

Tickborne Disease and Prevention in New Hampshire

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Tickborne Diseases in NH

- Lyme (bacterial)
- Anaplasmosis (bacterial)
- Babesiosis (parasite)
- Powassan Virus (viral)



NH DHHS Tickborne Disease Activities

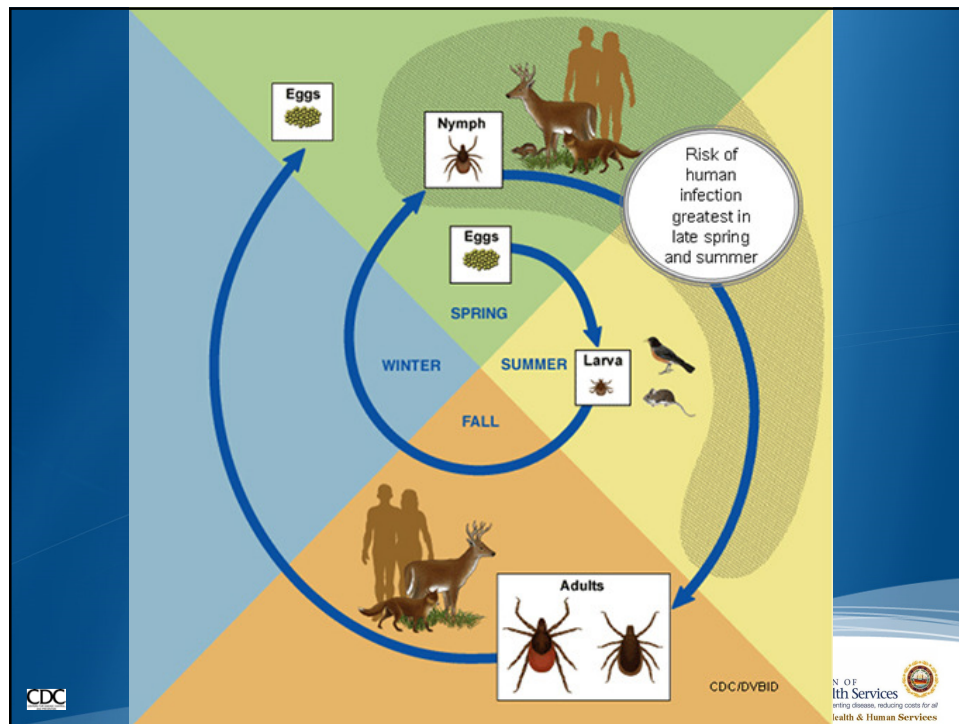
- Human case surveillance
- Tick surveillance as funding allows
- Distribution of surveillance data
 - Maps, Data Reports, Incidence by County
- Healthcare provider clinical messaging
 - Annual health alert message with clinical, diagnosis, and treatment information
- Public education and prevention messaging
 - NH DHHS website
 - Annual Press Release
 - Availability of public health staff to respond to public inquiries by phone or email



Ticks in NH

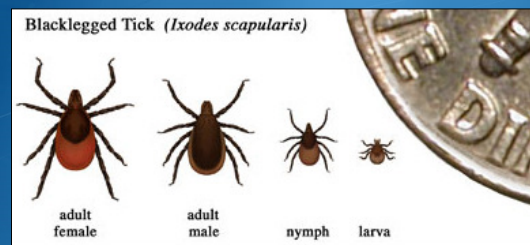
- Common human-biting species in NH
 - American dog tick: *Dermacentor variabilis*
 - **Blacklegged tick (deer tick): *Ixodes scapularis***
- Other ticks
 - Winter tick: generally does not bite humans, looks similar to dog tick
 - Lone star tick: may be moving north to NH eventually





Lyme Disease Biology

- *Borrelia burgdorferi*
 - Spirochete - motile, corkscrew shaped bacteria
- Transmitted by the bite of an infected deer tick
- Ticks need to be attached for 24-36 hours before the bacterium can be transmitted
 - Nymphs very small and can go unnoticed



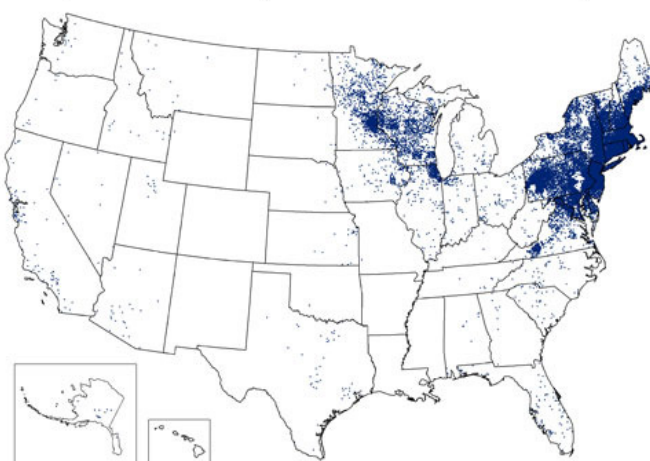
Symptoms of Lyme Disease

- **Early localized disease**
 - Incubation : 3 to 32 days
 - Early localized disease
 - within 1 month of infection
 - Slowly expanding skin lesion (80%): erythema migrans rash
 - Usually accompanied by influenza-like illness: headache, arthralgias, myalgias, fever, lymphadenopathy.
- **Early disseminated disease**
 - Weeks to months after initial infection and can involve skin, joints, heart, CNS
 - Neurologic disease in 15 % of untreated patients
 - Cardiac disease in 5% of untreated patients
 - Recent publication on Lyme carditis deaths
 - Musculoskeletal involvement in 60% of untreated patients
- **Late disseminated disease**
 - Months to years after initial infection
 - Lyme arthritis – 60% (untreated)
 - Neuroborreliosis – 5% (untreated)



Distribution of Lyme Disease

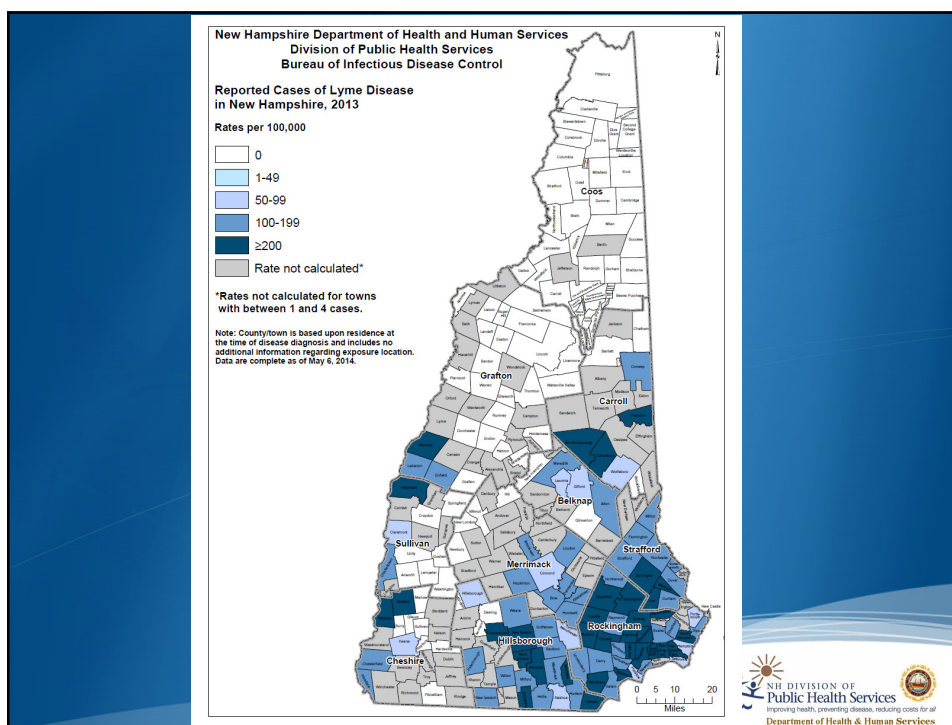
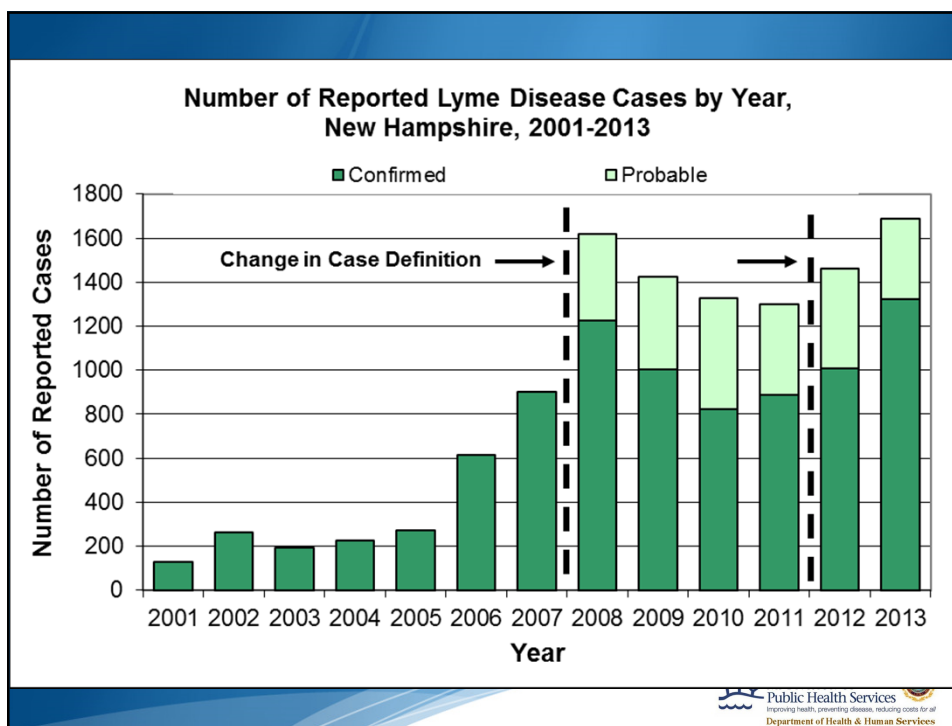
Reported Cases of Lyme Disease -- United States, 2013



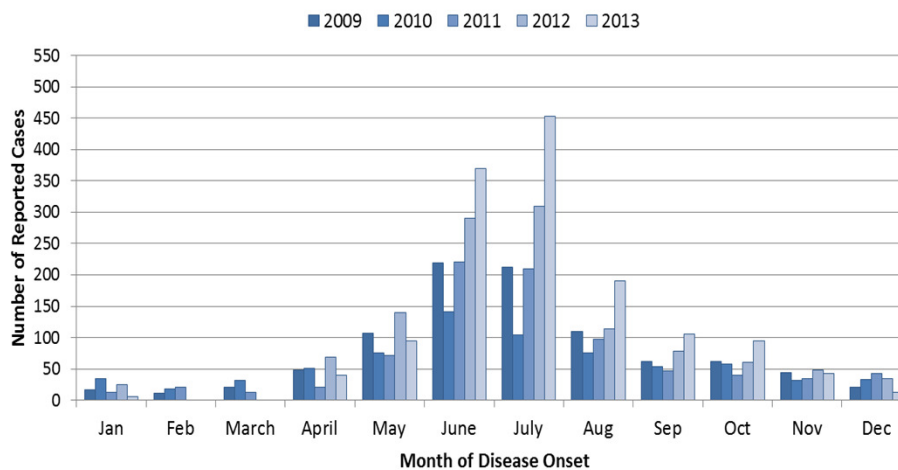
1 dot placed randomly within county of residence for each confirmed case

cdc.gov



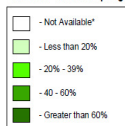


Number of reported Lyme disease cases by month, NH, 2008-2013.



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Proportion of Adult Black-legged Ticks infected with *Borrelia burgdorferi* (Lyme disease)
Fall 2007-2010 Samplings

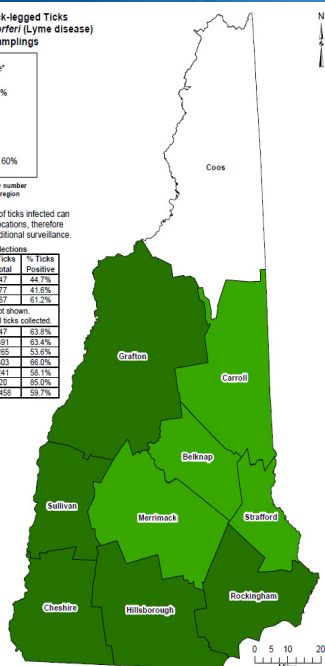


*Not available due to low number of ticks collected in the region

Tick numbers and percentage of ticks infected can change between years and locations, therefore estimates may change with additional surveillance.

2007-2010 Fall Tick Collections

County	# Ticks Positive	# Ticks Total	% Ticks Positive
Belknap	21	47	44.7%
Carroll	32	77	41.6%
Cheshire	41	67	61.2%
Coos	Data not shown. Fewer than 20 ticks collected		
Grafton	30	47	63.8%
Hillsborough	245	391	62.4%
Merrimack	142	265	53.6%
Rockingham	200	303	66.0%
Strafford	140	241	58.1%
Sullivan	17	25	68.0%
State Total	871	1458	59.7%



Presence of the *Borrelia* bacteria in the NH Black-legged Ticks 2007- 2010



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Anaplasmosis and Babesiosis

- Flu-like symptoms (most common presentation)
 - Fever, headache, muscle pain, malaise, chills, nausea/abdominal pain, cough, confusion, sweats, headache, body aches, loss of appetite, nausea, fatigue
 - Can range from mild illness to severe, life-threatening
- Transmitted by the black legged tick
- Main reservoir is the white footed mouse



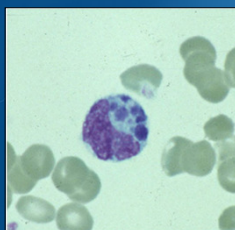
Image from
http://www.fcps.edu/islandcreekes/ecology/white-footed_mouse.htm



Anaplasmosis and Babesiosis

Anaplasmosis

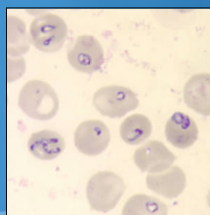
- Bacterium *Anaplasma phagocytophilum*
- Rarely causes a rash
- Potential to cause renal failure, difficulty breathing
- Severity ranges from mild to life-threatening



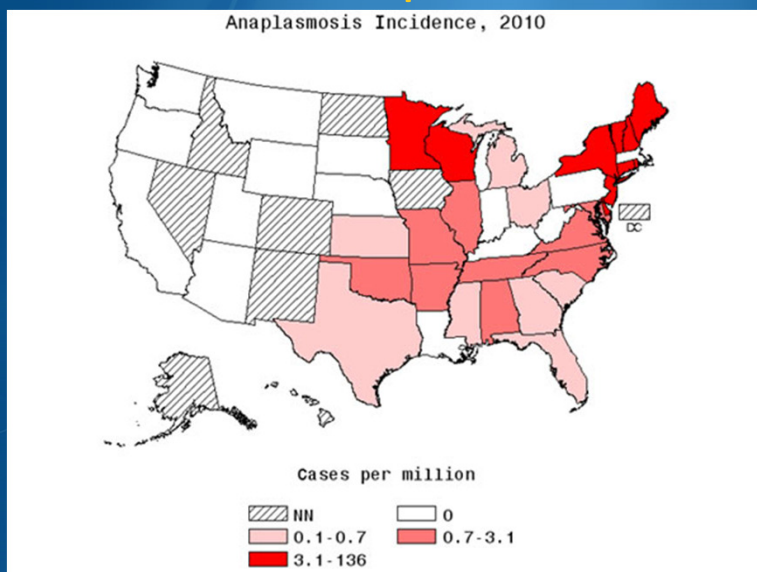
Images from cdc.gov

Babesiosis

- RBC parasite *Babesia microti*
- No rash
- Potential to cause hemolytic anemia, renal failure
- Severity ranges from asymptomatic to life-threatening



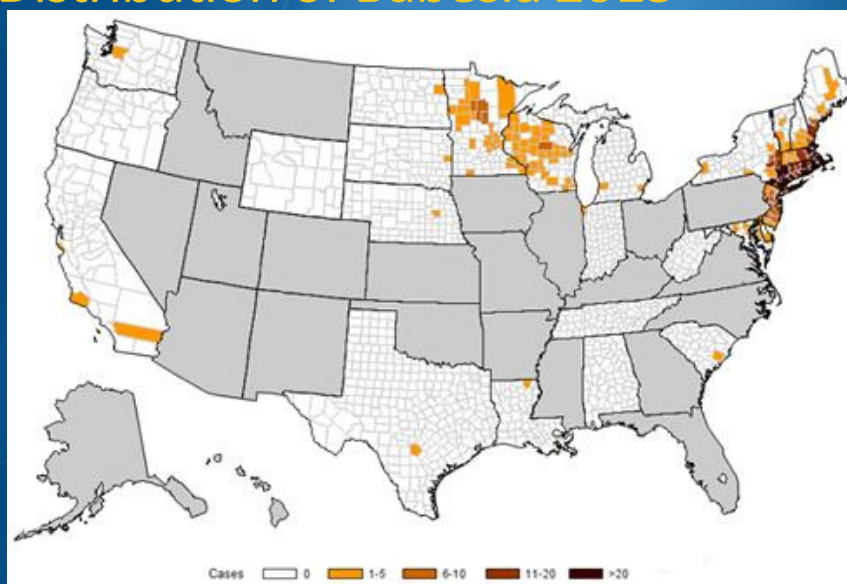
Distribution of Anaplasmosis



www.cdc.gov

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Distribution of Babesia 2013



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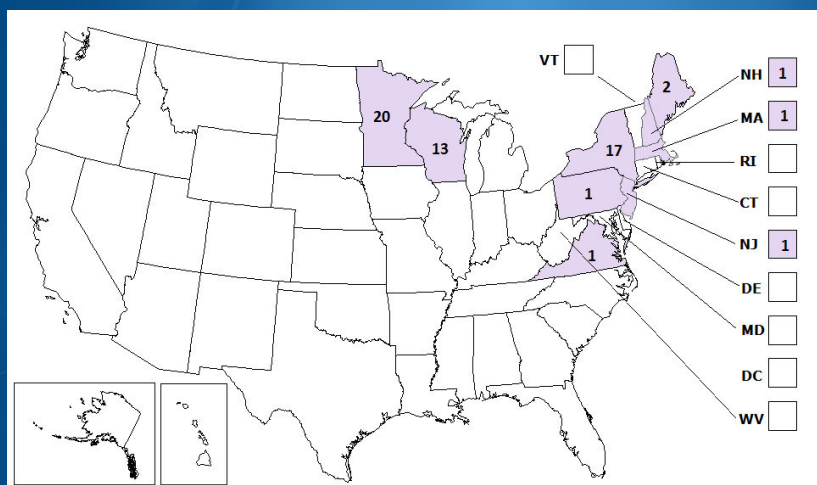
Powassan Virus



- Viral encephalitis
- Incubation from 1 week to 1 month
- Two strains associated with human disease
 - Powassan Virus (POW) – Lineage 1
 - Deer Tick Virus (DTV) – Lineage 2
 - Ixodes scapularis – white-footed mice (DTV)
- Possible symptoms: Drowsiness, headache, confusion, fever, vomiting, weakness, speech difficulties,
 - Illness could progress to encephalitis (brain), meningitis (membranes), or meningoencephalitis
 - Severe, long lasting sequelae in $\geq 50\%$
- Case fatality $\sim 10\%$ (encephalitis)



Distribution of Powassan Virus 2004-2013



Source: cdc.gov and ArboNET



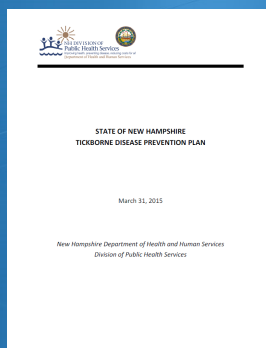
Treatment for Tickborne Disease

- Lyme Disease and Anaplasmosis are most commonly treated with Doxycycline
 - Alternatives are used in children and pregnant women, or in Lyme patients with neurologic or heart-related symptoms
- Babesiosis is treated with a combination of Atovaquone with Azithromycin OR Clindamycin with Quinine (similar to malaria)
- Powassan Virus is treated with supportive care



Tickborne Disease Prevention

- We have a NEW state plan
<http://www.dhhs.nh.gov/dphs/cdcs/lyme/documents/tbdpreventionplan.pdf>



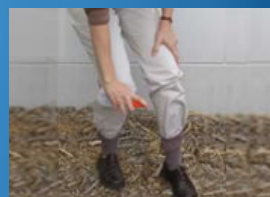
Protect Yourself Against Tick Bites

- **EVERYONE should be doing/advocating for these**
- Use an EPA registered repellent
- Stay on cleared trails when possible
- Wear long pants, long sleeves, hat, closed-toe shoes
 - Tuck shirts into pants and pants into socks
 - Light colors may make ticks on clothing easier to spot
- Daily tick checks for you and your pets, remove promptly
- Shower after returning indoors
- Dry clothes in hot dryer



Personal Protective Measures: Mosquito and Tick Repellent

- | | |
|---|---|
| <ul style="list-style-type: none"> ● DEET <ul style="list-style-type: none"> ● Mosquitoes and Ticks ● Oil of Lemon Eucalyptus <ul style="list-style-type: none"> ● Mosquitoes and Ticks ● Picaridin <ul style="list-style-type: none"> ● Mosquitoes | <ul style="list-style-type: none"> ● Permethrin <ul style="list-style-type: none"> ● Mosquitoes and Ticks ● Applied to clothing ● Permethrin impregnated clothing |
|---|---|



Mosquito and Tick Repellent

- Always use according to the product label
- For information on EPA registered repellents and their active ingredients:

<http://www.epa.gov/pesticides/insect/choose.htm>



It's Lyme Time!

Protect Yourself Against Lyme Disease*
in Spring, Summer, and Fall

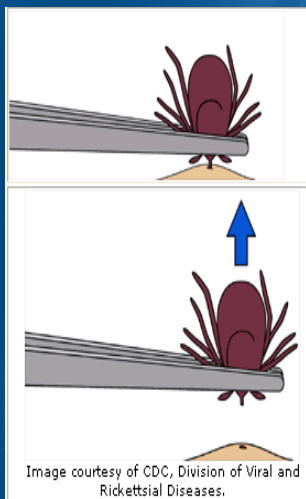


*Lyme disease, the most common tick-borne disorder in the U.S., can affect the skin, joints, nervous system, heart, and eyes. Lyme disease is transmitted by a tiny tick the size of the end of this sentence.

<http://lymediseaseguide.org/lyme-disease-prevention>



Tick Removal



- Cleanse your hands and the area around the tick
- Grasp tick's mouth parts close to the skin with tweezers
- Pull the tick slowly upwards using a gentle, straight-up motion
- Apply an antiseptic to the site

Tick Removal

- Do NOT:
 - Twist or jerk the tick
 - Squeeze the tick
 - Rub petroleum jelly on the tick
 - Pour kerosene or nail polish on the tick
 - Use a hot match or cigarette

Tick Habitat



Ticks prefer sheltered, humid areas away from direct sunlight

Tall grass
Brush
Leaf litter

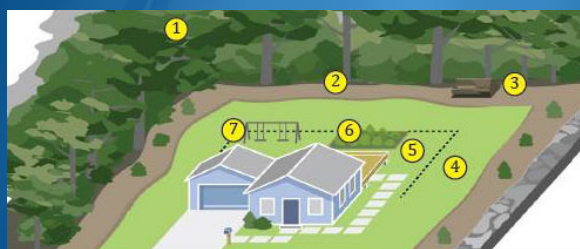


All make great tick habitat

Connecticut Agricultural Experiment Station



Create a "Tick-Safe Zone"



- | | | |
|---|----------------------------|---|
| 1 | Tick zone | Avoid areas with forest and brush where deer, rodents, and ticks are common. |
| 2 | Wood chip barrier | Use a 3 ft. barrier of wood chips or rock to separate the "tick zone" and rock walls from the lawn. |
| 3 | Wood pile | Keep wood piles on the wood chip barrier, away from the home. |
| 4 | Tick migration zone | Maintain a 9 ft. barrier of lawn between the wood chips and areas such as patios, gardens, and play sets. |
| 5 | Tick safe zone | Enjoy daily living activities such as gardening and outdoor play inside this perimeter. |
| 6 | Gardens | Plant deer resistant crops. If desired, an 8-ft. fence can keep deer out of the yard. |
| 7 | Play sets | Keep play sets in the "tick safe zone" in sunny areas where ticks have difficulty surviving. |

Based on a diagram by K. Stafford, Connecticut Agricultural Experiment Station



A. Yard before landscape intervention.



B. Yard after landscape intervention.



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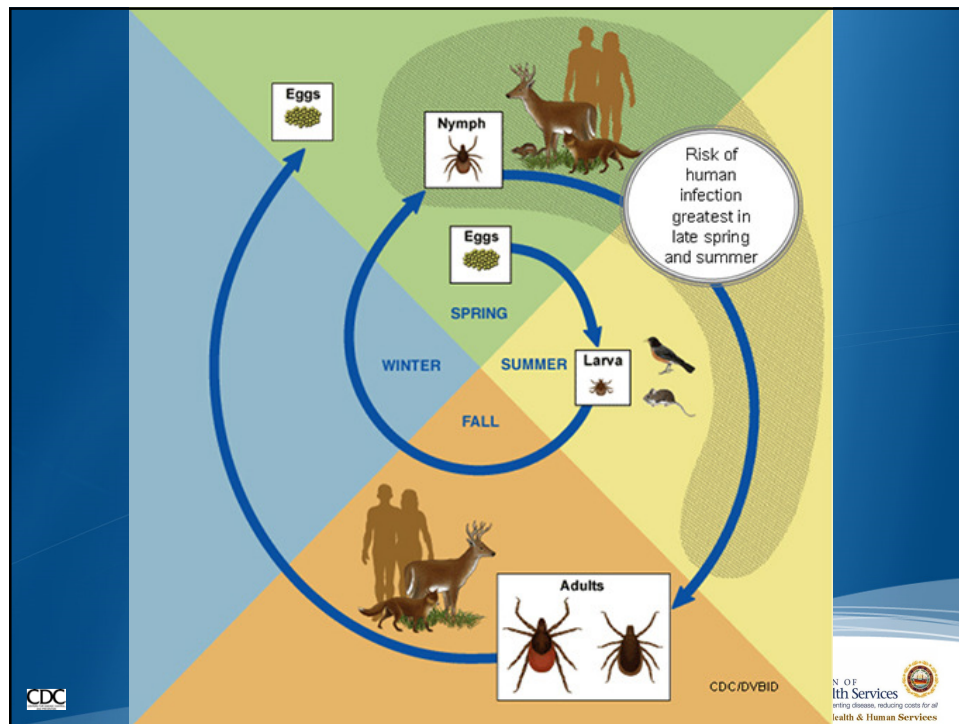


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Prevention Methods and Priorities

- Management of landscaping for schools and community use areas
- Treatment and/or exclusion of deer
 - An option for communities, but requires extensive maintenance and other considerations
- Treatment and exclusion of mice
 - Owner based decisions
- What about host elimination?
- Area wide acaricide treatment

Acknowledgments

- NH DHHS Division of Public Health Services
 - Jose Montero, Chris Adamski, Elizabeth Daly, Tylor Young, Whitney Howe
- NH Public Health Laboratories
 - Christine Bean, Fengxiang Gao, Denise Bolton, Carol Loring, Amanda Archambault, Trevor Lester
- Dragon Mosquito Control
- Municipal Pest Management
- Atlantic Pest Solutions
- NH Towns and Cities



- Helpful resources

- <http://www.dhhs.nh.gov/dphs/cdcs/index.htm>
- <http://www.cdc.gov/ncezid/dvbd/>
- <http://www.ct.gov/caes/site/default.asp>

- Contact information:

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