



*Commonwealth of Massachusetts*

HOUSE OF REPRESENTATIVES

# **Lyme Disease in Massachusetts: A Public Health Crisis**

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**A Report Issued by the House Committee on  
Post Audit and Oversight**

**April 2011**

Chairman David P. Linsky  
Vice Chairman Benjamin Swan

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## LETTER FROM CHAIRMAN DAVID P. LINSKY

Residents of the Commonwealth,

The occurrence of Lyme disease has reached near epidemic proportions in Massachusetts. Virtually every family in Massachusetts has been affected by Lyme disease in some way. Lyme disease is a public health crisis in the Commonwealth. Over 4,000 new cases of Lyme disease were reported in Massachusetts in 2009, the last year for which official totals are available. In reality, due to reporting issues, probably many times that number occurred.

The state's official response to Lyme disease can be characterized as haphazard at best. The state budget currently does not earmark any public funds for prevention, treatment or education. The Massachusetts Department of Public Health cannot itemize what it spends on Lyme disease. Only a few local Boards of Health have any significant plan or programs. As a result, millions of dollars are lost in employee absences due to Lyme disease. Each year, hundreds of school children miss school. Millions of dollars are spent in medical care.

At present, no one has a clear plan or recommendation for treatment, prevention or education. Some medical professionals question whether "chronic Lyme disease" even exists. Yet, it is clear that hundreds of Massachusetts residents are afflicted by its debilitating symptoms. Few people can effectively access treatment due to a lack of providers and problems with insurance coverage.

The Committee calls for a state chartered commission to immediately convene and bring together experts in medicine, wildlife management, public health, and insect control, as well as patients and advocates to propose solutions regarding treatment, prevention and education. The Committee calls upon health care providers and insurers to make all necessary treatment accessible and affordable and for the Massachusetts Department of Public Health to look into the possibility of combining tick control efforts with state mosquito control efforts. The Committee further calls upon the legislature to appropriate whatever funds are necessary to accomplish these goals.



Chairman David P. Linsky  
House Committee on Post Audit and Oversight

## **FACTS ON LYME DISEASE:**

### ***What:***

Lyme disease is caused by bacteria and is spread by infected ticks. Typically the tick must be attached to the human for at least twenty four hours for the bacteria to spread<sup>1</sup>.

### ***Where:***

Lyme disease most commonly occurs in the Northeast, mid-Atlantic and upper Midwest regions of the United States. Lyme disease has been reported in every city and town in Massachusetts.

### ***When:***

Lyme disease can occur at any time of year in Massachusetts. While the young ticks are the most active between the months of May and July, adult deer ticks are most active during the fall, spring, and when winter temperatures are above freezing.

### ***Prevention:***

When outside during times of the year when ticks are most prevalent and when in wooded or brush areas wearing long, light-colored pants tucked into socks or boots, and a long-sleeved shirt helps to protect skin from exposure. Staying on cleared paths also helps to limit contact with vegetation where there may be ticks. The use of repellent with DEET (the chemical N-N-diethyl-meta-toluamide) or permethrin has proven effective when used according to the instructions on the product label<sup>2</sup>. DEET products should not be used on infants under two months of age and should be used in concentrations of thirty percent or less on older children<sup>3</sup>. Permethrin products should not be applied directly to skin. Pet owners should talk to their veterinarian about tick control options such as tick collars and repellents for their animals. Pets can be both infected with Lyme disease as well as serve as carries of ticks into your home. After spending time in an area likely to have ticks, check yourself, children, and pets for ticks. Young

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<sup>1</sup> Massachusetts Department of Public Health, "Public Health Fact Sheet: Lyme Disease," June 2007, <http://www.mass.gov/Eeohhs2/docs/dph/cdc/factsheets/lyme.pdf>, accessed December 7, 2010

<sup>2</sup>"Public Health Fact Sheet: Lyme Disease,"

<sup>3</sup>"Public Health Fact Sheet: Lyme Disease,"

ticks, called nymphs, are the size of a poppy seed. Adult deer ticks are the size of a sesame seed. Both nymph and adult deer ticks can spread the bacteria that cause Lyme disease; however, nymphs are of more concern. Nymphs are aggressive feeders and are so tiny that it can be difficult to see them on the body. Ticks like places that are warm and moist; most commonly the back of the knees, armpits, groin, scalp, back of the neck, and behind the ears. Ticks attached to the body should be removed as soon as possible using fine-point tweezers<sup>4</sup>.

### ***Symptoms:***

Early symptoms which occur between three and thirty days after being bitten usually consist of rash where the tick was attached. It often, but not always, starts as a small red area that spreads outward, clearing up in the center so it looks like a donut<sup>5</sup>. Flu-like symptoms, such as fever, headache, stiff neck, sore and aching muscles and joints, fatigue and swollen glands may also occur. If not treated immediately later symptoms may occur months and even years later. A rash may develop on other areas of their body other than the site of the bite. More serious symptoms consist most commonly of joint, nervous system and heart problems<sup>6</sup>.

### ***Treatment:***

It is currently recommended by the Infectious Disease Society of America (IDSA) guidelines that early treatment with antibiotics is the best way to prevent further symptoms of Lyme disease. They suggest that twenty-eight days of treatment is enough to kill the bacteria that cause Lyme disease. The International Lyme and Associated Diseases Society (ILADS) in addition to the early treatment with antibiotics suggests that treatment should not be withheld based on laboratory testing, and that longer courses of antibiotics treatment is warranted, as well as the repeat antibiotics for recurrence<sup>7</sup>.

## **SURVEILLANCE AND REPORTING**

Surveillance conducted on Lyme disease is provided by physician-reporting on potential or confirmed Lyme disease cases. This information is then used to establish the demographics of

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<sup>4</sup> "Public Health Fact Sheet: Lyme Disease,"

<sup>5</sup> "Public Health Fact Sheet: Lyme Disease,"

<sup>6</sup> "Public Health Fact Sheet: Lyme Disease,"

<sup>7</sup> The International Lyme and Associated Disease Society, "ILADS Lyme Disease Treatment Guidelines Summary," [http://www.ilads.org/lyme\\_disease/treatment\\_guidelines\\_summary.html](http://www.ilads.org/lyme_disease/treatment_guidelines_summary.html), accessed March 18, 2011

the spread of the disease across the United States. There is currently no national, mandated uniform surveillance procedure for the reporting of Lyme disease. The Massachusetts Department of Public Health (MDPH), under the Bureau of Communicable Disease Control has issued surveillance, reporting, and control deadline regulations specific to Lyme disease. The MDPH mandates that all health care providers immediately report (within 24 hours) to the local board of health in the community where a Lyme disease case is suspected or diagnosed<sup>8</sup>. If the local board of health is unavailable then the health care provider should report to the MDPH. A *Lyme Disease Case Report Form* must be submitted to the MDPH's Office of Integrated Surveillance and Information Services. The MDPH provides the standardized form for submission which includes demographic information, clinical information, laboratory information, any multiple diagnosis, and exposure information (tick bite and travel history).

The MDPH surveillance on Lyme disease is regularly published and information on incidence rates by county is available on the MDPH website. More narrowly tracked data is available upon request from the Department<sup>9</sup>. The MDPH reports the data to the Center of Disease Control (CDC) which also publishes the information on their website. While the CDC mandates reporting deadlines for Lyme disease, the MDPH has found that the reporting of cases to the Department often comes months and even years after the CDC's deadline. For this reason, the MDPH continues to collect information as reported to the Department, often increasing the numbers reported to the CDC significantly. In addition to continued reporting assistance, the MDPH provides technical assistance to providers and local boards of health on diagnosis, confirmatory testing, and follow-up procedures<sup>10</sup>. MDPH has presented and briefed legislators individually as well as through the Joint Committee on Public Health on issues related to Lyme disease<sup>11</sup>.

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<sup>8</sup> Massachusetts Department of Public Health Bureau of Communicable Disease Control, "Guide to Surveillance, Reporting and Control; Lyme Disease," June 2006, pg. 459, [http://www.mass.gov/Eeohhs2/docs/dph/disease\\_reporting/guide/lyme.pdf](http://www.mass.gov/Eeohhs2/docs/dph/disease_reporting/guide/lyme.pdf), accessed December 14, 2010

<sup>9</sup> Delaney, Daniel; MDPH Legislative Liaison, email message to Chairman David Linsky, "DPH Lyme Disease Response," January 5, 2011

<sup>10</sup> Delaney, January 5, 2011

<sup>11</sup> Delaney, January 5, 2011

## LYME DISEASE IN MASSACHUSETTS

Based upon the numbers reported to the Massachusetts Department of Public Health, the incidences of Lyme disease recorded have increased every year. The last reportable data, which is based on the number of reported cases in 2009, indicates that to date 4,045 cases of Lyme disease have been reported to the MDPH for 2009.

### Confirmed Lyme Disease Cases in Massachusetts by Year<sup>12\*</sup>

COUNTY	2005	2006	2007	2008	2009
<b>BERKSHIRE COUNTY</b>	75	79	100	128	101
<b>BRISTOL AND PLYMOUTH COUNTIES</b>	497	432	632	697	620
<b>CAPE COD COUNTIES</b>	355	253	386	277	252
<b>ESSEX COUNTY</b>	270	281	384	374	297
<b>FRANKLIN COUNTY</b>	25	16	31	52	53
<b>HAMPDEN COUNTY</b>	125	140	149	183	196
<b>HAMPSHIRE COUNTY</b>	71	64	76	102	118
<b>NORFOLK COUNTY</b>	260	285	400	461	462
<b>SUFFOLK AND MIDDLESEX COUNTIES</b>	509	544	753	834	702
<b>UNKNOWN</b>	19	44	275	502	827
<b>WORCESTER COUNTY</b>	255	377	387	509	417
	2461	2515	3573	4119	4045

\*Data as of January 13, 2011 and are subject to change. Due to MDPH confidentiality requirements, selected county data have been combined to maintain confidentiality. Town specific data provided by the MDPH is available at the end of this report (See **Appendix 1**).

Data collected by the MDPH’s surveillance proves that the incidences of Lyme disease continue to increase across the Commonwealth, and that the reporting of cases typically takes longer than the CDC’s deadline in order to be compiled and analyzed due to the lack of succinct

<sup>12</sup> Massachusetts Department of Public Health Bureau of Infectious Disease Prevention, Response and Services Office of Integrated Surveillance and Informatics Services, “Confirmed Lyme Disease Cases in Massachusetts by Year,” February 2011

mandating and diagnostic tools. Yale scientists believe that the increase in number of Lyme cases may be due to climate change. Other researchers suggest that human impact on deer populations may also be a cause. There still exists however, a lack of substantial information regarding the spread of Lyme disease across the country<sup>13</sup>.

## RESEARCH AND OUTREACH

### *Vaccine:*

Research and studies on Lyme disease that have been initiated by states or provided for by the U.S. Department of Public Health and Human Services grant for Lyme disease have included research and evaluation of prevention, detection, and treatment of the disease as well as vaccine formulations to prevent transmission<sup>14</sup>. *LYMERix*, a vaccine to prevent Lyme disease was created in 1998, however was pulled off the market in 2002, “citing low demand”<sup>15</sup>. Controversy arose about the drug’s safety and efficacy and it was brought before the FDA for review in 2001. After *LYMERix* was pulled off the market, the U.S. Senate adopted a bill in 2003 that appropriated \$448,386 to Yale University School of Medicine to further fund vaccine research<sup>16</sup>. While research has been conducted regarding Lyme vaccination; no vaccinations have been released for federal approval since *LYMERix*. Awards have also been granted to fund field trials evaluating the efficacy of natural products for the control of tick vectors of Lyme disease.

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<sup>13</sup> Gatewood, Anne G., “Climate and Tick Seasonality Are Predictors of *Borrelia burgdorferi* Genotype Distribution,” *Applied and Environmental Microbiology*, 2009; 75 (8): 2476 DOI: [10.1128/AEM.02633-08](https://doi.org/10.1128/AEM.02633-08), <http://aem.asm.org/cgi/content/abstract/75/8/2476>, accessed January 14, 2011

<sup>14</sup> Department of Health and Human Services, Office: Centers for Disease Control and Prevention, “Research, Treatment and Education Programs on Lyme Disease in the United States,” *Catalogue of Federal Domestic Assistance*, Number: 93.942, <https://www.cfda.gov/?s=program&mode=form&tab=step1&id=59accaab11927ab51e04db0e184e3e41>, accessed December 6, 2010

<sup>15</sup> Centers for Disease Control and Prevention, “Vaccines and Immunizations; Lyme Disease Vaccination,” <http://www.cdc.gov/vaccines/vpd-vac/lyme/default.htm>, accessed January 3, 2011

<sup>16</sup> Office of Senator Christopher Dodd, “Dodd, Lieberman Announce Federal Support For Lyme Disease Vaccine Research; Yale Study Awarded Nearly \$500,000 to Focus on Feeding Process of Ticks to Halt Spread of Disease,” 108<sup>th</sup> Congressional 1<sup>st</sup> Session, April 1, 2003, <http://dodd.senate.gov/press/Releases/03/0401.htm>, accessed January 3, 2011

### ***Tick Control Methods:***

- **Management of Host Abundance:**

- **White-tailed Deer, *Odocoileus virginianus* (Zimmerman):** It is estimated that from New Jersey and New York to Maine the deer population is 1,918,000<sup>17</sup>. Overabundance of deer is associated with problems such as deer/vehicle collisions, agricultural damage, lack of forest regeneration, detrimental impacts on other wildlife (especially birds), damage to residential landscapes, spread of seeds of invasive plants, and the rising incidence of Lyme disease<sup>18</sup>. The abundance and distribution of *Ixodes scapularis*, otherwise known as the blacklegged or deer tick, has been related to the size of the deer population. It has been estimated that over 90% of adult ticks feed on deer, each laying approximately 3,000 eggs. Deer serve as the transport for the female ticks to property where they can lay thousands of eggs, increasing the number of larval ticks available to feed on smaller animals. Deer management options include deer fencing, repellents, and deer population reduction<sup>19</sup>.

- **Deer Fencing and Repellents:** Building fences can deter the deer from entering property and therefore help limit the travel of infected ticks. Deer repellents may help defer the deer elsewhere as well reduce the damage to plants. Repellent performance is highly variable depending upon the product, rain, frequency of application, and the availability of other food sources for deer<sup>20</sup>. Some repellents are only effective with low to moderate deer densities<sup>21</sup>. It is important to note that neither reduce the amount of ticks carrying the disease but rather reduce the tick's hosts, therefore helping to reduce the spread of the bacteria.
- **Deer Management and Reduction:** Deer management in Massachusetts is broken down to fifteen zones by the Division of Fisheries and Wildlife

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<sup>17</sup> Stafford, Kirby C. III, "Tick Management Handbook; An integrated guide for homeowners, pest control operators, and public health officials for the prevention of tick-associated disease,"

The Connecticut Agricultural Experiment Station, The Connecticut General Assembly, 2007, pg. 52, <http://www.cdc.gov/ncidod/dvbid/lyme/resources/handbook.pdf>, accessed February 16, 2011

<sup>18</sup> Stafford, pg. 52

<sup>19</sup> Stafford, pg. 52

<sup>20</sup> Stafford, pg. 54

<sup>21</sup> Stafford, pg. 54

(See **Appendix 2**). Each zone’s deer population is monitored by the Division to track population effects. It has been shown in studies that the incremental removal, reduction or elimination of deer has substantially reduced the amount of ticks. Observational studies and computer models suggest that a reduction of deer densities to less than twenty deer per square mile may significantly reduce tick bite risk, and interrupt the “enzootic cycle of Lyme disease and transmission of *Borrelia burgdorferi*, the bacteria that causes Lyme disease, to wildlife and humans”<sup>22</sup>. Lethal management options for deer are effective, though controversial, while the use of anti-fertility agents remains experimental and labor intensive<sup>23</sup>.

*Hunting Regulations in Massachusetts:*

- Deer hunting season is dependent upon the weapon, but typically is between mid-October through the end of December.
- Licenses are available to persons over the age of fifteen<sup>24</sup>.
- Deer hunting is limited to two buck tags per season; however permits for doe hunting are typically dispersed by hunting zone and are based on a lottery system.
- Hunting is permitted in Wildlife Management Facilities, some Department of Conservation and Recreation-managed facilities, and private property with written consent from a landowner.
- While some towns have by-laws prohibiting the release of a fire arms, or requiring written permission from a land owner, it is the interpreted by the Division of Fisheries and Wildlife that state laws supersede the by-laws, and therefore hunting on the Division’s land is permitted.
- There are currently no state lands in Massachusetts that are in towns that have by-laws restricting the discharge of firearms.

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<sup>22</sup> Stafford, pg. 55

<sup>23</sup> Stafford, pp. 55-56

<sup>24</sup> Massachusetts Department of Fish and Wildlife, “2011 Massachusetts Fish & Wildlife guide to hunting, freshwater fishing and trapping,” pg. 27, [http://www.mass.gov/dfwele/dfw/regulations/abstracts/hunt\\_fish\\_abstracts.pdf](http://www.mass.gov/dfwele/dfw/regulations/abstracts/hunt_fish_abstracts.pdf), accessed February 17, 2011

- There are however state lands within towns that have written permission laws. In these cases the state is the owner of that property and consent is implied.
  - The Department of Conservation and Recreation (DCR) property follows similar laws and regulations to that of the Division of Fisheries and Wildlife.
- **Host-Targeted Chemical Tick Control for White-Tailed Deer:** The U.S. Department of Agriculture's, Agricultural Research Service (ARS), developed a self-treatment method for white-tailed deer to kill ticks feeding on deer. A "4-Poster" was designed for the application of topical acaricides (insecticides that kills ticks) to white-tailed deer to prevent the successful feeding of adult ticks. It consists of a feeding station with four paint rollers that hold pesticide. Deer treat themselves by brushing against the rollers as they feed on corn. Computer simulations of various intervention scenarios suggest that acaricide applied to white-tailed deer (assuming 90% of deer are treated and 90% tick mortality on these deer) would prevent more cases of human Lyme disease<sup>25</sup>. Permethrin is the chemical used as a tick repellent on clothing and as an acaricide in some louse and scabies mite treatment products for human use. Acaricide is not to be used less than one hundred yards from any area where children might be present without adult supervision.
- **Rodents:** The white-footed mouse, *Peromyscus leucopus*, is generally the most abundant and efficient animal host for the Lyme disease bacteria. White-footed mice also are reservoirs for the causal agents of *anaplasmosis* and *babesiosis*. Over 90% of white-footed mice will be infected with *Borrelia burgdorferi* in many areas and up to half have been found to carry all three pathogens in some areas.
  - **Host-Targeted Chemical Tick Control for Rodents:** The first rodent-targeted product was a cardboard tube of cottonballs treated with the insecticide permethrin (Damminix® Tick Tubes)<sup>26</sup>. The product is aimed at

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<sup>25</sup> Stafford, pg. 57

<sup>26</sup> Stafford, pg. 61

larvae and nymphs of black-legged ticks feeding on white-footed mice. Its effectiveness is dependent upon the mice collecting the cotton as nesting material from cardboard tubes and then distributing them throughout the mouse habitat. Although reductions in tick numbers were reported in a couple of Massachusetts studies, evaluations in Connecticut and New York failed to show any reduction in the number of infected, host-seeking *Ixodes scapularis* nymphs when this product was used for a three-year period in woodland and residential areas of about four acres or less<sup>27</sup>. Lack of control may be due to failure of the mice in some areas to collect the cotton or the presence of alternative tick hosts, such as chipmunks; an important secondary tick host and *Borrelia burgdorferi* reservoir<sup>28</sup>. Reductions in tick numbers were reported in an eighteen acre tract study conducted in Massachusetts. Bait boxes used for the topical treatment of rodents with fipronil, were first successfully evaluated for the control of *Ixodes scapularis* on wild white-footed mice on Mason's Island in Connecticut, where the prevalence of infection of *Borrelia burgdorferi* in the mice dropped dramatically after one year and nymphal tick populations were substantially reduced after only two years of use. Fipronil is the active ingredient in topical or spray flea and tick control products (Frontline®). In the laboratory, a single topical application to a mouse can kill all ticks on the animal for four-six weeks. A commercial version called the Maxforce® Tick Management System was available through licensed pesticide applicators and consisted of a sealed, ready to use, child resistant box containing nontoxic food blocks and an applicator wick containing 0.70% fipronil. Due to added costs from a metal shroud required to prevent squirrels from chewing into the boxes, the Maxforce® Tick Management System is no longer being manufactured by Bayer Environmental Science<sup>29</sup>.

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<sup>27</sup> Stafford, pg. 61

<sup>28</sup> Stafford, pg. 61

<sup>29</sup> Stafford, pg. 61

- **Prevention of Tick-Associated Disease in Companion Animals:** Vaccination prior to tick exposure will provide better protection for pets, but vaccination after treatment can help reduce future infection<sup>30</sup>.
- **Management of the Ticks**
  - **Reducing Tick Habitat:** Altering landscapes to increase sunlight and lower humidity may make an area less hospitable to ticks<sup>31</sup>. Adjusting and planting landscapes so that they are dry and sunny will defer tick populations to more humid and wooded areas. “Xeriscaping” is the application of water conserving landscape practices. This approach reduces habitat cover, helps isolate frequently used areas, and can provide an attractive focal area in the yard or garden and reduce maintenance and water, fertilizer, and chemical use<sup>32</sup>.
  - **Chemical Control of Ticks:** Acaricides, are considered the most effective way to reduce ticks, particularly when combined with the landscaping changes to decrease tick habitat<sup>33</sup>. Chemical intervention should focus on early control of nymphal *Ixodes scapularis* ticks, the stage most likely to transmit Lyme disease, by spraying once in May or early June. A fall application may also be used to control adult blacklegged ticks. Targeting lawn, woodland edges, and perimeter areas near tick “hot-spots” or along the “tick zone” can minimize exposure<sup>34</sup>.

Both liquid and granular formulations have been reported effective against blacklegged or deer ticks with somewhat better control usually obtained with liquid formulations. “Synthetic pyrethroid insecticides” are the most commonly used tick control agents<sup>35</sup>. Bait boxes that treat wild rodents with acaricide are now available for home use. When properly used, these boxes have been shown to reduce ticks around homes by more than 50%. The treatment is similar to products used to control fleas and ticks on pets and it does not harm rodents. Bait

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<sup>30</sup> Stafford, pg. 62

<sup>31</sup> Stafford, pp. 47-48

<sup>32</sup> Stafford, pg. 50

<sup>33</sup> Stafford, pg. 63

<sup>34</sup> Stafford, pg. 63

<sup>35</sup> Stafford, pg. 64

boxes are available from licensed pest control companies in many states and are available in Massachusetts<sup>36</sup>.

- **Biological Control of Ticks:** Ticks have relatively few natural enemies, but the use of predators, parasites, and pathogens have been examined for tick control. Tick predation is difficult to document and observations are sporadic<sup>37</sup>. The application of insect pathogenic fungi, however, has proven to be a promising approach for controlling ticks. Several fungi, such as *Beauveria bassiana* and *Metarhizium anisopliae* have been shown to be pathogenic to *Ixodes scapularis* in the laboratory and field. A perimeter treatment of existing commercial formulations of the fungus *Beauveria bassiana* and *Metarhizium anisopliae* at residential sites have been shown to control *Ixodes scapularis* in small experimental trials<sup>38</sup>. *Metarhizium* is a naturally occurring soil fungus that is considered nonpathogenic to mammals. The fungus infects host insects (and ticks) when conidia (spores) attach to the host cuticle, germinate, penetrate the cuticle and hyphae grow<sup>39</sup>. *Metarhizium* also produces insect toxic secondary metabolites. The green muscardine fungus *Metarhizium anisopliae* strain 52 is being developed as a tick control biopesticide by Novozymes Biologicals Inc. in Salem, Virginia. Additional residential trials with this fungus in Connecticut and New Jersey in 2007 provided good control of nymphal *Ixodes scapularis*<sup>40</sup>. A granular product is also currently under development. This fungus poses minimal risk to non-target organisms and does not harm many beneficial insects such as honey bees, green lacewings, lady beetles, parasitic Hymenoptera or earthworms at rates suggested. The *Metarhizium* spores, applied like a traditional pesticide, may become an option in future tick management programs and could readily meet organic standards<sup>41</sup>.

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<sup>36</sup> Vermont Department of Public Health , “Tools for Tick Control,” <http://healthvermont.gov/prevent/lyme/landscape.aspx>, accessed February 16, 2011

<sup>37</sup> Stafford, pg. 70

<sup>38</sup> Stafford, pg. 70

<sup>39</sup> Stafford, pg. 70

<sup>40</sup> Stafford, pg. 70

<sup>41</sup> Stafford, pg. 70

***Massachusetts Action:***

Within the Commonwealth of Massachusetts the MDPH provides a small amount of surveillance, research, reporting, and outreach efforts on Lyme disease. They provide some resources to public health officials about prevention, recognition, and treatment of Lyme disease. Their public awareness and outreach initiatives consist of producing and distributing fact sheets, reports and public service announcements on Lyme disease and other tick-borne illnesses<sup>42</sup>. While their efforts do spread across many of the areas concerning Lyme disease, such efforts and programs provided for by the MDPH are not appropriated separately through the Department's budget but rather are funded through the Bureau of Infectious Disease, the Hinton State Laboratory, and the MDPH communication office<sup>43</sup>. Because the funding for Lyme disease prevention efforts are accrued this way, there is no guarantee that such efforts can and will continue and no specific dollar amounts spent can be determined at this time.

## **PARTIES INVOLVED**

***Patients and Advocacy Groups:***

Lyme disease advocacy groups from across the Commonwealth, as well as the country, have taken up Lyme disease as a public issue due to the hundreds of victims that suffer each year. They often, both individually and collectively, lobby for Lyme disease-related legislation and rights. Their main concerns consist of the lack of availability of physicians who will treat chronic Lyme disease and insurance coverage for long-term antibiotics in Massachusetts. The passage of H.4683 filed by Representative Harriet L. Stanley on May 18, 2010 and adopted into Massachusetts General Laws under Chapter 112 under section 12cc within the Fiscal Year 2011 budget protects physicians who prescribe long-term antibiotic treatment for patients diagnosed with Lyme disease. The Lyme disease advocacy community however does not feel as though this is adequately addressing the problem here in Massachusetts due to the perceived "peer pressure" from other physicians on doctors who treat Lyme disease. In addition to this perceived internal pressure, they also express their frustration with insurance companies who will not approve Lyme disease treatments longer than the IDSA's recommended twenty-eight day treatment.

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<sup>42</sup> Delaney, January 5, 2011

<sup>43</sup> Delaney, January 5, 2011

***Medical Community:***

The medical community; ranging from physicians to medical research institutes, have varied perceptions of Lyme disease and appropriate treatment methods. While some physicians treat for acute as well as chronic Lyme disease, there are others who feel as though the research that currently backs the IDSA's recommendation on twenty-eight days of antibiotic treatment for all Lyme disease patients is the most accurate and therefore continue to follow their guidelines. ILADS has released their own research regarding Lyme disease which is contrary to the IDSA's in that their recommendation for the duration of therapy is guided by clinical response, rather than by a specific timeline<sup>44</sup>.

***Insurance Companies:***

Insurance companies rely upon guideline criteria to determine whether a claim is justified. Insurance companies in Massachusetts have typically followed IDSA guidelines rather than ILADS and therefore patients being prescribed treatment for longer than twenty-eight days often have their treatment denied by the insurance companies. This is a critical issue for those afflicted with long-term or chronic Lyme disease.

***State Agencies:***

The MDPH continuously compiles resources regarding Lyme disease surveillance as well as educational materials for schools and local boards of health. The Department also provides outreach through press releases when particular "hot spots" or tick hatchings are brought to their attention. The Department however does not have specific funding allocated to provide this to the Commonwealth and often have to take resources from other areas if available.

***Legislature:***

The legislature is currently researching what has previously and what is currently being done both in the Commonwealth of Massachusetts as well as other states across the country in order to help provide citizens of Massachusetts with a guide and legislation to better address the issues surrounding Lyme disease.

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<sup>44</sup> ILADS, "Summary of ILADS Guidelines for Lyme Disease," [http://www.ilads.org/lyme\\_disease/treatment\\_guidelines\\_clearing\\_ilads.html](http://www.ilads.org/lyme_disease/treatment_guidelines_clearing_ilads.html), accessed March 8, 2011

## LEGISLATION

States across the country, and in particular in the Northeast, have passed legislation regarding Lyme disease in areas ranging from mandating health insurance coverage of physician treatment, issuing state-wide task forces, establishing Lyme disease awareness months, and mandating case reporting guidelines. There still exists however, no Federal legislation specifically focused on Lyme disease research, treatment, surveillance regulation, or funding.

### ***Federal:***

Every session since 2005, Congress has introduced legislation regarding Lyme and tick-borne disease prevention education and research. Most recently the 111<sup>th</sup> United States Congress introduced HR.1179/ S.1352; *To provide for the expansion of Federal efforts concerning the prevention, education, treatment, and research activities related to Lyme and other Tick-borne disease, including the establishment of a Tick-Borne Diseases Advisory Committee*, in 2009. HR.1179 was introduced on February 25, 2009 by Representative Christopher Smith (R-NJ4) and was last reported to the Subcommittee on Health on February 26, 2009. S.1352 was introduced on June 25, 2009 by Senator Christopher Dodd (D-CT) and was last reported to the Committee on Health, Education, Labor, and Pensions. It has been reported that similar legislation will be filed during the 112<sup>th</sup> Congressional Session which will exclude the Federal funding portion of the bill. On September 29, 2010 Congressman Christopher Smith introduced into the Congressional Record a report that exposed the research gaps in Lyme disease. The report was submitted by three Lyme disease organizations; the NJ based national Lyme Disease Association (LDA), the California Lyme Disease Association (CALDA), and the Connecticut-based Time for Lyme (TFL). The report was originally commissioned by the Institute of Medicine (IOM) study group as part of a scientific workshop which was initiated through Congressional Appropriations language. The three groups objected to the IOM process which they believe permits bias on the workshop committee and lack of transparency<sup>45</sup>. Concerns have also been raised on the perceived control that the IDSA has on the Lyme disease debate and the

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<sup>45</sup> Lyme Disease Association, INC., "Research Gaps in Lyme Disease Exposed in the Congressional Record," October 5<sup>th</sup> 2010, [http://www.lymediseaseassociation.org/index.php?option=com\\_content&view=article&id=712:research-gaps-in-lyme-disease-exposed-in-the-congressional-record&catid=6:news-releases&Itemid=399](http://www.lymediseaseassociation.org/index.php?option=com_content&view=article&id=712:research-gaps-in-lyme-disease-exposed-in-the-congressional-record&catid=6:news-releases&Itemid=399), accessed December 7, 2010

fear of persecution of doctors by insurance companies who treat Lyme disease for longer than twenty-eight days.

***State:***

During 2009 seven states, including Massachusetts, introduced legislation related to Lyme disease. New Hampshire introduced HB.1326; the “Doctor Protection Bill”, which was related to the long-term treatment of Lyme disease. This bill ultimately died due to controversy over amendments. Maryland passed three Lyme disease-related bills in 2009. Minnesota introduced SF.1631 which passed out of Senate Committee and HF.2597 which was read in the House and tabled. Both bills were relative to Lyme disease treatment and addressing the Board of Medical Practice’s disciplinary action against a physician for prescribing, administering, or dispensing long-term antibiotic therapy for chronic Lyme disease. In place of the bill, an agreement was reached with the Minnesota Medical Board, which passed a doctor protection agreement (patient, parent, guardian etc. complaints can still generate action by medical board)<sup>46</sup>. New Jersey introduced AR.202/SR.133 which asked New Jersey legislature to memorialize formation of NeuroEndocrineImmune Center that includes Gulf War Syndrome, multiple chemical sensitivity, chronic fatigue syndrome, and Lyme disease. SR.133 did not come up for a vote in Senate. A new resolution, SR.20, which encompassed the same idea, but was introduced without the words “Lyme disease”, was passed in June of 2010<sup>47</sup>. The New Jersey legislature also adopted legislation that made May “Lyme disease awareness month”. The New Jersey Department of Education adopted “NJ Core Curriculum Content Grade 6; a section on Disease & Health Conditions which compares and contrasts diseases and health conditions prevalent in adolescents, including: asthma, obesity, diabetes, Lyme disease, STDs, and HIV/AIDS”<sup>48</sup>. Pennsylvania introduced SB.1199/HB.894 which included doctor protection, insurance, and a task force on TBDs, however they were never adopted. SB.346; *An Act Providing for Lyme Disease Education, Prevention, and Treatment* was also introduced but was never passed. Rhode Island enacted a Lyme disease curriculum bill; Chapter 087 / 2010 – H.7418/S.2265 in which the

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<sup>46</sup> “Research Gaps in Lyme Disease Exposed in the Congressional Record”

<sup>47</sup> “Research Gaps in Lyme Disease Exposed in the Congressional Record”

<sup>48</sup> “Research Gaps in Lyme Disease Exposed in the Congressional Record”

Lyme Disease Association (LDA) proposed new language changes related to the treatment of Lyme disease<sup>49</sup>.

***Massachusetts:***

In 2005 two public hearings on Lyme disease were held. The first hearing was hosted by the House Chairman of Joint Committee on Public Health; Peter J. Koutoujian in Ayer, Massachusetts. For that hearing the LDA was asked to submit a letter containing their recommendations to the Committee. The second hearing was on October 12, 2005. The hearing was conducted by the Joint Committee on Public Health. The LDA was asked to provide a panel of doctor experts followed by citizen testimony. Most of the testimony consisted of personal stories of Lyme disease and the inability of patients to be diagnosed or treated in the Commonwealth. Many stated their need to going out of state to receive treatment. The lack of a definitive test and protection for treating physicians was also mentioned.

During the 186<sup>th</sup> General Court Session of the Commonwealth of Massachusetts, Representative Theodore C. Speliotis filed H.1038; *An Act Relative to Lyme Disease treatment Coverage* on January 12, 2009. Representative Jennifer Callahan filed H.3592; *An Act Relative to Tick Borne Illnesses* on January 13, 2009. Representative Robert S. Hargraves filed H.1148; *An Act Relative to the Treatment of Lyme Disease* on May 20, 2009. H.3592 and H.1148 were then combined by the Joint Committee on Public Health and were filed by Chairman Jeffrey Sanchez as H.4480; *A Resolve Relative to Lyme Disease and Associated Co-Infections*. Representative Jennifer Benson filed H.4471; *An Act Establishing a Public Health Research Institute at the University of Massachusetts Medical School at Worcester* on December 17, 2009.

H.4683 was filed by Representative Harriet L. Stanley on May 18, 2010 and was adopted into Massachusetts General Laws under Chapter 112 under section 12cc within the Fiscal Year 2011 budget. This law established that “a licensed professional may prescribe, administer or dispense long-term antibiotic therapy for a therapeutic purpose to eliminate infection or to control a patient’s symptom upon making a clinical diagnosis that the patient has Lyme disease or displays symptoms consistent with a clinical diagnosis of Lyme disease, if such clinical diagnosis and treatment are documented in a patients’ medical record by the prescribing licensed

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<sup>49</sup> “Research Gaps in Lyme Disease Exposed in the Congressional Record”

physician”<sup>50</sup>. By legally permitting doctors to clinically diagnose and treat patients long term, the State Medical Board is prohibited from bringing charges against a doctor solely for prescribing long-term antibiotic treatment for Lyme disease. To date the Board has yet to file any charges against a physician for prescribing long-term antibiotic treatment for Lyme disease.

For the 187<sup>th</sup> General Session, five officials have filed legislation related to Lyme disease. Representative Theodore C. Speliotis filed H.329; *An Act relative to Lyme Disease treatment coverage*, which would provide that subscribers of any health insurance and health maintenance organization be afforded coverage under that plan for diagnostic testing and long-term antibiotic treatment of chronic Lyme disease, when determined to be medically necessary and ordered by a physician after making a thorough evaluation of the patient’s symptoms, diagnostic test results, and response to treatment. Treatment otherwise eligible for benefits pursuant to this section would not be denied solely because such treatment may be characterized as unproven, experimental, or investigational in nature. Representative Jennifer E. Benson filed bill H.349; *An Act establishing a public health Lyme disease research institute at the University of Massachusetts Medical School at Worcester*, which would establish a separate fund known as the Lyme Disease Research Institute Trust Fund to be used to provide funding grants to the University of Massachusetts Medical School at Worcester for Lyme disease research. Senator Michael O. Moore has filed S.1129; *An Act relative to lyme disease and associated co-infections*. Senator Moore’s bill would establish a Commission to investigate the cost-effectiveness of establishing a research institute at the University of Massachusetts Medical School, conducting a Lyme disease public health clinical screening study in high risk regions, developing education materials and training resources for clinical providers and school health personnel for detecting signs and symptom of tick-borne illnesses in school-aged populations and statewide surveillance and testing for tick-borne diseases in ticks. The Commission would also investigate the availability of grants and federal funds made available for the study of Lyme disease and associated co-infections, review any changes made to the 2006 Infectious Disease Society of America’s Lyme disease treatment guidelines in response to the Connecticut Attorney General’s investigation into the development of said guidelines, and investigate the issue of chronic Lyme disease and its treatment. Chairman David P. Linsky of the House Post Audit and Oversight

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<sup>50</sup> FY2011 Massachusetts State Budget, “Lyme Disease,” Section 67, Chapter 112 of the General laws, [http://www.mass.gov/bb/gaa/fy2011/os\\_11/h67.htm](http://www.mass.gov/bb/gaa/fy2011/os_11/h67.htm)

Committee, combined efforts of former and present sponsors of Lyme disease related legislation, and has filed an omnibus Lyme disease bill for the 2011-2012 Legislative Session. H.3261; *An Act relative to the research and treatment of Lyme disease* filed by Chairman Linsky would establish a special Commission to develop a plan for the state to better provide information and services to the public relative to Lyme disease and establishes a separate fund known as the Lyme Disease Research Institute Trust Fund to be used to provide funding grants to the University of Massachusetts Medical School at Worcester for Lyme disease research. Representative Carolyn C. Dykema filed H.3269; *An Act relative to control of tick-borne illness* which would expand the jurisdiction of the state mosquito control board to include tick control through integrated pest management and education campaigns for communities that choose to opt into the program.

## **COMMITTEE RECOMMENDATIONS**

Based upon the information analyzed in this report the Committee has found that Lyme disease is an increasing problem in the Commonwealth of Massachusetts and that the Commonwealth currently lacks the capacity and understanding to properly address the situation. The state is faced with providing solutions based on outdated medical research and information on the proper diagnosis and treatment methods, combined with the lack of sufficient appropriated funds to adequately provide outreach resources to the medical and education communities as well as the public. There has also been very little communication and sharing of information on Lyme disease from stakeholders in order to provide a complete picture of the current situation in Massachusetts. It is for this reason that the Committee recommends that a commission be established in order to provide better insight into this problem and to raise possible solutions for the Commonwealth. In addition, legislation mandating insurance coverage for long-term antibiotic treatment for chronic Lyme disease should be enacted, which would ensure that patients are able to access necessary treatment. Due to a lack of appropriate funding, the Committee also recommends that the state appropriate funding to the MDPH in order to ensure that more educational outreach is done across the Commonwealth in relation to Lyme disease. Finally, the Committee recommends that the MDPH look into the possibility of combining tick control efforts with state mosquito control efforts.

**Appendix A.**

**Confirmed Lyme Disease Cases in Massachusetts by Year\***

TOWN	2005	2006	2007	2008	2009
ABINGTON	<5	<5	6	6	6
ACTON	21	12	40	33	15
ACUSHNET	15	8	<5	12	12
ADAMS	0	0	<5	<5	0
AGAWAM	6	7	<5	<5	6
ALFORD	<5	0	<5	<5	<5
AMESBURY	10	21	20	21	11
AMHERST	12	10	19	21	19
ANDOVER	30	28	36	46	34
AQUINNAH	<5	0	<5	<5	<5
ARLINGTON	14	13	12	12	6
ASHBURNHAM	<5	<5	0	<5	<5
ASHBY	<5	<5	0	5	<5
ASHFIELD	0	0	0	0	<5
ASHLAND	6	6	12	9	11
ATHOL	<5	0	5	<5	6
ATTLEBORO	<5	<5	6	9	7
AUBURN	<5	6	9	9	7
AVON	0	0	<5	<5	<5
AYER	<5	6	7	<5	<5
BARNSTABLE	10	8	28	22	22
BARRE	<5	5	<5	7	5
BECKET	<5	<5	0	<5	<5

<b>BEDFORD</b>	15	21	18	10	13
<b>BELCHERTOWN</b>	23	25	18	13	25
<b>BELLINGHAM</b>	<5	<5	9	11	19
<b>BELMONT</b>	6	7	8	5	8
<b>BERKLEY</b>	<5	<5	9	8	5
<b>BERLIN</b>	<5	0	5	5	<5
<b>BERNARDSTON</b>	0	0	0	<5	<5
<b>BEVERLY</b>	13	17	18	20	7
<b>BILLERICA</b>	7	9	7	14	12
<b>BLACKSTONE</b>	<5	0	6	6	<5
<b>BLANDFORD</b>	<5	0	<5	0	<5
<b>BOLTON</b>	10	6	11	16	6
<b>BOSTON</b>	45	23	53	57	62
<b>BOURNE</b>	26	15	27	7	13
<b>BOXBOROUGH</b>	10	10	11	9	<5
<b>BOXFORD</b>	<5	10	17	23	12
<b>BOYLSTON</b>	<5	6	<5	5	<5
<b>BRAINTREE</b>	<5	11	9	14	16
<b>BREWSTER</b>	27	23	28	23	16
<b>BRIDGEWATER</b>	13	10	24	33	20
<b>BRIMFIELD</b>	<5	8	7	<5	<5
<b>BROCKTON</b>	12	9	14	17	27
<b>BROOKFIELD</b>	<5	<5	<5	<5	<5
<b>BROOKLINE</b>	11	4	14	9	9
<b>BURLINGTON</b>	9	<5	<5	6	9

<b>CAMBRIDGE</b>	11	11	17	18	15
<b>CANTON</b>	6	9	20	16	14
<b>CARLISLE</b>	8	8	7	11	<5
<b>CARVER</b>	7	10	7	10	8
<b>CHARLEMONT</b>	0	0	<5	<5	<5
<b>CHARLTON</b>	6	21	11	12	14
<b>CHATHAM</b>	13	11	12	9	6
<b>CHELMSFORD</b>	18	13	25	24	15
<b>CHELSEA</b>	<5	0	<5	<5	<5
<b>CHESHIRE</b>	0	0	0	<5	<5
<b>CHESTER</b>	<5	<5	0	0	0
<b>CHICOPEE</b>	0	4	6	8	9
<b>CHILMARK</b>	15	8	<5	9	<5
<b>CLARKSBURG</b>	0	<5	0	0	0
<b>CLINTON</b>	6	7	7	8	5
<b>COHASSET</b>	<5	<5	7	14	12
<b>COLRAIN</b>	0	0	0	5	<5
<b>CONCORD</b>	19	18	24	24	22
<b>CONWAY</b>	0	<5	<5	<5	<5
<b>CUMMINGTON</b>	0	0	0	<5	0
<b>DALTON</b>	<5	<5	<5	<5	<5
<b>DANVERS</b>	<5	8	15	7	11
<b>DARTMOUTH</b>	30	31	24	28	18
<b>DEDHAM</b>	12	11	11	19	21
<b>DEERFIELD</b>	<5	<5	<5	<5	<5

<b>DENNIS</b>	18	14	10	11	7
<b>DIGHTON</b>	0	<5	<5	<5	<5
<b>DOUGLAS</b>	6	8	13	11	12
<b>DOVER</b>	6	5	12	17	12
<b>DRACUT</b>	<5	<5	13	8	6
<b>DUDLEY</b>	<5	5	14	12	10
<b>DUNSTABLE</b>	<5	11	8	11	7
<b>DUXBURY</b>	16	12	30	32	20
<b>EAST BRIDGEWATER</b>	<5	12	9	16	16
<b>EAST BROOKFIELD</b>	<5	<5	<5	<5	<5
<b>EAST LONGMEADOW</b>	7	8	9	13	14
<b>EASTHAM</b>	7	<5	9	8	8
<b>EASTHAMPTON</b>	<5	5	<5	9	8
<b>EASTON</b>	10	19	15	20	16
<b>EDGARTOWN</b>	23	14	10	14	5
<b>EGREMONT</b>	<5	5	<5	9	<5
<b>ERVING</b>	0	<5	<5	<5	<5
<b>ESSEX</b>	5	<5	<5	<5	0
<b>EVERETT</b>	<5	<5	<5	<5	<5
<b>FAIRHAVEN</b>	10	14	17	12	5
<b>FALL RIVER</b>	18	23	20	23	15
<b>FALMOUTH</b>	44	22	43	17	25
<b>FITCHBURG</b>	5	6	5	7	<5
<b>FOXBOROUGH</b>	8	12	12	14	18
<b>FRAMINGHAM</b>	21	17	33	24	38

<b>FRANKLIN</b>	11	17	19	30	37
<b>FREETOWN</b>	<5	17	21	17	14
<b>GARDNER</b>	0	<5	<5	<5	<5
<b>GEORGETOWN</b>	10	6	9	16	5
<b>GILL</b>	0	0	<5	<5	<5
<b>GLOUCESTER</b>	20	11	24	7	9
<b>GOSHEN</b>	0	0	<5	0	0
<b>GOSNOLD</b>	0	0	<5	0	0
<b>GRAFTON</b>	16	30	22	20	21
<b>GRANBY</b>	6	5	<5	6	5
<b>GRANVILLE</b>	0	0	<5	<5	<5
<b>GREAT BARRINGTON</b>	27	28	34	25	22
<b>GREENFIELD</b>	6	<5	7	8	12
<b>GROTON</b>	10	18	14	17	19
<b>GROVELAND</b>	0	<5	8	14	8
<b>HADLEY</b>	0	<5	0	<5	5
<b>HALIFAX</b>	<5	<5	<5	7	6
<b>HAMILTON</b>	12	6	9	7	<5
<b>HAMPDEN</b>	13	6	14	13	9
<b>HANCOCK</b>	0	0	0	0	<5
<b>HANOVER</b>	5	0	9	11	15
<b>HANSON</b>	<5	<5	5	13	9
<b>HARDWICK</b>	<5	0	<5	<5	<5
<b>HARVARD</b>	25	15	22	33	16
<b>HARWICH</b>	26	7	21	16	14

<b>HATFIELD</b>	0	<5	<5	<5	<5
<b>HAVERHILL</b>	22	21	22	20	36
<b>HEATH</b>	0	0	0	0	<5
<b>HINGHAM</b>	7	<5	11	27	30
<b>HOLBROOK</b>	<5	0	<5	5	8
<b>HOLDEN</b>	<5	16	16	12	8
<b>HOLLAND</b>	0	<5	<5	<5	<5
<b>HOLLISTON</b>	11	9	22	26	21
<b>HOLYOKE</b>	<5	<5	13	9	10
<b>HOPEDALE</b>	<5	<5	5	8	6
<b>HOPKINTON</b>	13	12	22	18	16
<b>HUBBARDSTON</b>	<5	<5	<5	<5	<5
<b>HUDSON</b>	<5	<5	12	16	7
<b>HULL</b>	0	<5	6	<5	<5
<b>HUNTINGTON</b>	<5	0	<5	<5	<5
<b>IPSWICH</b>	20	24	23	23	8
<b>KINGSTON</b>	9	<5	9	11	6
<b>LAKEVILLE</b>	11	13	7	11	11
<b>LANCASTER</b>	6	11	7	10	5
<b>LANESBOROUGH</b>	0	0	0	<5	<5
<b>LAWRENCE</b>	5	7	3	1	7
<b>LEE</b>	5	<5	5	7	7
<b>LEICESTER</b>	0	0	6	<5	10
<b>LENOX</b>	<5	<5	<5	<5	6
<b>LEOMINSTER</b>	6	11	7	15	13

<b>LEVERETT</b>	0	0	<5	<5	<5
<b>LEXINGTON</b>	7	14	14	16	14
<b>LEYDEN</b>	0	0	0	<5	0
<b>LINCOLN</b>	13	16	16	19	8
<b>LITTLETON</b>	11	10	24	18	6
<b>LONGMEADOW</b>	9	<5	6	14	8
<b>LOWELL</b>	6	7	13	9	10
<b>LUDLOW</b>	12	13	7	8	20
<b>LUNENBURG</b>	7	9	9	13	19
<b>LYNN</b>	6	1	7	11	8
<b>LYNNFIELD</b>	11	15	12	8	14
<b>MALDEN</b>	2	1	4	0	4
<b>MANCHESTER</b>	<5	8	9	6	<5
<b>MANSFIELD</b>	10	11	19	15	19
<b>MARBLEHEAD</b>	5	6	6	6	<5
<b>MARION</b>	23	6	13	14	8
<b>MARLBOROUGH</b>	19	24	29	43	15
<b>MARSHFIELD</b>	24	20	24	17	26
<b>MASHPEE</b>	6	6	6	<5	<5
<b>MATTAPOISETT</b>	17	<5	22	10	<5
<b>MAYNARD</b>	<5	0	11	8	<5
<b>MEDFIELD</b>	21	21	34	26	26
<b>MEDFORD</b>	2	3	3	7	4
<b>MEDWAY</b>	9	13	18	18	15
<b>MELROSE</b>	<5	0	<5	8	6

<b>MENDON</b>	<5	<5	11	8	6
<b>MERRIMAC</b>	0	<5	<5	8	5
<b>METHUEN</b>	7	<5	9	12	14
<b>MIDDLEBOROUGH</b>	23	18	22	25	23
<b>MIDDLEFIELD</b>	0	0	0	<5	0
<b>MIDDLETON</b>	<5	6	5	7	10
<b>MILFORD</b>	9	6	10	14	13
<b>MILLBURY</b>	7	17	7	9	15
<b>MILLIS</b>	12	9	17	11	10
<b>MILLVILLE</b>	<5	<5	5	<5	6
<b>MILTON</b>	8	12	11	6	17
<b>MONSON</b>	8	21	13	10	13
<b>MONTAGUE</b>	6	<5	<5	9	<5
<b>MONTEREY</b>	<5	<5	<5	<5	<5
<b>MONTGOMERY</b>	0	0	0	0	<5
<b>MOUNT WASHINGTON</b>	<5	0	0	0	<5
<b>NAHANT</b>	0	<5	0	0	<5
<b>NANTUCKET</b>	29	25	62	40	40
<b>NATICK</b>	13	25	17	29	33
<b>NEEDHAM</b>	26	18	20	31	23
<b>NEW BEDFORD</b>	22	9	29	26	15
<b>NEW BRAINTREE</b>	<5	0	<5	<5	0
<b>NEW MARLBOROUGH</b>	<5	0	<5	<5	<5
<b>NEWBURY</b>	11	<5	6	12	8
<b>NEWBURYPORT</b>	6	6	15	12	12

<b>NEWTON</b>	26	11	19	24	31
<b>NORFOLK</b>	12	<5	10	20	12
<b>NORTH ADAMS</b>	0	<5	<5	10	<5
<b>NORTH ANDOVER</b>	10	<5	18	17	24
<b>NORTH ATTLEBOROUGH</b>	0	0	5	<5	10
<b>NORTH BROOKFIELD</b>	0	<5	<5	<5	<5
<b>NORTH READING</b>	11	12	16	36	20
<b>NORTHAMPTON</b>	11	11	9	16	18
<b>NORTHBOROUGH</b>	0	5	9	11	10
<b>NORTHBRIDGE</b>	5	12	<5	11	9
<b>NORTHFIELD</b>	<5	<5	<5	<5	<5
<b>NORTON</b>	5	11	8	11	10
<b>NORWELL</b>	8	9	8	11	12
<b>NORWOOD</b>	5	11	19	17	18
<b>OAK BLUFFS</b>	<5	<5	<5	<5	<5
<b>OAKHAM</b>	0	<5	0	<5	<5
<b>ORANGE</b>	<5	<5	<5	<5	<5
<b>ORLEANS</b>	18	18	16	14	12
<b>OTIS</b>	<5	0	0	<5	<5
<b>OXFORD</b>	7	10	7	15	10
<b>PALMER</b>	5	7	10	7	12
<b>PAXTON</b>	<5	7	<5	<5	<5
<b>PEABODY</b>	6	5	11	7	8
<b>PELHAM</b>	<5	<5	<5	<5	<5
<b>PEMBROKE</b>	10	7	26	23	16

<b>PEPPERELL</b>	8	8	12	14	11
<b>PETERSHAM</b>	<5	<5	0	<5	<5
<b>PITTSFIELD</b>	<5	11	10	13	14
<b>PLAINFIELD</b>	0	0	0	<5	<5
<b>PLAINVILLE</b>	<5	0	5	<5	<5
<b>PLYMOUTH</b>	61	37	53	49	34
<b>PLYMPTON</b>	<5	0	<5	7	6
<b>PRINCETON</b>	0	0	5	<5	<5
<b>PROVINCETOWN</b>	0	<5	<5	<5	<5
<b>QUINCY</b>	4	5	10	17	5
<b>RANDOLPH</b>	<5	<5	<5	5	5
<b>RAYNHAM</b>	7	8	7	11	13
<b>READING</b>	8	8	11	18	18
<b>REHOBOTH</b>	6	<5	6	11	11
<b>REVERE</b>	<5	<5	<5	<5	<5
<b>RICHMOND</b>	<5	<5	<5	<5	<5
<b>ROCHESTER</b>	17	<5	12	15	<5
<b>ROCKLAND</b>	<5	<5	6	13	8
<b>ROCKPORT</b>	0	<5	<5	7	<5
<b>ROWE</b>	0	0	0	<5	0
<b>ROWLEY</b>	9	5	9	6	<5
<b>ROYALSTON</b>	<5	0	0	0	0
<b>RUSSELL</b>	<5	0	<5	<5	<5
<b>RUTLAND</b>	0	<5	<5	<5	<5
<b>SALEM</b>	<5	<5	5	<5	9

<b>SALISBURY</b>	<5	7	9	11	<5
<b>SANDISFIELD</b>	<5	0	<5	<5	<5
<b>SANDWICH</b>	5	22	42	18	17
<b>SAUGUS</b>	0	<5	<5	<5	6
<b>SAVOY</b>	0	0	<5	0	0
<b>SCITUATE</b>	8	11	12	16	32
<b>SEEKONK</b>	0	5	5	10	11
<b>SHARON</b>	21	26	26	28	22
<b>SHEFFIELD</b>	8	9	13	10	8
<b>SHELBURNE</b>	<5	<5	<5	<5	<5
<b>SHERBORN</b>	15	17	22	17	11
<b>SHIRLEY</b>	5	<5	9	11	<5
<b>SHREWSBURY</b>	<5	<5	8	17	8
<b>SHUTESBURY</b>	<5	<5	<5	<5	<5
<b>SOMERSET</b>	<5	0	6	9	<5
<b>SOMERVILLE</b>	1	7	9	8	9
<b>SOUTH HADLEY</b>	7	0	<5	8	8
<b>SOUTHAMPTON</b>	0	0	<5	<5	6
<b>SOUTHBOROUGH</b>	6	15	13	14	20
<b>SOUTHBRIDGE</b>	9	9	6	7	8
<b>SOUTHWICK</b>	<5	0	<5	8	<5
<b>SPENCER</b>	5	5	5	11	12
<b>SPRINGFIELD</b>	18	17	21	24	22
<b>STERLING</b>	5	5	8	<5	<5
<b>STOCKBRIDGE</b>	7	7	<5	<5	<5

<b>STONEHAM</b>	<5	<5	<5	<5	<5
<b>STOUGHTON</b>	8	<5	11	<5	9
<b>STOW</b>	6	9	10	18	9
<b>STURBRIDGE</b>	11	8	11	5	8
<b>SUDBURY</b>	7	25	24	25	16
<b>SUNDERLAND</b>	<5	0	0	<5	<5
<b>SUTTON</b>	0	11	<5	13	7
<b>SWAMPSCOTT</b>	<5	5	0	<5	0
<b>SWANSEA</b>	<5	<5	<5	8	19
<b>TAUNTON</b>	13	15	22	15	18
<b>TEMPLETON</b>	0	0	<5	<5	<5
<b>TEWKSBURY</b>	<5	8	14	9	11
<b>TISBURY</b>	39	12	18	15	11
<b>TOLLAND</b>	0	0	0	<5	<5
<b>TOPSFIELD</b>	12	23	24	12	<5
<b>TOWNSEND</b>	<5	8	5	6	12
<b>TRURO</b>	7	5	7	<5	5
<b>TYNGSBOROUGH</b>	0	<5	7	8	9
<b>TYRINGHAM</b>	0	<5	0	0	0
<b>UPTON</b>	7	8	<5	10	11
<b>UXBRIDGE</b>	5	10	13	19	13
<b>UNKOWN</b>	19	44	275	502	827
<b>WAKEFIELD</b>	5	5	<5	9	15
<b>WALES</b>	<5	<5	0	<5	<5
<b>WALPOLE</b>	15	27	29	40	34

<b>WALTHAM</b>	0	3	3	8	11
<b>WARE</b>	7	<5	12	7	13
<b>WAREHAM</b>	39	36	29	23	22
<b>WARREN</b>	<5	6	<5	8	6
<b>WARWICK</b>	0	0	<5	<5	0
<b>WATERTOWN</b>	<5	<5	5	7	10
<b>WAYLAND</b>	11	16	15	15	18
<b>WEBSTER</b>	0	8	<5	10	7
<b>WELLESLEY</b>	21	10	16	11	19
<b>WELLFLEET</b>	<5	<5	<5	6	14
<b>WENDELL</b>	<5	0	<5	<5	<5
<b>WENHAM</b>	8	<5	8	6	<5
<b>WEST BOYLSTON</b>	<5	<5	5	10	<5
<b>WEST BRIDGEWATER</b>	<5	<5	<5	5	5
<b>WEST BROOKFIELD</b>	<5	<5	8	<5	8
<b>WEST NEWBURY</b>	13	12	15	11	10
<b>WEST SPRINGFIELD</b>	<5	11	<5	10	13
<b>WEST STOCKBRIDGE</b>	<5	<5	<5	<5	7
<b>WEST TISBURY</b>	9	9	11	14	<5
<b>WESTBOROUGH</b>	7	6	8	12	19
<b>WESTFIELD</b>	8	9	7	21	14
<b>WESTFORD</b>	30	23	30	32	20
<b>WESTHAMPTON</b>	0	0	<5	<5	0
<b>WESTMINSTER</b>	<5	<5	0	8	<5
<b>WESTON</b>	17	14	16	24	15

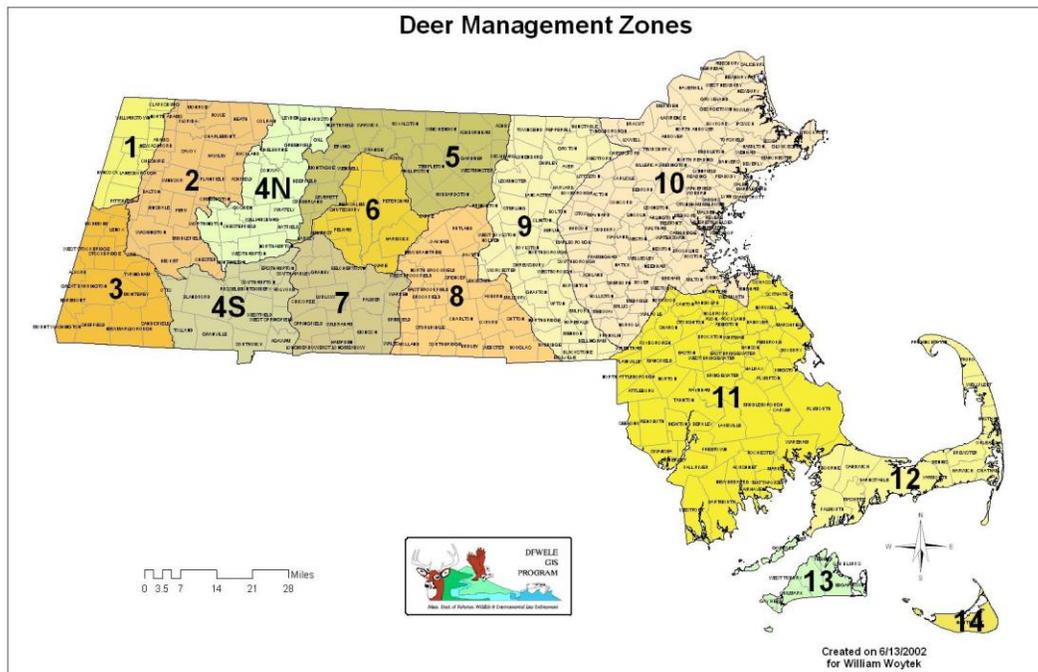
<b>WESTPORT</b>	6	12	19	13	11
<b>WESTWOOD</b>	18	24	31	36	30
<b>WEYMOUTH</b>	5	20	17	28	33
<b>WHATELY</b>	0	0	0	0	<5
<b>WHITMAN</b>	6	<5	9	9	8
<b>WILBRAHAM</b>	22	17	22	25	29
<b>WILLIAMSBURG</b>	0	0	0	5	<5
<b>WILLIAMSTOWN</b>	<5	0	5	21	6
<b>WILMINGTON</b>	<5	6	<5	8	13
<b>WINCHENDON</b>	<5	0	0	0	0
<b>WINCHESTER</b>	<5	6	6	<5	8
<b>WINDSOR</b>	0	0	<5	<5	<5
<b>WINTHROP</b>	0	0	0	0	<5
<b>WOBURN</b>	6	5	5	7	12
<b>WORCESTER</b>	27	36	25	43	17
<b>WORTHINGTON</b>	0	0	0	<5	0
<b>WRENTHAM</b>	<5	5	7	10	12
<b>YARMOUTH</b>	28	20	21	21	20

*Information Provided for by the Massachusetts Department of Public Health Bureau of Infectious Disease Prevention, Response and Services, Office of Integrated Surveillance and Informatics Services.*

\*Data as of January 13, 2011 and are subject to change.

Note: for areas with a population <50,000, cell sizes less than 5 are suppressed to maintain confidentiality.

## APPENDIX B.<sup>51</sup>



<sup>51</sup> Christensen, Sonja, "Massachusetts White-Tailed Deer Study," Federal aid in wildlife restoration project W-35 R52, Massachusetts Division of Fisheries and Wildlife, Boston, Massachusetts, USA, 2010