008 produced a report that concluded the health threat posed to residents of Islesboro by the presence of the deer tick appeared to be serious and should become a top priority for the Health Center and the Town of Islesboro. The report recommended that there should be an inquiry into the incidence of tick-related diseases on Islesboro, their causes and what steps, if any, should be taken to address the problem.

On the basis of the HCAB's findings, in the spring of 2009 the Board of Selectmen authorized \$15,000 for additional research, including surveys of the tick and deer populations on the island. The tick survey was taken by the staff of the Vector-borne Disease Laboratory in the fall of that year, and a deer count managed by Stantec Consulting, Inc. was conducted in March 2010. As the two surveys revealed that there were considerable numbers of both deer and infected ticks on the island, in April 2010 the Selectmen established the seven-member Tick-borne Disease Prevention Committee (T-bDPC), which is charged with formulating recommendations to the Selectmen for the prevention of tick-borne diseases on Islesboro.

Please see *Attachment J* for a chronology of the Town's work relating to tick-borne disease prevention.

MISSION OF THE COMMITTEE

The mission of the Tick-borne Disease Prevention Committee, established by the Islesboro Board of Selectmen in April 2010, is to provide information to the Selectmen about tick-borne diseases and to make recommendations about the prevention of these diseases on Islesboro.

Islesboro Tick-borne Disease Prevention Committee Report

COMMITTEE MEMBERS¹⁸

Laura Houle, Chair	Member, Islesboro School Board; Captain, Islesboro EMS team; Secretary, Islesboro Sporting Club; administrator, Islesboro deer tagging station
Andrew Coombs	President, Islesboro Sporting Club
Linda Gillies, Secretary	Community volunteer
Col. (Retired) Philo Hutcheson	Founder and past President, Islesboro Sporting Club; taught the State-mandated hunter safety course on Islesboro for 20 years
Seth Wilbur	Member, Islesboro Board of Selectmen
Alison Wood, PA-C	Manager, Islesboro Health Center
Ex Officio: Jeffrey Grossman	Islesboro Town Manager

THE COMMITTEE'S WORK

The Tick-borne Disease Prevention Committee met approximately every other month from May 2010 until the release of the report in May 2011. Its primary focus was to gather information relating to tick-borne diseases; measures that can be taken to prevent them; the incidence of the diseases nationally, regionally and in the State of Maine; the incidence of the diseases on Islesboro; the numbers of deer and infected deer ticks on Islesboro; and hunting regulations both state-wide and on Islesboro. The committee's recommendations have been made on the basis of this information. Committee member Linda Gillies was primarily responsible for the research and for preparing the report to the Selectmen.

The committee has gathered information from many sources (see Parts 7-9). Of primary help have been the staffs at the Vector-borne Disease Laboratory in Portland and the Maine State Department of Inland Fisheries & Wildlife.

Since the outset, the committee has kept Islesboro's Board of Selectmen and Town Manager informed through periodic reports at Selectmen's meetings. The Islesboro community has been kept up-to-date through mailings included with the monthly Town calendar and articles in the Islesboro Island News.

¹⁸ Nakomis Nelson, a Selectman, was an original member of the committee, but because his schedule prevented him from attending meetings, he resigned in February 2011.

PART 11

ATTACHMENTS

- A – Lyme disease rash
- B – U. S. Centers for Disease Control, Reported Cases of Lyme Disease, United States, 2009 (map)
- C – U. S. Centers for Disease Control, Reported Lyme Disease Cases by State, 1995-2009
- D – Maine Center for Disease Control, Lyme Disease in Maine, 2004-2009
- E – Maine Center for Disease Control, Lyme Disease Cases by County of Residence, 2005-2010
- F - Maine Center for Disease Control, Submission of Ixodes Scapularis by Town, 1989-2010
- G – Tick Life Cycle
- H – Maine Department of Inland Fisheries and Wildlife, Deer Harvest Trends on Islesboro, 1992-2010
- I – Vector-borne Disease Laboratory, *Islesboro/Midcoast Canine Lyme Disease/Anaplasmosis Serosurvey, 2009*, test results of Islesboro dogs
- J - Chronology of tick-borne disease prevention work on Islesboro to date

Attachment A



Attachment B

Reported Cases of Lyme Disease -- United States, 2009



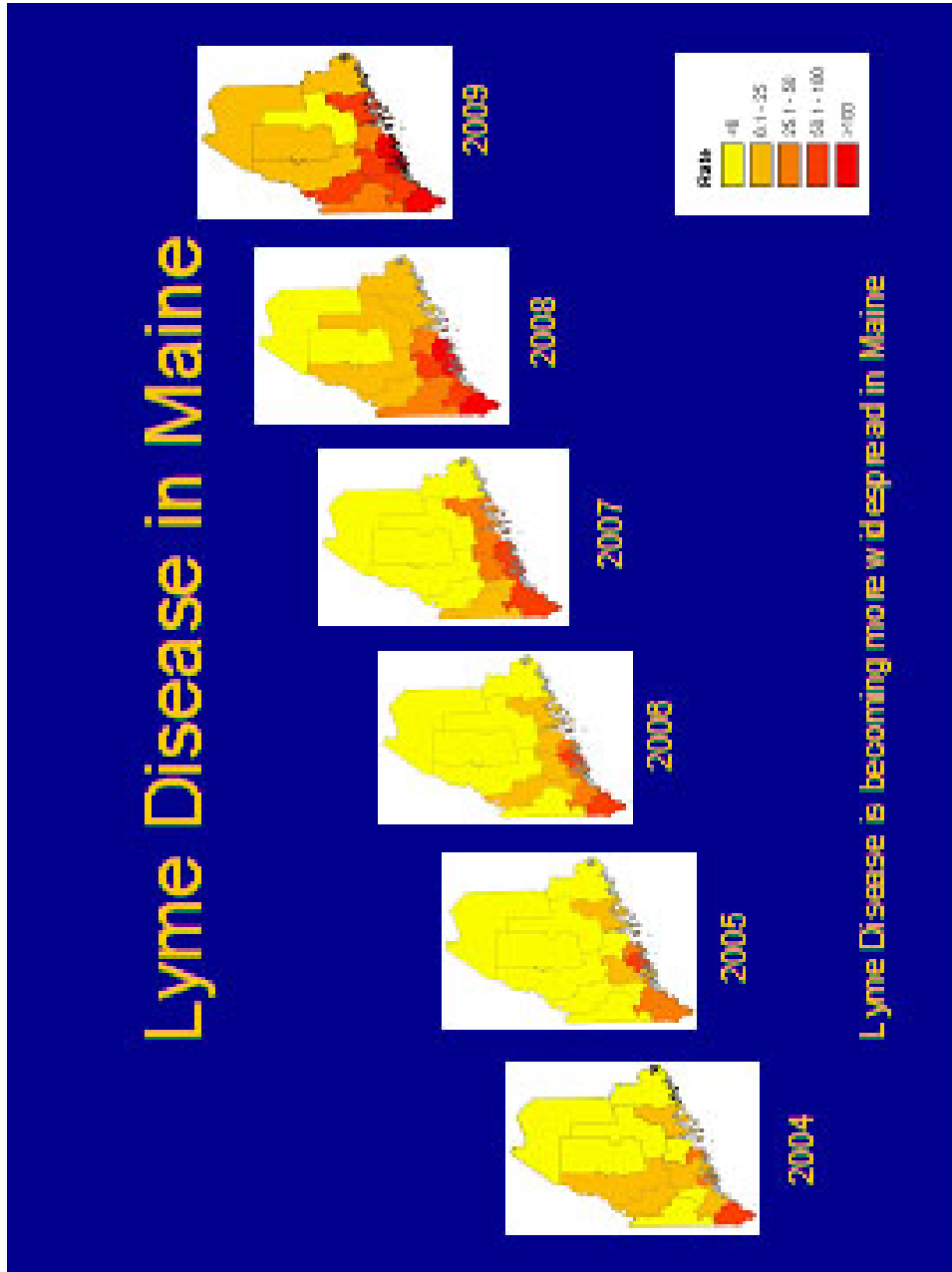
1 dot placed randomly within county of residence for each confirmed case

Reported Lyme disease cases by state, 1995-2009

State	TABLE. Reported cases of Lyme disease by state or locality, 1995-2009															2009		
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008 [†]	Confirmed	Probable	Incidence*	
Alabama	12	9	11	24	20	6	10	11	8	6	3	11	13	6	3	0	0.1	
Alaska	0	0	2	1	0	2	2	3	3	3	4	3	10	6	7	0	1.0	
Arizona	1	0	4	1	3	2	3	4	4	13	10	10	2	2	3	4	0.0	
Arkansas	11	27	27	8	7	7	4	3	0	0	0	0	1	0	0	0	0.0	
California	84	64	154	135	139	96	95	97	86	48	95	85	75	74	117	0	0.3	
Colorado	0	0	0	0	3	0	0	1	0	0	0	0	0	2	0	1	0.0	
Connecticut	1548	3104	2297	3434	3215	3773	3597	4631	1403	1348	1810	1788	3058	2738	2751	1405	78.2	
Delaware	56	173	109	77	167	167	152	194	212	339	646	482	715	772	984	0	111.2	
DC	3	3	10	8	6	11	17	25	14	16	10	62	116	71	53	8	8.8	
Florida	17	55	56	71	59	54	43	79	43	46	47	34	30	72	77	33	0.4	
Georgia	14	1	9	5	0	0	0	2	10	12	6	8	11	35	40	0	0.4	
Hawaii	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
Idaho	0	2	4	7	3	4	5	4	3	6	2	7	9	5	4	12	0.3	
Illinois	18	10	13	14	17	35	32	47	71	87	127	110	149	108	136	0	1.1	
Indiana	19	32	33	39	21	23	26	21	25	32	33	26	55	42	61	22	0.9	
Iowa	16	19	8	27	24	34	36	42	58	49	89	97	123	85	77	31	2.6	
Kansas	23	36	4	13	16	17	2	7	4	3	3	4	8	16	18	0	0.6	
Kentucky	16	26	20	27	19	13	23	25	17	15	5	7	6	5	1	0	0.0	
Louisiana	9	9	13	15	9	8	8	5	7	2	3	1	2	3	0	0	0.0	
Maine	45	63	34	78	41	71	108	219	175	225	247	338	529	780	791	179	60.0	
Maryland	454	447	494	659	899	688	608	738	691	891	1235	1248	2576	1746	1466	558	25.7	
Massachusetts	189	321	291	699	787	1158	1164	1807	1532	1532	2336	1432	2988	3960	4019	1237	61.0	
Michigan	5	28	27	17	11	23	21	26	12	27	62	55	51	76	81	22	0.8	
Minnesota	208	251	256	261	283	465	461	867	474	1023	917	914	1238	1046	1063	480	20.2	
Mississippi	17	24	27	17	4	3	8	12	21	0	0	3	1	1	0	0	0.0	
Missouri	53	52	28	12	72	47	37	41	70	25	15	5	10	6	3	0	0.1	
Montana	0	0	0	0	0	0	0	0	0	0	0	1	4	6	3	0	0.3	
Nebraska	6	5	2	4	11	5	4	6	2	2	2	11	7	8	4	1	0.2	
Nevada	6	2	2	6	2	4	4	2	3	1	3	4	15	9	10	3	0.4	
New Hampshire	28	47	39	45	27	84	129	261	190	226	265	617	896	1211	996	419	75.2	
New Jersey	1703	2190	2041	1911	1719	2459	2020	2349	2887	2698	3363	2432	3134	3214	4598	375	52.8	
New Mexico	1	1	1	4	1	0	1	1	1	1	3	3	5	4	1	4	0.0	
New York	4438	5301	3327	4640	4402	4329	4083	5535	5399	5100	5565	4460	4165	5741	4134	1517	21.2	
North Carolina	84	66	34	63	74	47	41	137	156	122	49	31	53	16	21	75	0.2	
North Dakota	0	2	0	0	1	2	0	1	0	0	3	7	12	8	10	5	1.5	
Ohio	30	32	40	47	47	61	44	82	66	50	58	43	33	40	51	7	0.4	
Oklahoma	63	42	45	13	8	1	0	0	0	3	0	0	1	1	2	0	0.1	
Oregon	20	19	20	21	15	13	15	12	16	11	3	7	6	18	12	26	0.3	
Pennsylvania	1562	2814	2188	2760	2781	2343	2806	3989	5730	3985	4287	3242	3994	3818	4950	772	39.3	
Rhode Island	345	534	442	789	546	675	510	852	736	249	39	308	177	186	150	85	14.2	
South Carolina	17	9	3	8	6	25	6	26	18	22	15	20	31	14	25	17	0.5	
South Dakota	0	0	1	0	0	0	0	2	1	1	2	1	0	3	1	0	0.1	
Tennessee	28	24	45	47	59	28	31	28	20	20	8	15	31	7	10	27	0.2	
Texas	77	97	60	32	72	77	75	139	85	98	69	29	87	105	88	188	0.4	
Utah	1	1	1	0	2	3	1	5	2	1	2	5	7	3	6	3	0.2	
Vermont	9	26	8	11	26	40	18	37	43	50	54	105	138	330	323	85	51.9	

Islesboro Tick-borne Disease Prevention Committee Report

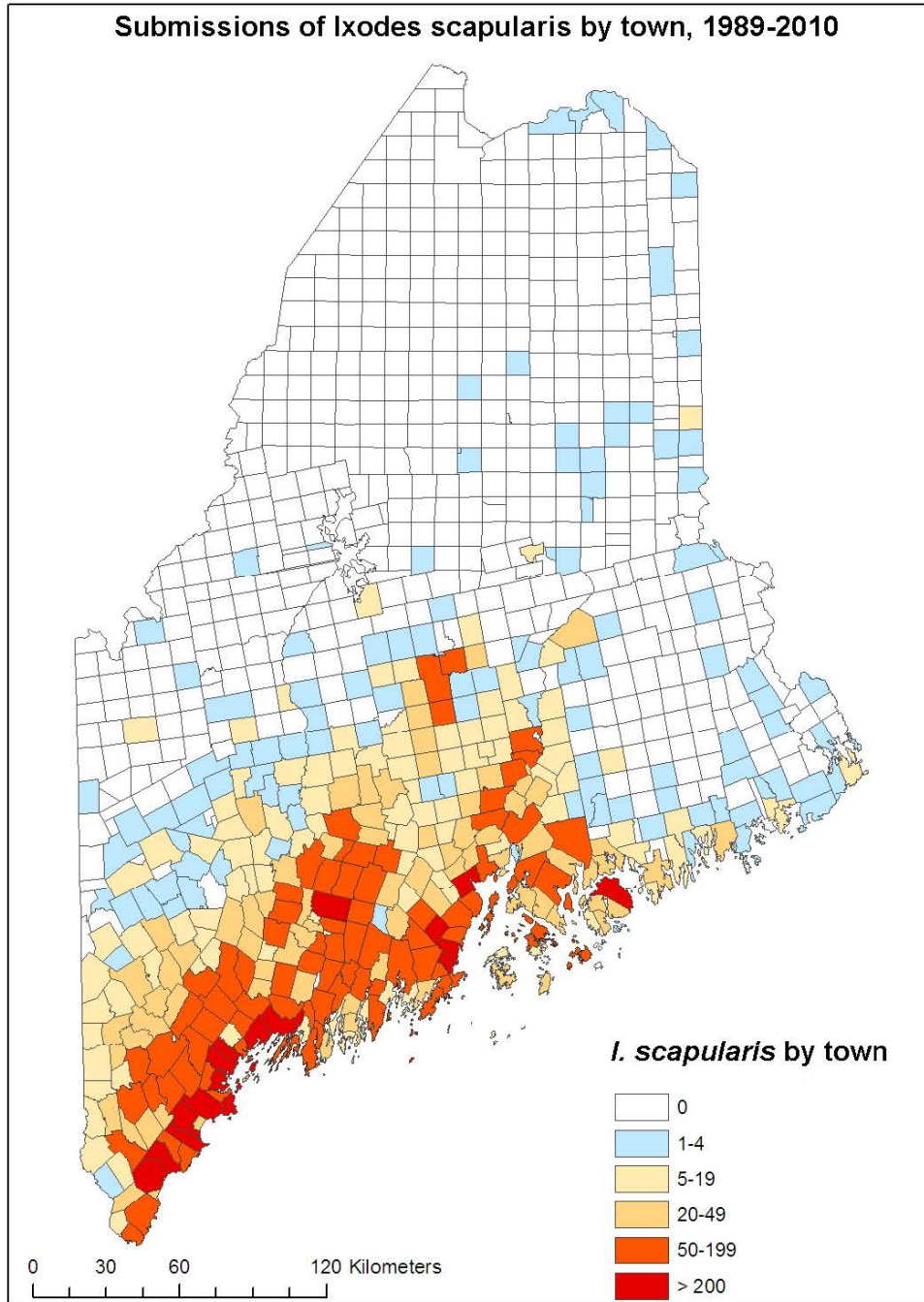
Virginia	55	57	67	73	122	149	156	259	195	216	274	357	959	886	698	210	8.9
Washington	10	18	11	7	14	9	9	11	7	14	13	8	12	22	15	1	0.2
West Virginia	26	12	10	13	20	35	16	26	31	38	61	28	84	120	143	58	7.9
Wisconsin	369	396	480	657	490	631	597	1090	740	1144	1459	1466	1814	1493	1952	637	34.5
Wyoming	4	3	3	1	3	3	1	2	2	4	3	1	3	1	1	2	0.2
U.S. TOTAL	11,700	16,455	12,801	16,801	16,273	17,730	17,029	23,763	21,273	19,804	23,305	19,931	27,444	28,921	29,959	8,509	13.4
[†] confirmed cases presented for all years except most recent [*] confirmed cases per 100,000 population																	



Number and Rate per 100,000 persons of Lyme Disease Cases by County of Residence – Maine, 2005-2010*

County	2005		2006		2007		2008		2009		2010	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Androscoggin	5	4.6	10	9.6	21	19.7	36	33.7	56	52.4	36	33.8
Aroostook	2	2.7	0	0	2	2.8	4	5.6	7	9.8	4	5.6
Cumberland	70	25.5	96	36.1	165	59.9	228	82.6	276	100.0	178	63.9
Franklin	0	0	5	14	1	3.3	4	13.4	15	50.2	19	63.9
Hancock	7	11.2	6	11.6	14	26.3	13	24.5	34	64.0	28	52.4
Kennebec	12	9.1	22	18.8	46	38.1	114	94.2	99	81.8	87	71.8
Knox	16	38.8	17	42.9	21	51.5	72	177	69	169.6	62	152.0
Lincoln	18	53.9	19	56.5	26	74.7	40	115.5	45	130.0	37	107.0
Oxford	3	3.5	1	1.8	6	10.6	21	37	15	26.4	14	24.9
Penobscot	6	4.1	5	3.5	7	4.7	13	8.7	8	5.4	11	7.4
Piscataquis	0	0	0	0	0	0	1	5.9	2	11.8	1	6.0
Sagadahoc	7	21.6	13	36.9	33	90.7	40	110.1	51	140.4	43	118.2
Somerset	1	1.9	3	5.9	3	5.8	9	17.5	6	11.7	7	13.7
Waldo	1	2.6	8	22.1	12	31.2	19	49.6	19	49.6	25	65.3
Washington	0	0	0	0	0	0	3	9.2	4	12.3	8	24.9
York	97	49.4	133	71.2	172	85.4	291	144.3	264	130.9	174	86.2
Maine	245	18.6	338	25.6	529	40.2	908	69	970	73.7	734	55.7

All data includes both confirmed and probable cases



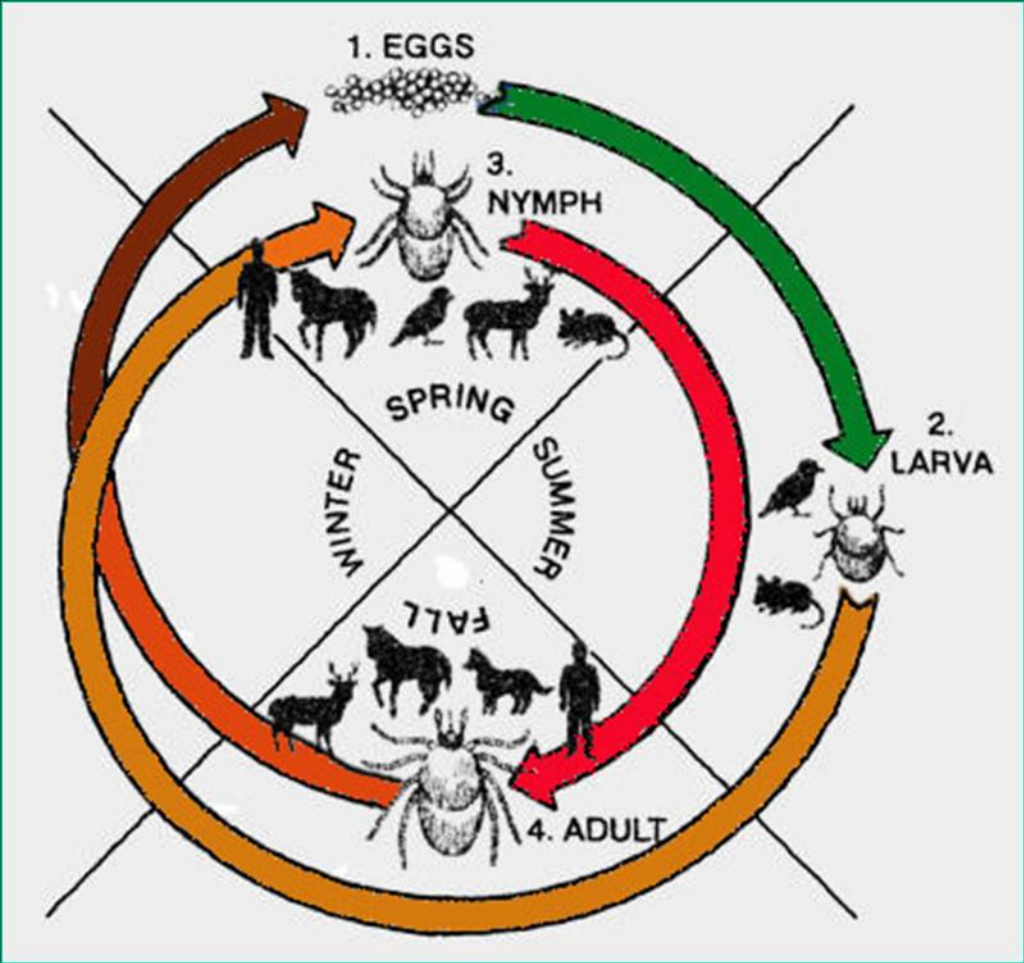
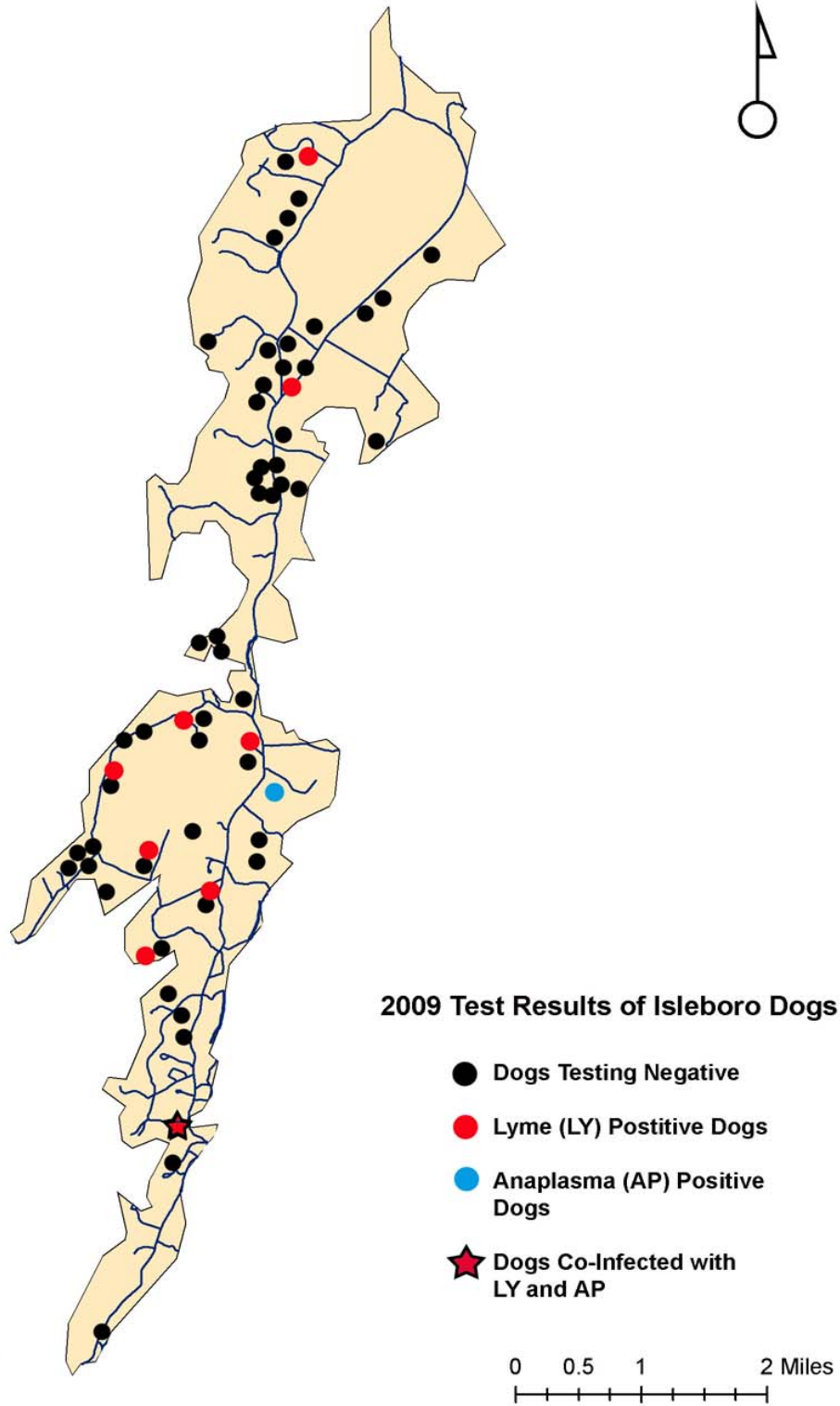


Table . Deer harvest trends on Islesboro, Waldo County, Maine.

Year	Adult		Fawn		Unk	Total	Total Per Sq. Mi.
	Buck	Doe	Buck	Doe			
1992	22	9	1	1	0	33	2.3
1993	8	9	1	0	0	18	1.3
1994	20	3	1	0	0	24	1.7
1995	20	15	0	0	0	35	2.5
1996	24	9	1	1	0	35	2.5
1997 ^a	33	21	2	2	1	59	4.2
1998	37	20	1	3	0	61	4.3
1999	39	33	2	1	2	77	5.4
2000	44	35	1	3	0	83	5.8
2001	59	71	4	5	1	140	9.9
2002	18	109	0	2	8	137	9.6
2003	44	64	6	10	3	127	8.9
2004	61	69	7	8	3	148	10.4
2005	41	89	12	11	1	154	10.8
2006	42	70	12	11	1	136	9.6
2007	61	83	17	14	0	175	12.3
2008	64	117	21	21	1	224	15.8
2009	75	111	30	14	2	232	16.3
2010	49	63	16	17	1	146	10.3

^aExpanded archery season implemented in 1997 to present.

Note: Islesboro is roughly 14.2 sq. mi.



TOWN OF ISLESBORO

CHRONOLOGY OF TICK-BORNE DISEASE PREVENTION WORK TO DATE

- 1997 On the initiative of the Health Center, the Vector-borne Disease Laboratory (V-BDL) conducts a tick survey. Found 0.5 ticks per hour, 0 were infected.
- 2006 Second tick survey by V-BDL. 3.5 ticks per hour, 24.0 % infected. Dr. Peter Rand gives “Tick Talk” for Islesboro community.
- October 23, 2008 Health Center Advisory Board (HCAB) meeting. Edie Konesni reports that to date in 2008, there were 18 new cases of Lyme disease on Islesboro, as opposed to 7 new cases in 2007. She says that Lyme disease prevention should be an urgent priority for the HCAB and recommends that a sub-committee be formed to gather information on the subject. The following join the committee: Jack Coffin, George Evans, Linda Gillies, Laura Houle and Jennifer Whyte.
- October 29, 2008 First meeting of the “Tick Committee” (the Committee). Committee members each volunteer to look into various aspects of Lyme disease prevention.
- November 4, 2008 Second meeting of the committee. Members pool their preliminary findings, agree to incorporate the information into a written report.
- November 7, 2008 Response from Pete Rand at the V-BDL saying that Islesboro “has a lot to offer as a site for a research project which would track both tick abundance and infection rate in response to island-wide interventions” (*Email correspondence with Pete Rand November – January – Attachment A*).
- November 13, 2008 HCAB meeting. The completed report is circulated to HCAB staff and Advisory Board members (*Attachment B*). Principal recommendations were:
- The health threat posed to residents of Islesboro by the presence of the deer tick appears to be serious and should become a top priority for the Health Center, the Health Center Advisory Board and the Town of Islesboro.
 - To determine the course of action to address this potential problem, the Health Center Advisory Board should initiate a medical and scientific

Islesboro Tick-borne Disease Prevention Committee Report

inquiry into the incidence of Lyme disease on Islesboro, its causes and what steps, if any, should be taken to address the problem.

- Staff of the V-BDL and the Department of Inland Fisheries and Wildlife, recognized authorities on issues related to Lyme disease, should be enlisted at the outset in order to assist in the design and implementation of the Health Center's inquiry.
- The Health Center should inform the Board of Selectmen of this initiative and should keep the Selectmen briefed on an ongoing basis.
- While the inquiry is being carried out, the Health Center should make every effort to inform islanders of the risk of tick bites, how to avoid the and how to control ticks on their properties.

There is agreement that the issue of Lyme disease should be presented to the Selectmen.

- November 27, 2008 Third Committee meeting. Committee's findings indicate that the first steps in a Lyme disease prevention program are surveys of both tick and deer density. Because of staff shortages, IF&W is unable to conduct the deer survey; V-BDL will be able to conduct the tick survey. The committee agrees to secure a proposal from V-BDL and to enlist assistance from IF&W in finding an organization that that could assist with the deer surveys. Pete Rand of V-BDL emails his on November 28 (*see Attachment A*); Lee Kantar recommended Woodlot Alternatives (which has been acquired by Stantec) and sent information about deer surveys on December 3 (*Attachment C*).
- December 3, 2008 Fourth Committee meeting. Agree to secure proposals from Woodlot Alternatives and to investigate "fly-by" alternatives. (*Meeting summary, Attachment D*).
- January 2009 Linda Gillies has conversations with Susan Bernatas of Vision Air and Steven Pelletier of Stantec ; both submitted proposals (*Attachments E and F*).
- January 15, 2009 HCAB meeting, Marnie Diffin present. Board reviews Vision Air and Stantec proposals and decides that in all probability, the Stantec proposal was more appropriate to Islesboro's heavily wooded topography. Board discusses presentation to Board of Selectmen. Marnie Diffin agrees to add an item for \$20,000 under the Public Safety category in the Town budget to cover the cost of both the Stantec and V-BDL surveys. If funding is available, the surveys to be taken in the spring and fall of 2010 (*Meeting summary, Attachment G*).
- May 3, 2009 Town Meeting approves allocation of \$15,000

Islesboro Tick-borne Disease Prevention Committee Report

- Spring/Summer 2009 In cooperation with local veterinarians, V-BDL conducts Islesboro/Midcoast Canine Lyme Disease/Anaplasmosis Serosurvey. Of the 65 Islesboro dogs tested, 13.8% carried antibodies for Lyme disease.
- Summer 2009 Health Center disseminates information about Lyme disease through providing information to various groups with outdoor activities, articles in the IIN and displays at the post office, ferry landing and Health Center.
- Health Center diagnoses 9 new cases of Lyme disease May – September
- Health Center negotiates with Canadian Helicopter in New Brunswick to do deer count via helicopter.
- Oct/Nov 2009 Vector Borne Disease Laboratory conducts survey of deer ticks at 20 locations on Islesboro (*Attachment H*). 5.0 ticks per hour, 48.4 % infected, a 50% increase over 2006.
- Canadian Helicopter declines to do survey because of international security restrictions and on the grounds that the deer will not be visible from the air because of Islesboro's heavy soft wood cover.
- January 2010 Health Center negotiates with Stantec to conduct deer survey in March; use of island volunteers reduces price.
- March 15-18, 2010 Michael Johnson and Tom Tetreau, biologists from Stantec, organize deer count. Under the direction of Vicki Conover and Heather Sinclair, the 9th grade biology class participated, as did 17 Islesboro volunteers coordinated by Laura Houle.
- April 7, 2010 9th grade biology class makes presentation about deer survey at Science Night. They conclude that Islesboro has 75 deer per square mile.
- April 10, 2010 9th grade biology class makes presentation at the Maine State Geographical Information Systems competition in Augusta.
- April 14, 2010 Selectmen decide to establish a 7-member "Tick" committee.
- May 20, 2010 Stantec submits its deer count report, which concludes that Islesboro has 62 deer per square mile.
- May 24, 2010 First meeting of the "Tick" committee. Reviewed background information, elected Laura Houle as chair and Linda Gillies as secretary. Agreed on a mission and that the committee should be called the Lyme Disease Prevention Committee (LDPC), established a tentative timetable and meeting schedule.

Islesboro Tick-borne Disease Prevention Committee Report

- July 12, 2010 Second meeting of the LDPC. Agreed that the committee's primary tasks were 1) information gathering 2) reporting to and involving the Islesboro community.
- October 4, 2010 Linda Gillies meets with Lee Kantar at the IF&W office in Bangor.
- October 25, 2010 Third meeting of LDPC. It was agreed that: 1) a second deer count should be taken in March 2011 2) Laura Houle should submit an article for the November/December IIN 3) Laura Houle should report to the Selectmen at the November 10th meeting 4) Forum/s for the Islesboro community should be held after the committee has completed its recommendation and report.
- November 12, 2010 Pete Rand, Eleanor Lacombe and Chuck Lubeczyk of the Vector-borne Disease Laboratory conduct tick count. 93 ticks were collected during a total of 11.25 hours of flagging, equaling 8.3 ticks per hour, up from 5 ticks per hour in 2009. Percentage of infected ticks TBD.
- November 16, 2010 Laura Houle and Linda Gillies meet with Jim Connolly, Wildlife Biologist, Region B, by telephone conference call. They agree that forums for the community should happen after the committee has made its recommendation.
- Nov/Dec. 2010 Islesboro Island News has article by Laura Houle.
- December 6, 2010 Fourth meeting of LDPC. It was reported that Stantec, Inc. has been contacted about a March 2011 deer count and that further information about state regulations and procedures relating to hunting on Islesboro has been obtained. It was agreed that the committee should aim to complete its recommendation/report by April.
- January 2011 Town retains Stantec Consulting to conduct 2011 deer survey, contingent on approval of \$7,000 in additional funds at the Special Town Meeting scheduled for February 26, 2011. The survey to include 700 Acre Island (not included in 2010).
- January 2011 With the encouragement of the Vector-borne Disease Laboratory, committee changes its name to the Tick-borne Disease Prevention Committee (T-bDPC).
- January 20, 2011 IF&W takes aerial survey of Islesboro and 700 Acre Island. Because of snow conditions, the ability to detect deer was low and the survey did not provide a reliable estimate.

Islesboro Tick-borne Disease Prevention Committee Report

- February 7, 2011 Fifth meeting of the T-bDPC. It was agreed that the committee would prepare a statement to be read at the 2/26/11 Special Town meeting.
- February 24, 2011 Sixth meeting of the T-bDPC. Reviewed statement for 2/26/11 Special Town meeting.
- February 26, 2011 Special Town meeting approves \$7,000 in additional funds for deer survey.
- Tuesday, March 1, 2011 Committee members and volunteers send out mailing to 300 Islesboro and 700 Acre Island landowners requesting permission for access to their land during deer count. All but about 10 landowners give permission.
- April 11-14, 2011 Michael Johnson and Tom Tetreau, Wildlife Biologists from Stantec Consulting take deer count. There were 42 transects on Islesboro and 13 on 700 Acre Island. They completed their survey work on Islesboro in three days and 700 Acre Island in one day.
- May 18, 2011 Seventh meeting of the T-bDPC. Committee formulates recommendations.
- May 25, 2011 Committee submits submits report to Selectmen.