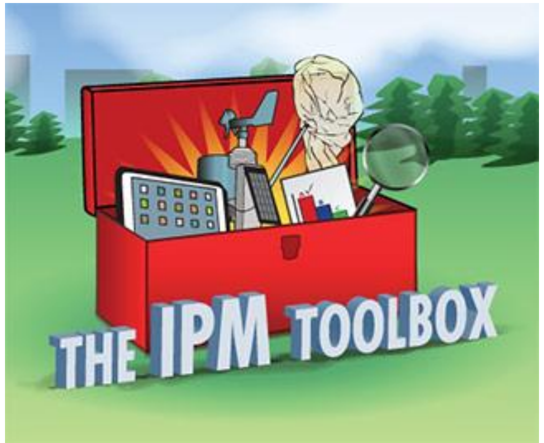
Northeastern IPM Center

Tick IPM Series
Part 1: Strategies and Barriers to the Prevention of Tick-Borne Disease

June 10, 2020



The Connecticut Agricultural Experiment Station

USDA United States Department of Agriculture National Institute of Food and Agriculture

Northeast Regional Center for Excellence in Vector-Borne Diseases

Webinar Details

- Welcome

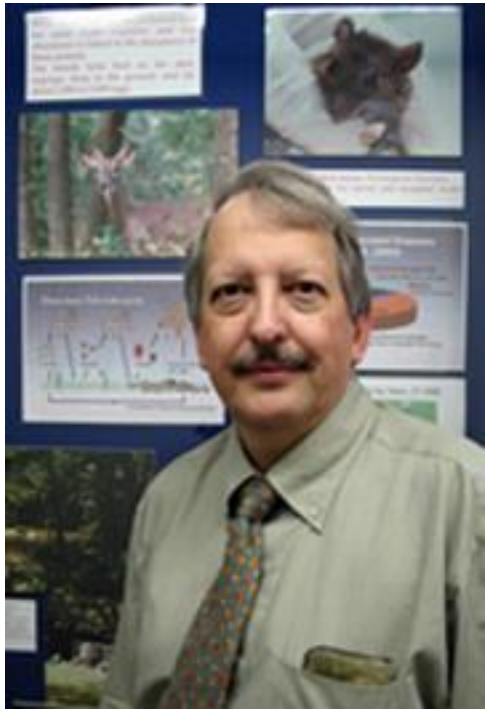
- A recording of this webinar will be available within a week at
- http://www.neipmc.org/go/ipmtoolbox

We Welcome Your Questions

- Please submit a question **at any time** using the Q&A feature to your right at any time

- If you'd like to ask a question anonymously, please indicate that at the beginning of your query.

Webinar Presenter



Kirby C. Stafford III, Ph.D.
Chief Scientist, State Entomologist
Department of Entomology
Center for Vector Biology & Zoonotic Diseases
CT Agricultural Experiment Station
New Haven, CT

Some Questions for You

“Few agricultural or health problems confronting human societies have proved as intractable as control of ticks and the many diseases they transmit.

Dan Sonenshine

Biology of Ticks, Vol. 2

Kirby Stafford

USDA/Scott Bauer

Beyond Lyme

There's a new tick-borne disease to worry about. Here's what you need to know

Kirby Stafford

PUBLIC HEALTH

The Current State of Integrated Tick Management

One of the country's leading tick experts shares where research may be heading to combat the rise of this public health pest.

Lisa Ames, University of Georgia, Bugwood.org

"The difficulty in managing ticks [like the blacklegged tick, Ixodes scapularis] lies in their multifaceted, multiyear lifecycle, diverse host complex, the increasing abundance of key hosts, and a tick's broad presence and adaptability to various habitats," says Connecticut Chief Entomologist Kirby C. Stafford III, Ph.D.

Pest Control Technology

CDC

Kirby Stafford

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Outline

- Overview of Tickborne Pathogens
- Tick Surveillance
- Tick Integrated Pest Management (IPM)
- Host Targeted Tick Control
- Challenges to Effective Public Tick Control
- Future Webinars

Overview of Tickborne Pathogens

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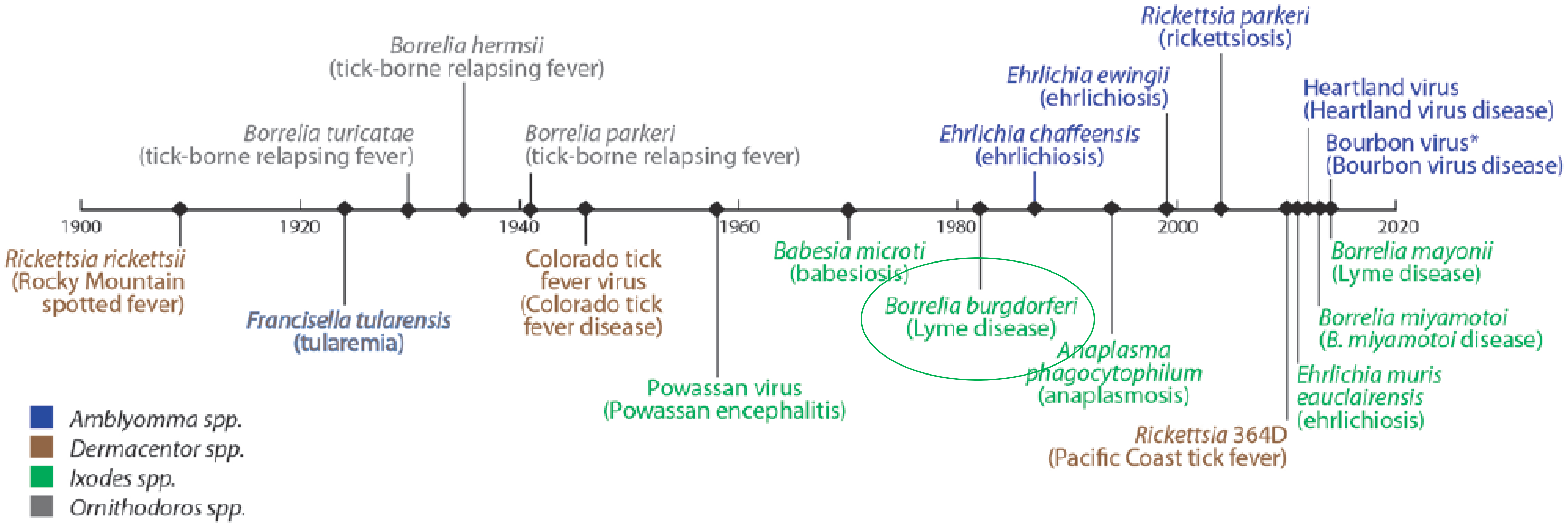
Discovery of tickborne pathogens as causes of human disease by year, 1909-2020



Note: This timeline shows when tickborne pathogens were recognized as causes of human disease.
In some cases, organisms were identifed in ticks before they were associated with human disease.
In other cases, the disease was recognized before the etiological agent was found to be tickborne.

*Putative vector

Eisen, Rebecca J and Christopher D. Paddock. 2020. Tick and Tickborne Pathogen Surveillance as a Public Health Tool in the United States. Journal of Medical Entomology. 10.1093/jme/tjaa087

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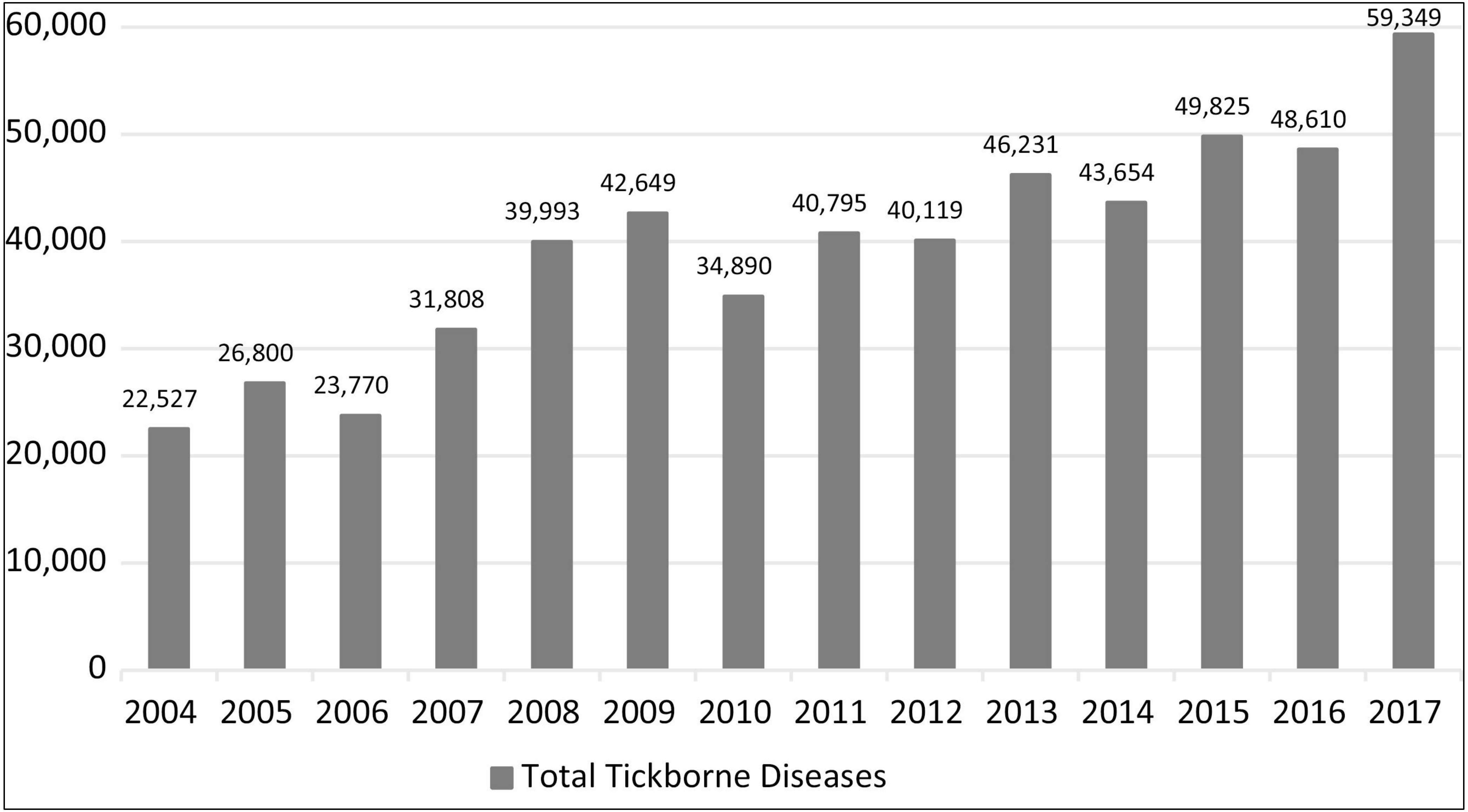
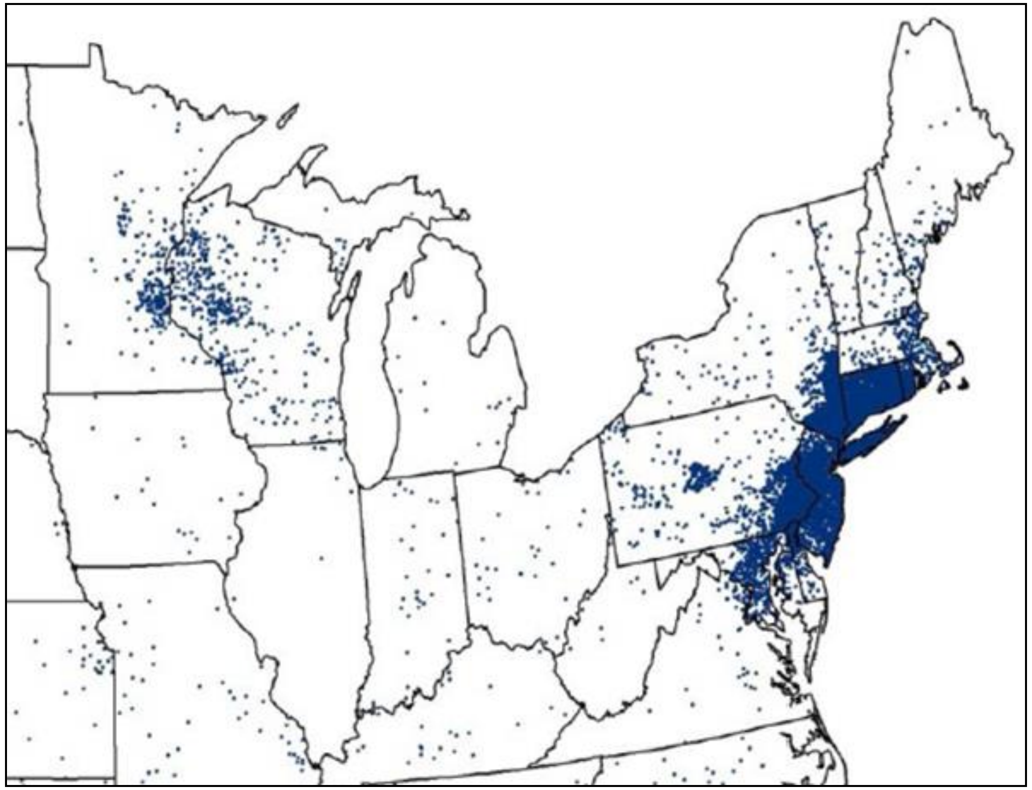
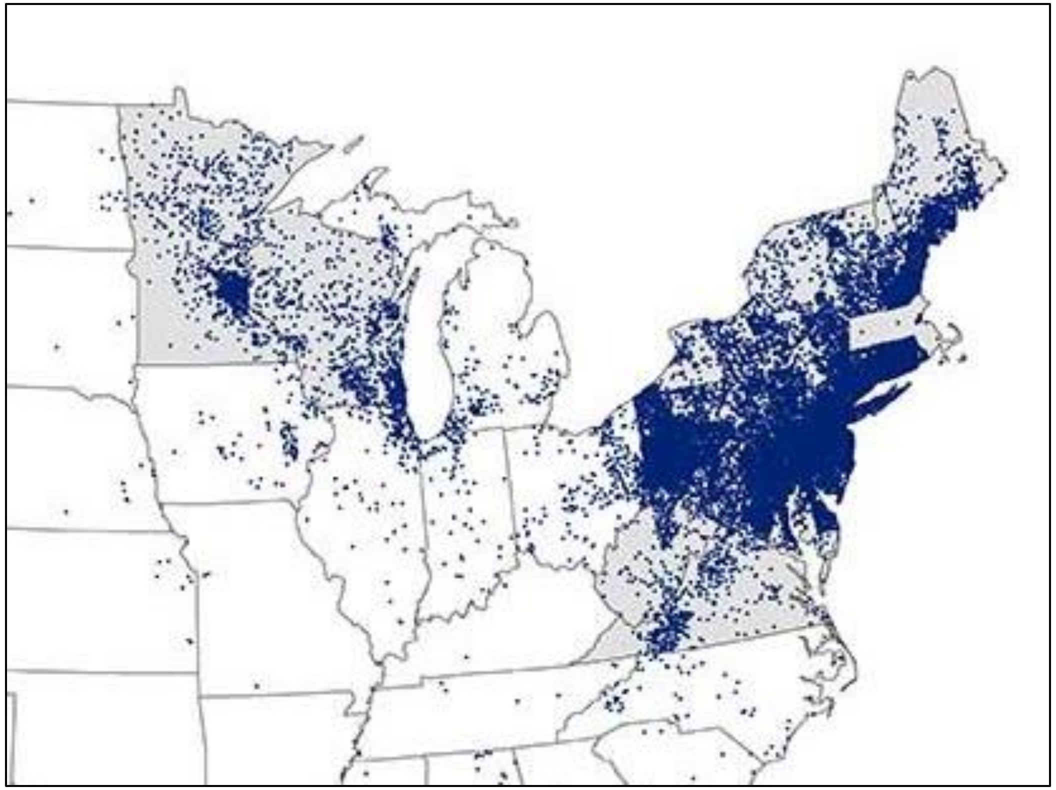


Journal of Medical Entomology, Volume 56, Issue 5, September 2019, Pages 1199–1203,
https://doi.org/10.1093/jme/tjz074

Lyme Disease Case Distribution Northeast and Upper Midwest - 22 Year Expansion



1996
16,455 reported cases of Lyme disease



2018
33,666 reported cases of Lyme disease

http://www.cdc.gov/lyme/stats/maps/interactiveMaps.html

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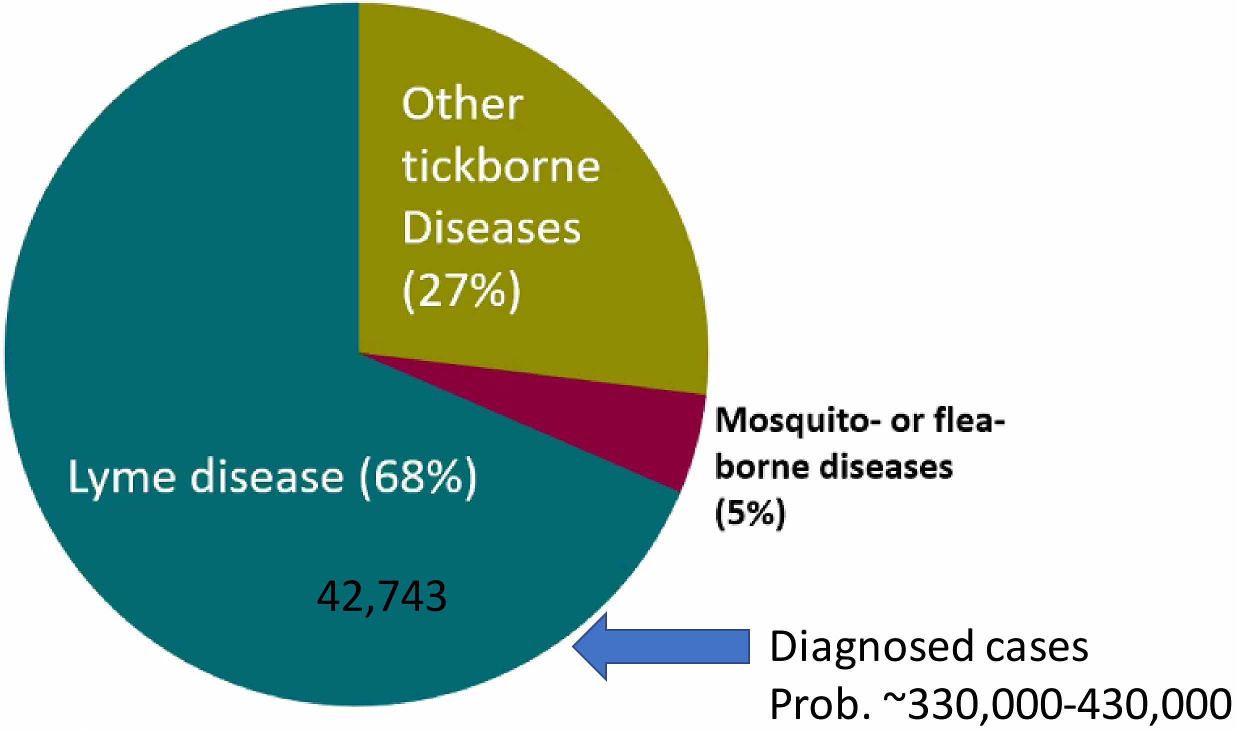
Majority of Reported Vector-Borne Diseases are Spread by Ticks



N= 62,399 cases

Cases of Nationally Notifiable Vector-borne Diseases Reported in the U.S., 2017

Major Ticks of the Northeast

- Records of 17 species of ticks in northeastern states
  3 species commonly bite humans
- 4, maybe 5, species can transmit disease pathogens
- Occasional exotic tick species from foreign travel and new invasive Asian longhorned tick

Woodchuck Tick
Ixodes cookei

Blacklegged Tick
Ixodes scapularis

American Dog Tick
Dermacentor variabilis

Lone Star Tick
Amblyomma americanum

Asian longhorned tick
Haemaphysalis longicornis

CDC/James Gathany

Others from humans in Connecticut include *Ixodes dentatus, Rhipicephalus sanguineus (brown dog tick)*

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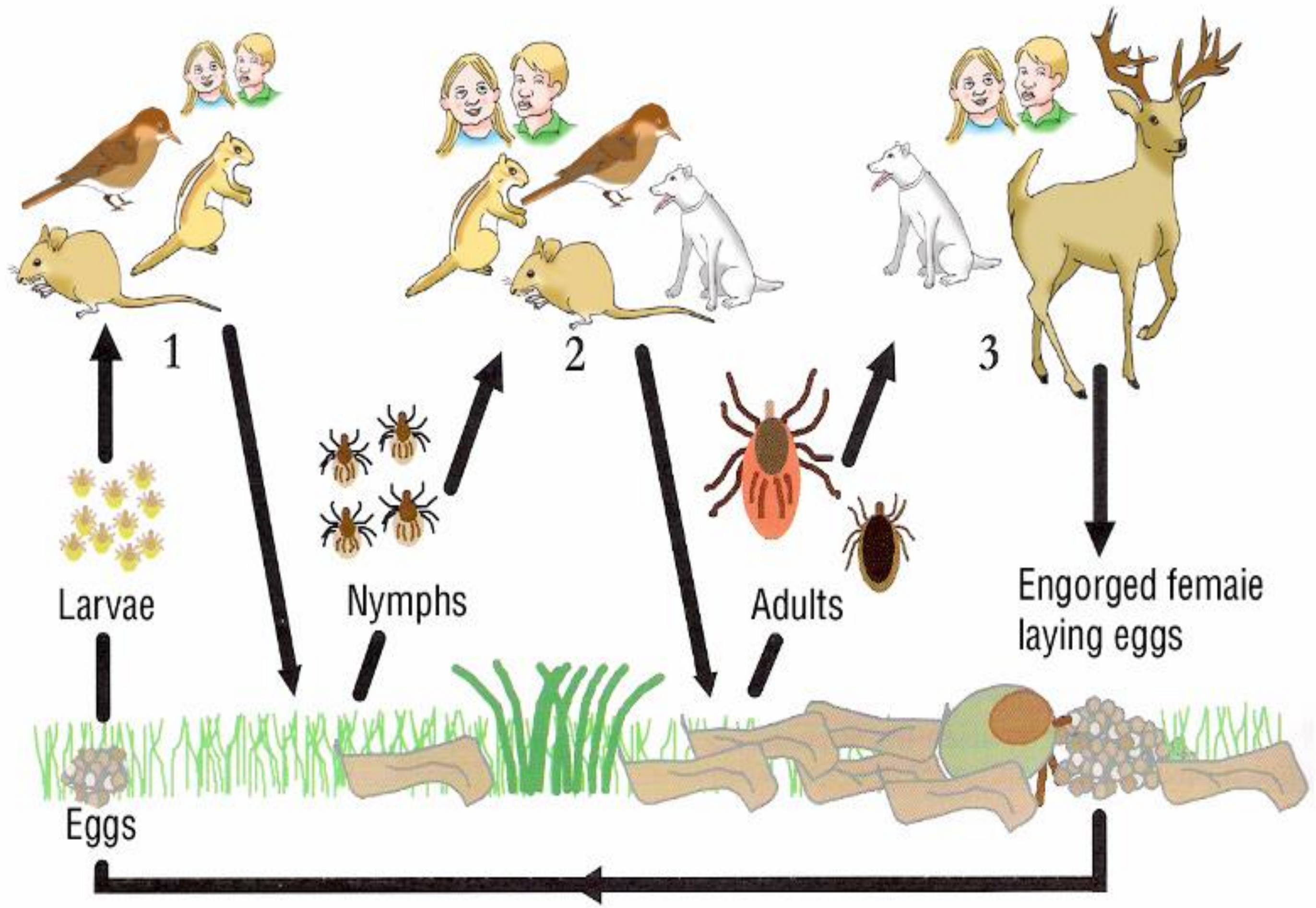
Three-host Tick Life-cycle

Ixodes scapularis



Kirby Stafford, CT Agricultural Experiment Station

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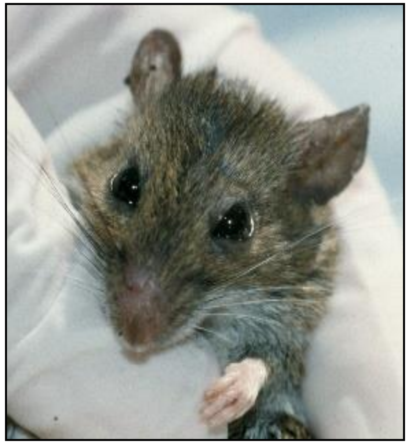
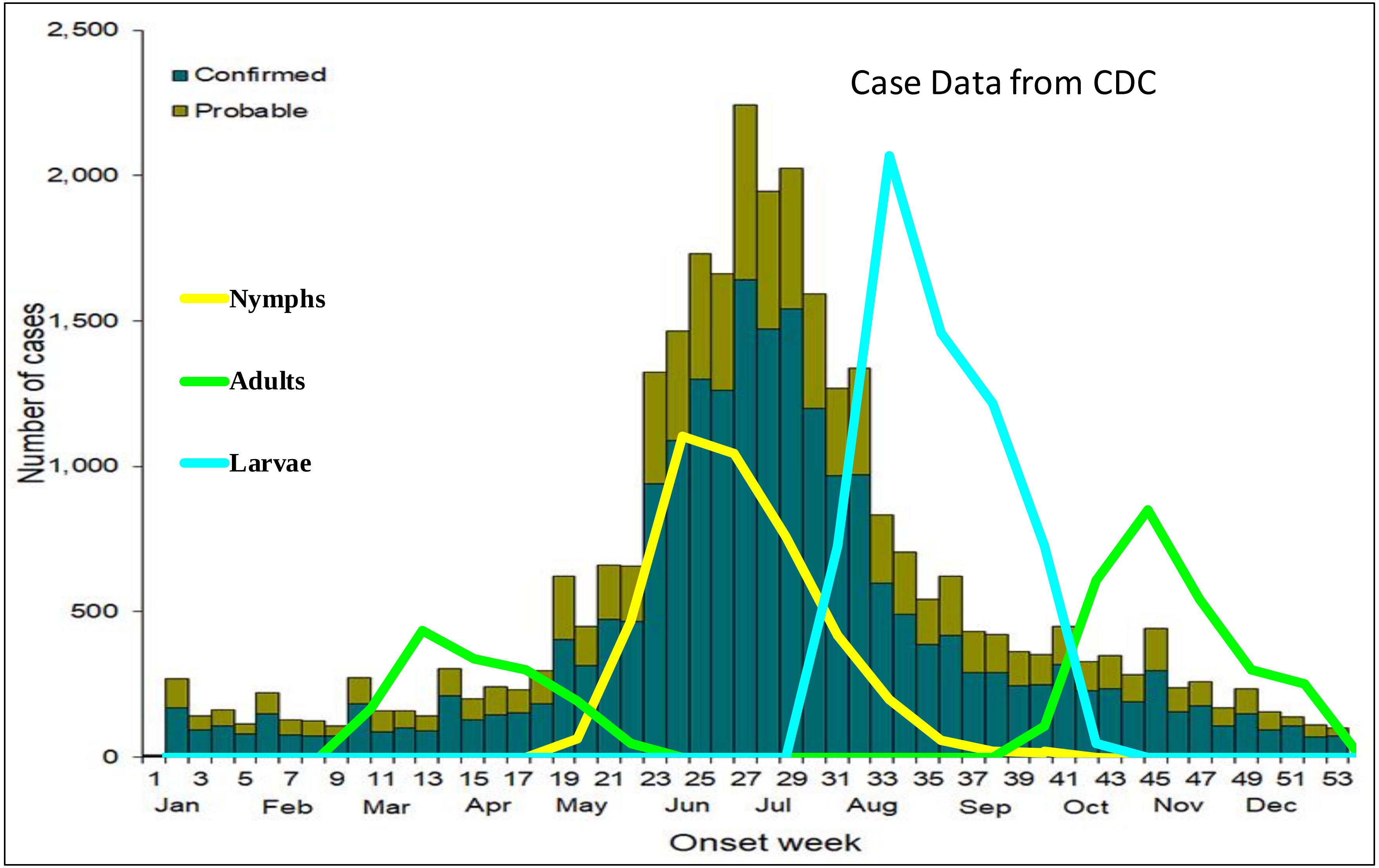


Photos K. Stafford unless otherwise labled

Lyme disease—Reported confirmed and probable cases by week* of disease onset, United States, 2017 with Seasonal Activity of *Ixodes scapularis* in the Northeast



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TICK SURVEILLANCE

Passive vs. Active Tick Surveillance

Guide to the Surveillance of Metastriate Ticks (Acari: Ixodidae) and their Pathogens in the United States

USDA

Centers for Disease Control and Prevent
Division of Vector-Borne Diseases
National Center for Emerging and Zoonotic Infecti
Atlanta, GA/Ft. Collins, CO
April 2020

Tick surveillance is intended to monitor changes in the distribution and abundance of ticks, seasonal activity, and the presence and prevalence of tickborne pathogens in order to provide actionable, evidence-based information to clinicians, the public and public health policy makers.

Surveillance for *Ixodes scapularis* and pathogens found in this tick species in the United States

Table of Contents

Surveillance for *Ixodes pacificus* and pathogens found in this tick species in the United States

Table of Contents

Adult *I. scapularis* on a tick drag (USDA)

Tick sweep variant of tick flag (USDA K7292-5)

Sampling wood plots

Sampling lawn edge

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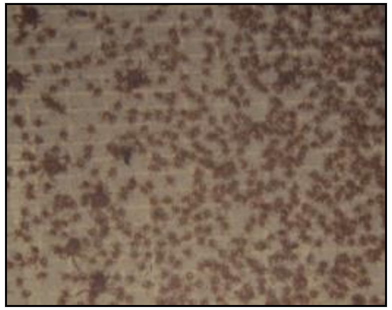
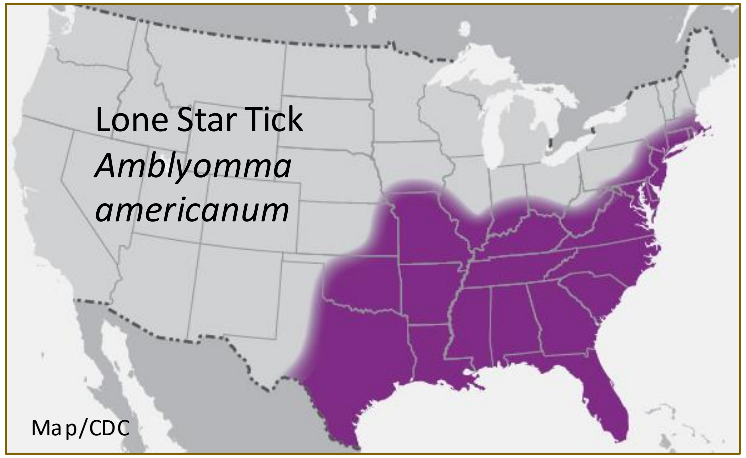
Lone star tick *Amblyomma americanum*

James Gathney/CDC





90-95% tick bites in southeastern U.S.

- Bourbon virus infection
- Ehrlichiosis: *Ehrichia chaffeensis, Ehrichia ewingii* Panola Mountain erhlichia
- Heartland virus infection
- Southern Rash Illness (STARI)
- Spotted Fever Group Tick-Associated Rickettsia
- Tularemia
- Red Meat Allergy (alpha-gal syndrome)

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Expansion of Lone Star Ticks in the Northeastern United States

Journal of Medical Entomology, 55(6), 2018, 1561–1568
doi: 10.1093/jme/tjy115
Advance Access Publication Date: 25 July 2018
Research Article

Vector-Borne Diseases, Surveillance, Prevention

OXFORD

Distribution and Establishment of the Lone Star Tick in Connecticut and Implications for Range Expansion and Public Health

Kirby C. Stafford III,[1,5] Goudarz Molaei,[1,2] Eliza A. H. Little,[1] Christopher D. Paddock,[3] Sandor E. Karpathy,[3] and Andrew M. Labonte[4]

Stafford et al. 2018. J. Med. Entomol. 55(6): 1561-1568 (July 25, 2018).

We have shown adult *A. americanum* can survive in Connecticut and to some extent, coastal Maine. Current environmental and climate conditions, especially moderate maritime climates, favor the establishment and expansion of lone star ticks along the New England coast (and mid-west). Inland areas may be still be to harsh for the immature stages. This tick is aggressive and is associated with several human diseases and will rise in importance for the region.

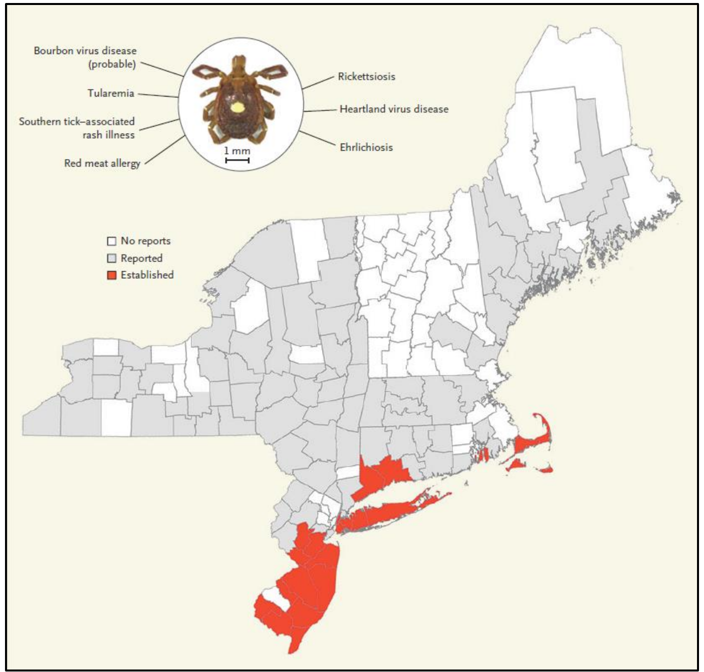
The NEW ENGLAND JOURNAL of MEDICINE

Perspective

DECEMBER 5, 2019

Bracing for the Worst — Range Expansion of the Lone Star Tick in the Northeastern United States

Goudarz Molaei, Ph.D., Eliza A.H. Little, Ph.D., Scott C. Williams, Ph.D., and Kirby C. Stafford, Ph.D.



Molaei et al. 2019. N. Eng. J. Med. 381;23: 2189-2192 (December 5, 2019).

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Asian Longhorned Tick
Haemaphysalis longicornis

H. longicornis adult (left) and nymph (right) with a straight pin for scale. (***Photo credit**: James L. Occi, Rutgers University*)

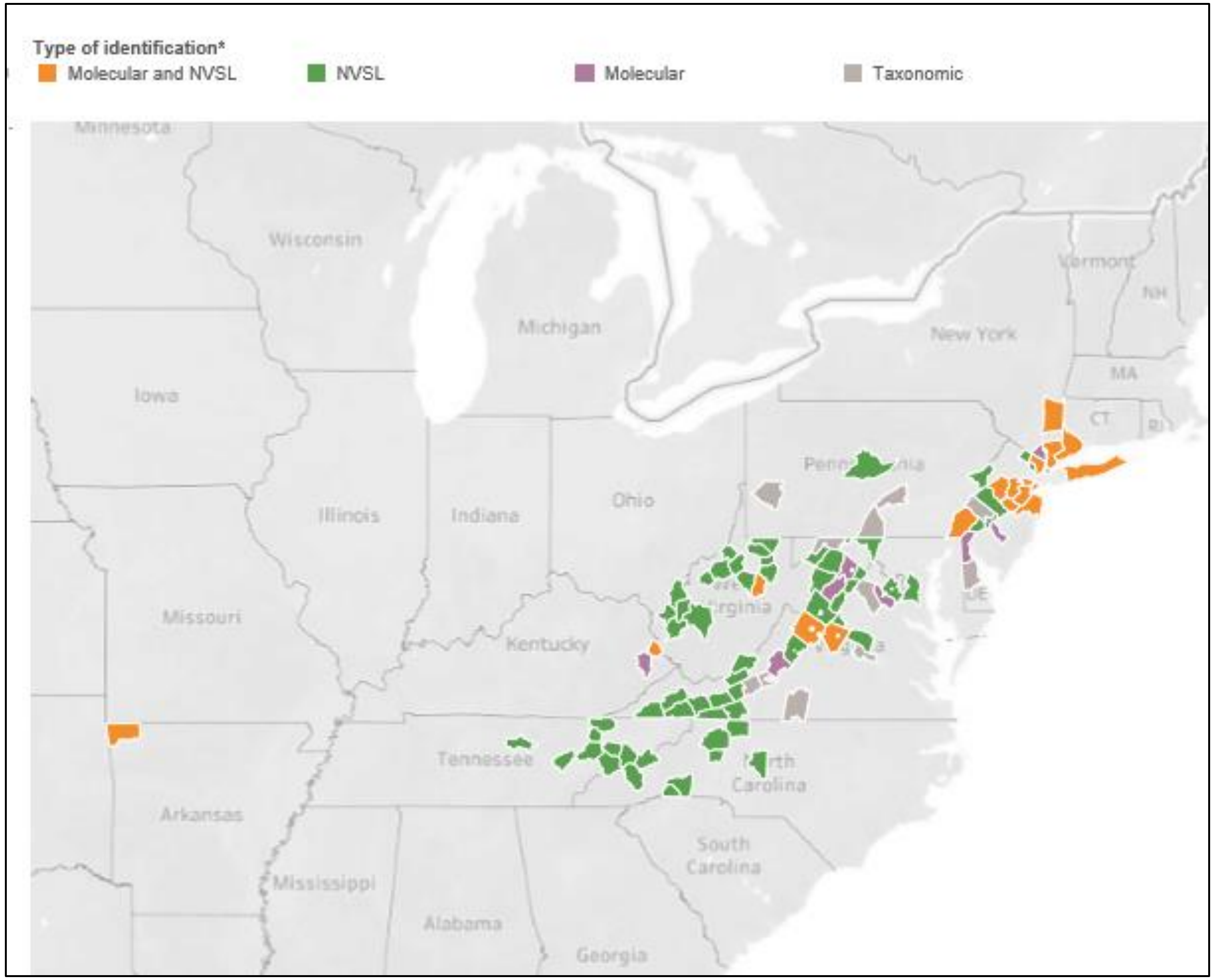
CDC/James Gathany

James Gathany/Centers for Disease Control and Prevention

This photograph depicts two *Haemaphysalis longicornis* ticks, commonly known as the longhorned tick. The smaller of the two ticks on the left, is a nymph. The larger tick is an adult female. Males are rare. This tick can reproduce asexually.

An East Asian tick, the Asian longhorned tick *Haemaphysalis longicornis*, was discovered on sheep at a farm in Hunterdon County, NJ on 9 Nov 2017. The East Asian tick is considered a serious pest to livestock including cattle, horses, sheep, and goats and will attack pets, wildlife, and occasionally humans. It is a known vector for a number of human and animal pathogens in its native range in parts of China, the Koreas, and Japan.

Counties and county equivalents* where *Haemaphysalis longicornis* has been reported (N = 63) — United States, as of April 15, 2020



- From August 2017 to April 15, 2020, reported from twelve U.S. states (Arkansas, Connecticut, Delaware, Kentucky, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Virginia, and West Virginia)
- Known distribution is expanding as surveillance efforts increase
- Not a vector for *B. burgdorferi*, but in lab for *R. rickettsii*
- Mainly of veterinary concern at this point

Source: National *Haemaphysalis longicornis* Situation Report, US Department of Agriculture, April 15, 2020

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Ticks as Vectors

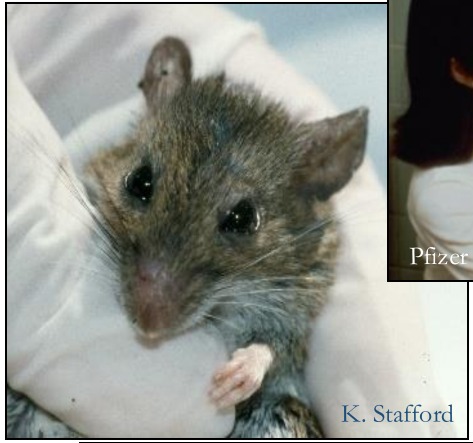
“There is increasing evidence from detailed analyses that rapid changes in the incidence of tick-borne diseases are driven as much, if not more, by **human behavior** that determines exposure to infected ticks than by tick population biology that determines the abundance of infected ticks.”

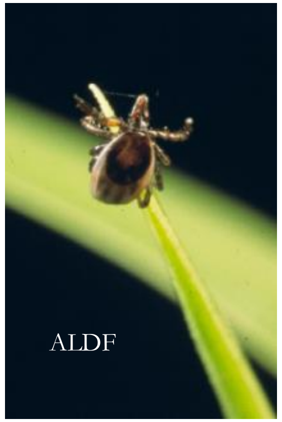
Randolph, S. E. 2010. To what extent has climate change contributed to the recent epidemiology of tick-borne diseases? Veterinary Parasitology 167: 92-94.

“Habitat diversity, **environmental factors** influencing survival and tick activity, and geographic distribution of the ticks impacts risk of tick-borne disease.”

Eisen, R. J. et al. 2012. What do we need to know about disease ecology to prevent Lyme disease in the Northeastern United States? Journal of Medical Entomology 49(1): 11-22.

CDC



USDA/Scott Bauer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Ticks as Vectors

Tick are found in wooded and successional habitats in relatively high numbers. Infection prevalence and tick-borne disease incidence (TBD) are endemic and non-focal. Ticks don't fly. People must *enter* or *live* in tick habitat to become exposed. Many homes are built in forested [tick & host] habitats.

Infection prevalence may be somewhat predictive of transmission risk for TBDs, but tick abundance and number of tick bites people receive impacts chance of encountering at least one infected tick. Risk is dependent upon human behavior, personal protection measures and tick checks.

K. Stafford

Pfizer

K. Stafford

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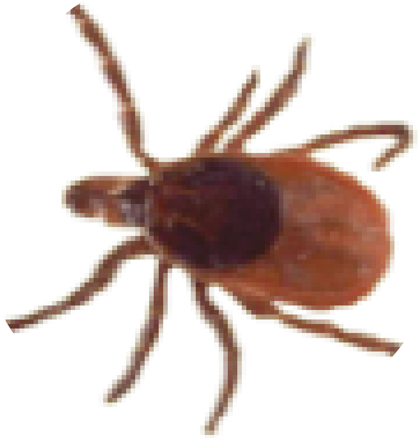
Questions



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IPM Tick Management

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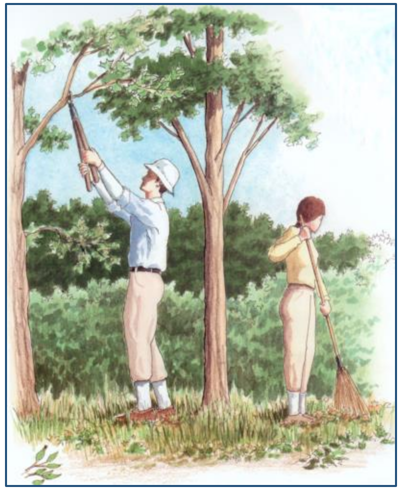
Approaches Integrated Tick Management

- **Education and behavior change**
- **Personal protection measures**
- **Landscape modifications**
- **Chemical control**
  Synthetic insecticides, botanicals, “natural” compounds
- **Biological control**
- **Host reduction or exclusion**
- **Host-targeted acaricides**
- **Host-targeted vaccines**

Kirby Stafford



Barnstable Co. Coop. Ext.

Kirby Stafford

Skip Weisenburger

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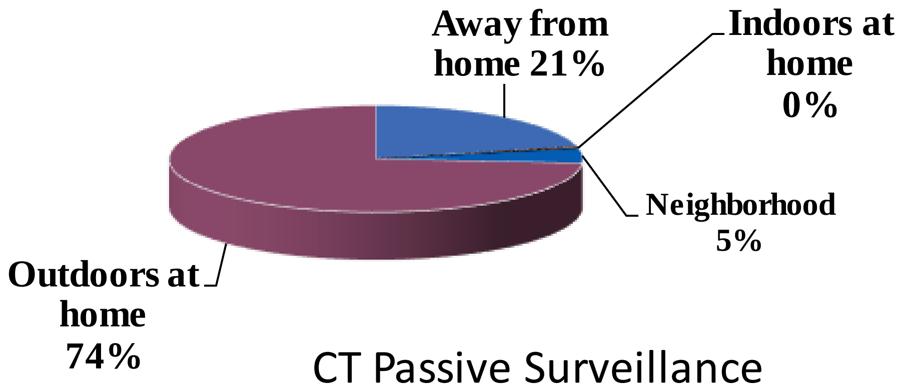
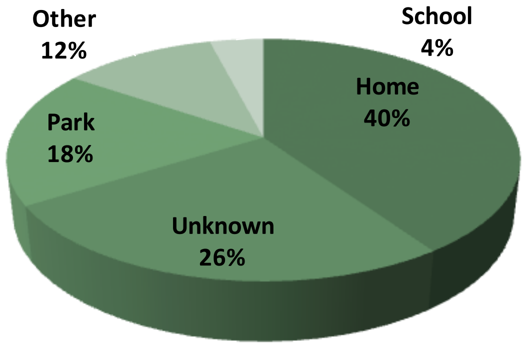
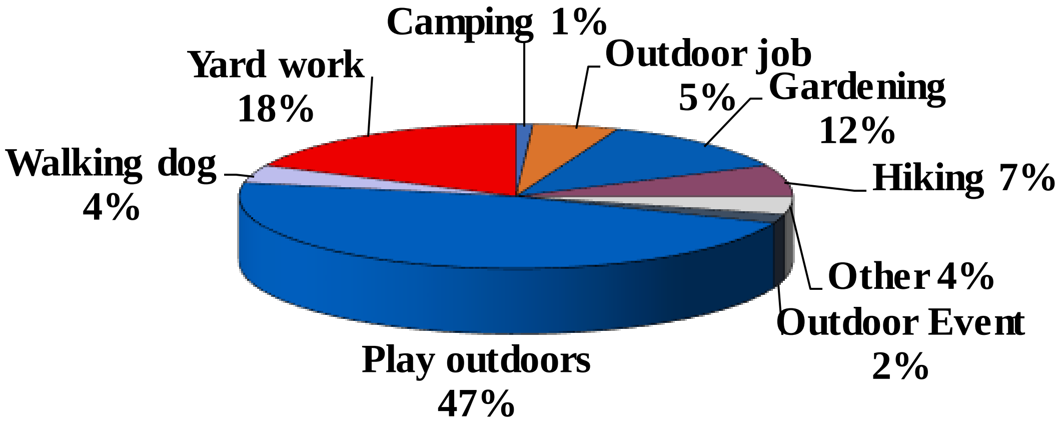
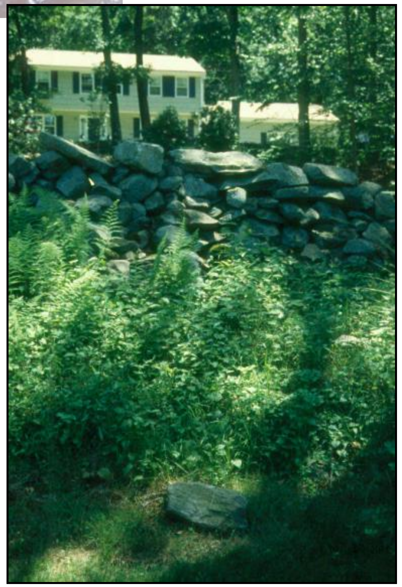


CT Passive Surveillance



Monmouth County NJ Passive Surveillance





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Risk Tick encounters

Passive Tick Surveillance (People submit ticks)

Exposure in Western U.S. is largely recreational

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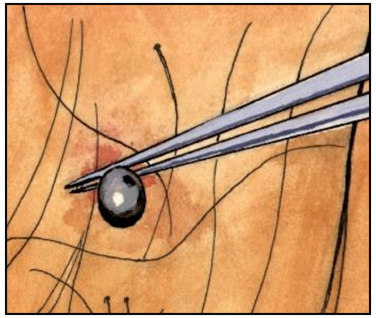
Personal Protection Measures

Tick Bite Prevention

- Clothing – pants tucked in socks
- Skin-based repellents: DEET (25-30%), Picaridin (20%), Oil of Lemon Eucalyptus (30%)
- Permethrin-based clothing tick repellents (0.5%) EFFECTIVE!
- Permethrin-treated clothing Reduced tick bites 58%
- Bathing, TICK CHECKS!
- Promptly remove ticks

Pfizer



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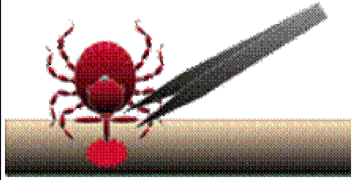
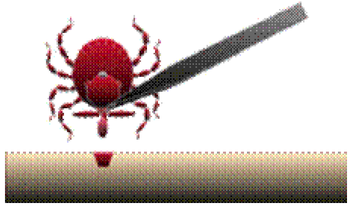
Pfizer





CDC

Stafford

Pfizer

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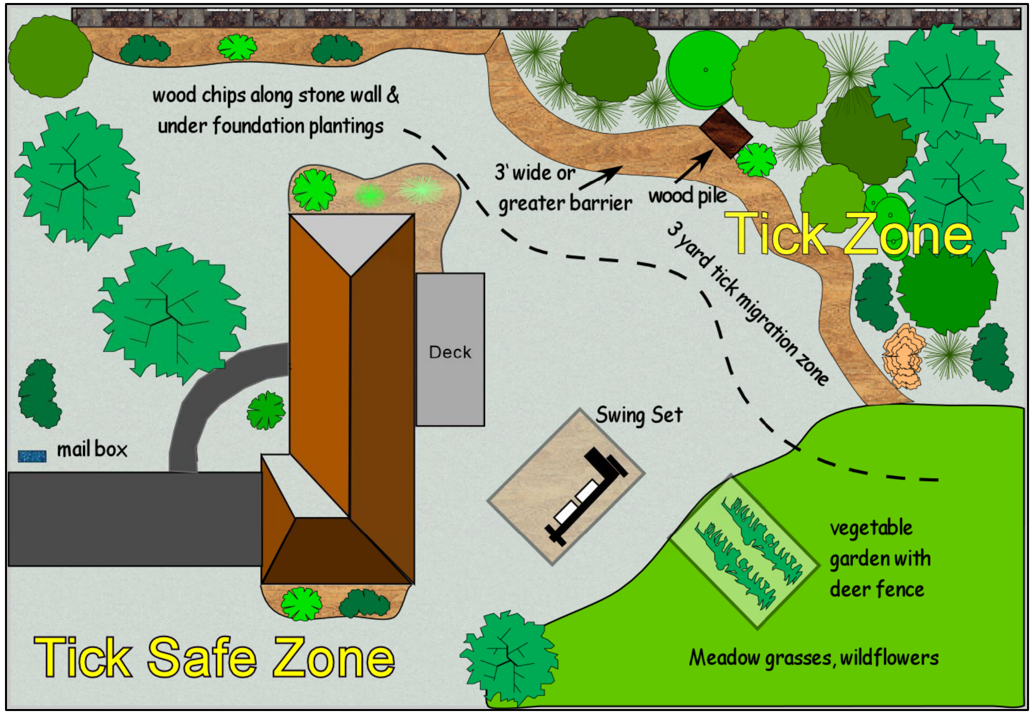
Residential Landscape Management



Leaf litter removal 49-70% reduction

Landscape barrier 35-77% reduction

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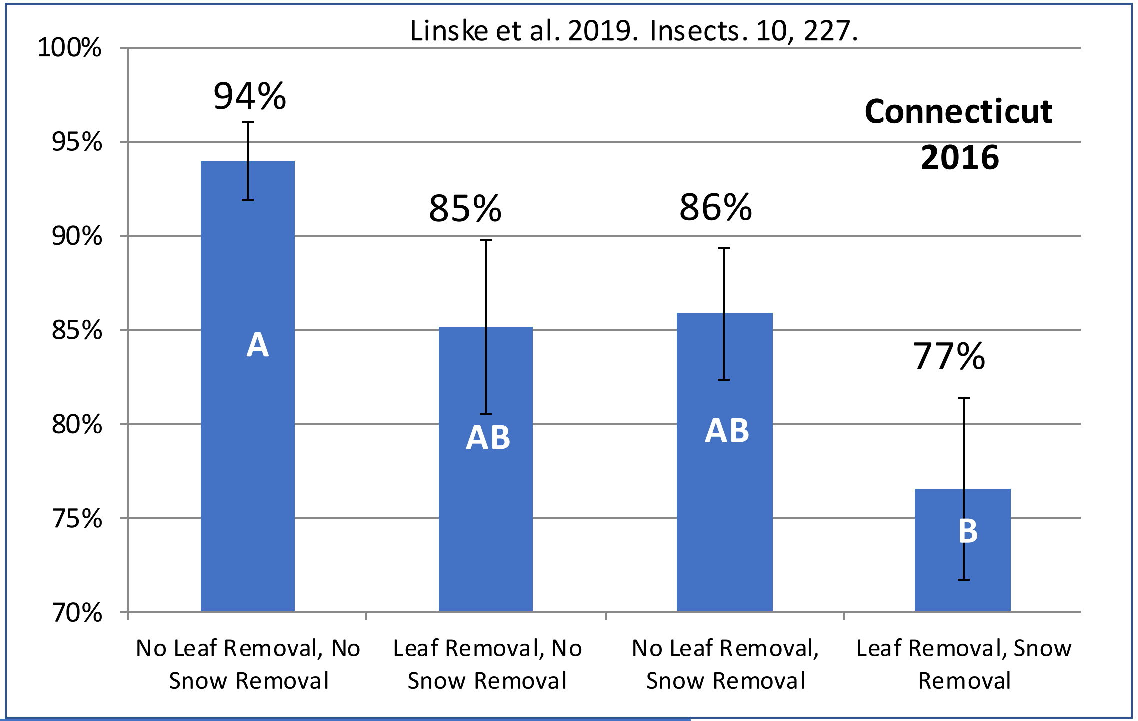
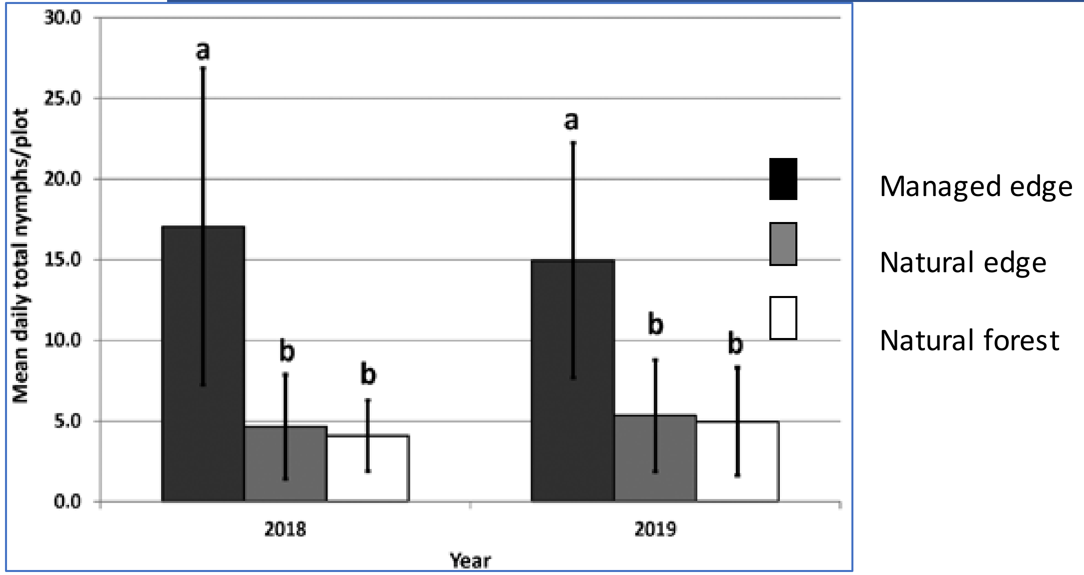
Leaf Litter management

- Leaf litter increases overwinter survival of *I. scapularis* nymphs and *A. americanum* adults
- Leaf blown or raked accumulations of leaves at lawn edge is associated with increased numbers of nymphal *I. scapularis*
- Removal off-site, bagging and possibly composting of leaf litter may help reduce risk.





Jordon & Schulze. 2020. J. Med. Entoml. Advance article

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Control Invasive plants for management of Ticks

- Higher tick counts are associated with exotic invasive forest understory than native forest understory or open understory forests
- Abundance adult blacklegged ticks, *Ixodes scapularis*, infected with *Borrelia burgdorferi*, was greatest in areas dense Japanese barberry
- Greater number lone star ticks, *Amblyomma americanum,* infected with *Ehrlichia sp.* was present in stands of invasive honeysuckle
- Dense stands provide ideal microclimate for ticks and host habitat
- Reduction and long-term management barberry significantly reduced abundance infected ticks
- Removal honeysuckle decreased deer activity and numbers of *Ehrlichia* infected ticks

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Spraying

Photographs: Kirby Stafford

- Synthetic Acaricides
  Carbamate
  Pyrethroids
  Neonicotinoids (animals)

- Microbial Biopesticides
  Metarhizium anisopliae
  (Met52)

- Botanicals & natural occurring substances, including plant extracts (essential oils)(EPA 25b list of minimum risk pesticides)

% Reduction *Ixodes scapularis* Nymphs by Application Acaricides to the Environment

	Acaricide	Application	reduction nymphs*	Time evaluation
Pyrethroids	Bifenthrin	Spray	45-100%	1-6 wks
	Cyfluthrin	Spray	88-100%	2-8 wks
	Cyfluthrin	Granules	87-97%	1-8 wks
	Deltamethrin	Granules	87-100%	1-5 wks
Carbamate	Carbaryl	Spray	43-93%	2-13 wks
	Carbaryl	Granules	46-96%	1 wk-3 mo
Biopesticide	*Metarhizium anisopliae*	Spray *(Met52)	36-96%	3-8 wks
25b	Rosemary, etc.*	Spray (low, 2x) (IC2)	10-95% (high 2nd appl)	1-5 wks
	Rosemary, etc.*	Spray (high) (IC2)	100%	1-2 wks
	Garlic	Mosquito Barrier	37-59% repellency	1-2 wks

Review Eisen, L. and M. C. Dolan. 2016. J. Med. Entomol. 53(3): 1063-1092. *Rosemary, peppermint, wintergreen, original IC2 is no longer available; but there is EcoExempt IC^2 and Essentria IC-3 is a different formulation

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Nootkatone

VECTOR CONTROL, PEST MANAGEMENT, RESISTANCE, REPELLENTS

Efficacy and Environmental Persistence of Nootkatone for the Control of the Blacklegged Tick (Acari: Ixodidae) in Residential Landscapes

ANUJA BHARADWAJ,[1,2,3] KIRBY C. STAFFORD, III,[1] AND ROBERT W. BEHLE[4]

MEDICAL ENTOMOLOGY

Suppression of Host-Seeking *Ixodes Scapularis* and *Amblyomma Americanum* (Acari: Ixodidae) Nymphs After Dual Applications of Plant-Derived Acaricides in New Jersey

ROBERT A. JORDAN,[1,2] MARC C. DOLAN,[3] JOSEPH PIESMAN,[3] AND TERRY L. SCHULZE[1,4]

VECTOR CONTROL, PEST MANAGEMENT, RESISTANCE, REPELLENTS

Susceptibility of Four Tick Species, *Amblyomma americanum*, *Dermacentor variabilis*, *Ixodes scapularis*, and *Rhipicephalus sanguineus* (Acari: Ixodidae), to Nootkatone From Essential Oil of Grapefruit

LINA B. FLOR-WEILER,[1] ROBERT W. BEHLE,[1,2] AND KIRBY C. STAFFORD III[3]

Nootka SHIELD™

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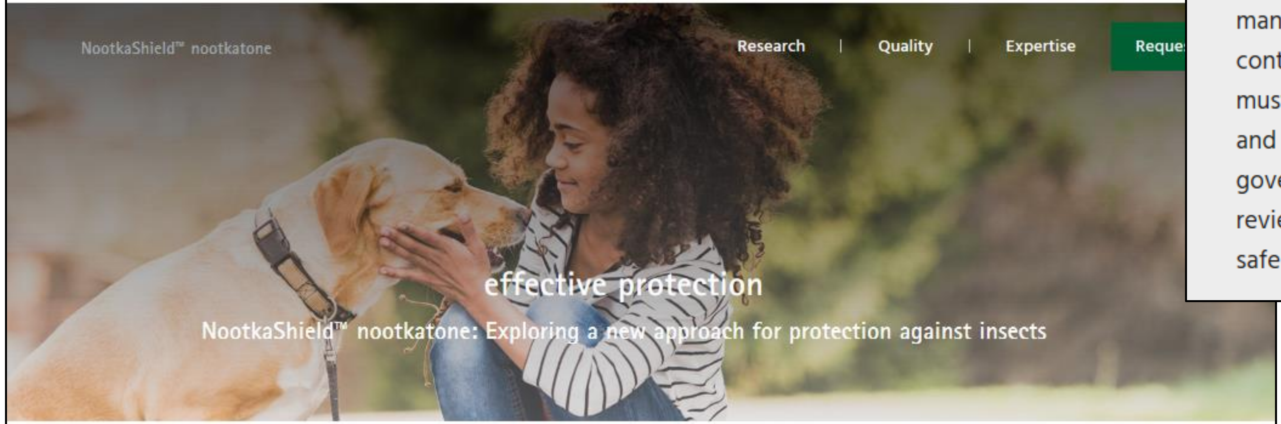
NootkaShield™ nootkatone | Research | Quality | Expertise | Reque



What is NootkaShield™ nootkatone?

Met52

Metarhizium anisopliae

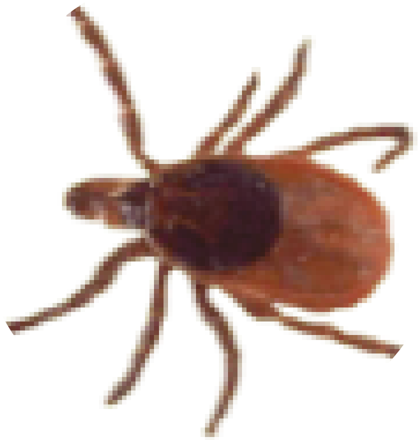
Future of product?

U.S. EPA Manufacturing Use Registration is Under Review

Evolva has a registration application before the U.S. Environmental Protection Agency (EPA) for the approval of NootkaShield™ for manufacturing use. Any product that will contain NootkaShield™ as an active ingredient must submit a product application to the EPA and be approved prior to initiating sales. Similar governing bodies in other countries must review data demonstrating NootkaShield™ is safe and effective.

https://evolva.com/NootKaShield/

Questions



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Host Targeted Tick Control

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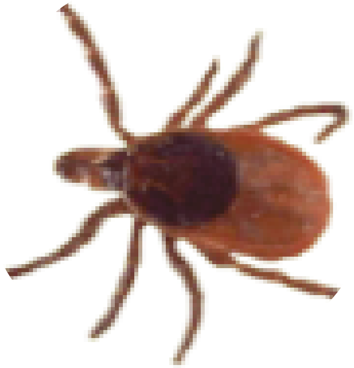
THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

Photo by Kirby Stafford

Photo by Skip Weisenburger, The Day



Host-Targeted Tick Control

Rodent Reservoir Hosts

White-footed Mice
Eastern Chipmunk
For *I. scapularis*

Photo by Kirby Stafford

Chipmunks do not use the cotton in tick tubes

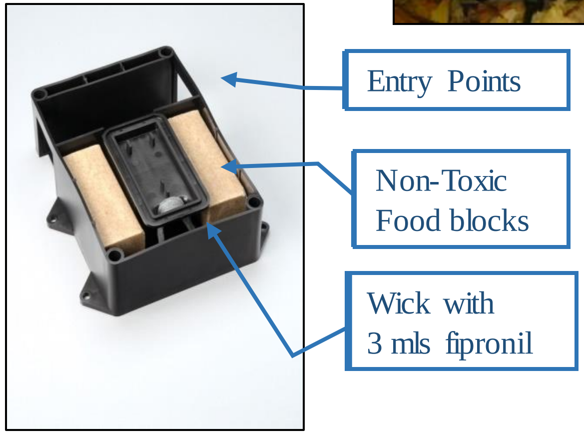
Tick Tubes

from
EcoHealth Inc.
&
Thermacell

27.6 & 20.3% control nymphs, Yr 1 & Yr 2

Fipronil Bait Boxes

K. Stafford



84.0 & 79.1% control nymphs, Yr 1 & Yr 2

Jordan & Schulze 2019 J.Med.Entomol. 56:1095-1101

Not applicable for lone star ticks as immature stages don't readily use rodent hosts

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White-tailed Deer

Photo by Skip Weisenburger, The Day

Exclusion

Reduction

Treatment

Fencing Reduction (> 70 m inside)
larvae 100%, nymphs 84%, adults 74%

Stafford III, Kirby C. and Scott C. Williams. 2017. Deer-targeted methods: A review of the use of topical acaricides for the control of ticks on white-tailed deer. J. Integrated Pest Mgmt. 8(1): 19; 1-5. OPEN ACCESS

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Tick-borne disease toolbox

Personal protection measures	Treatment/ vaccination in humans	Landscape/ vegetation management	Killing host-seeking ticks	Rodent -targeted approaches	Deer-targeted approaches
Avoid tick habitat	Antibiotic prophylaxis after tick bite	Xeroscaping/ hardscaping	Synthetic chemical acaricide	Topical acaricide bait box	Topical acaricide feeding station
Protective clothing	Human vaccine	Short grass, remove weeds	Natural product-based acaricide	Oral vaccine	Deer reduction
Tick checks & prompt removal ticks		Remove leaf litter and brush	Fungal acaricide	Oral antibiotic bait	Deer fencing
Synthetic chemical repellent		Remove rodent harborage	Acaricide with semiochemicals	Oral tick growth regulator	Oral parasiticide
Natural product-based repellent					Oral tick growth regulator
Permethrin-treated clothing					Anti-tick vaccine for deer
Natural product-based soap/lotion					

denotes intervention used in combination with another tick control method

denotes intervention with some supporting data on reduction Lyme disease

Adapted from slide by Ben Beard, CDC-Division Vector-Borne Diseases

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Integrated Tick Management (ITM)

Journal of Integrated Pest Management

Journal of Integrated Pest Management, (2017) 8(1): 28; 1–7
doi: 10.1093/jipm/pmx018
Issue

OXFORD

Integrated Pest Management in Controlling Ticks and Tick-Associated Diseases

Kirby C. Stafford III,[1,3] Scott C. Williams,[1] and Goudarz Molaei[1,2]

Open Access

Journal of Integrated Pest Management, (2018 9(1): 12; 1–10
doi: 10.1093/jipm/pmy006
Issues

OXFORD

Review: Application of Tick Control Technologies for Blacklegged, Lone Star, and American Dog Ticks

Alexis White[1] and Holly Gaff[1,2,3]

Open Access

JIPM Collection on Integrated Tick Management
https://academic.oup.com/jipm/pages/integrated_tick_management

Photo by Skip Weisenburger, The Day

Photos by Kirby Stafford

Integrated Tick Management – Connecticut (2013-2015)

Integrated Control of Nymphal *Ixodes scapularis*: Effectiveness of White-Tailed Deer Reduction, the Entomopathogenic Fungus *Metarhizium anisopliae*, and Fipronil-Based Rodent Bait Boxes

Scott C. Williams,[1] Kirby C. Stafford, III,[1] Goudarz Molaei,[1,2] and Megan A. Linske[1]

Vector-Borne and Zoonotic Diseases 18: 55-64

Original article

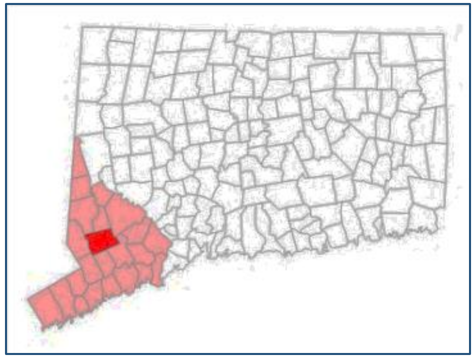
Integrated control of juvenile *Ixodes scapularis* parasitizing *Peromyscus leucopus* in residential settings in Connecticut, United States

Scott C. Williams[a,*], Eliza A.H. Little[a], Kirby C. Stafford III[a], Goudarz Molaei[a,b], Megan A. Linske[a]

Ticks and Tick-Borne Diseases 9: 1310-1316.

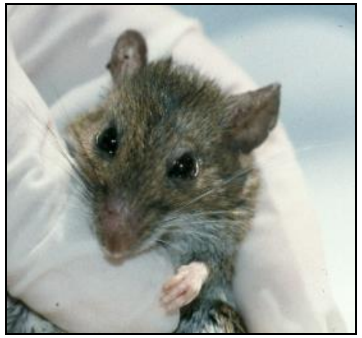
Four 1-mi^2 neighborhoods

1. Control (n = 12 residences)
2. Deer removal only (n = 8) (dropped after year 2)
3. Met 52 + Bait box (n = 13)
4. Deer removal, Met 52, Bait box (n = 5)







Photos by Kirby Stafford

Funded by the CDC

Note: Bait boxes not applicable for lone star ticks as immature stages don't readily use rodent hosts

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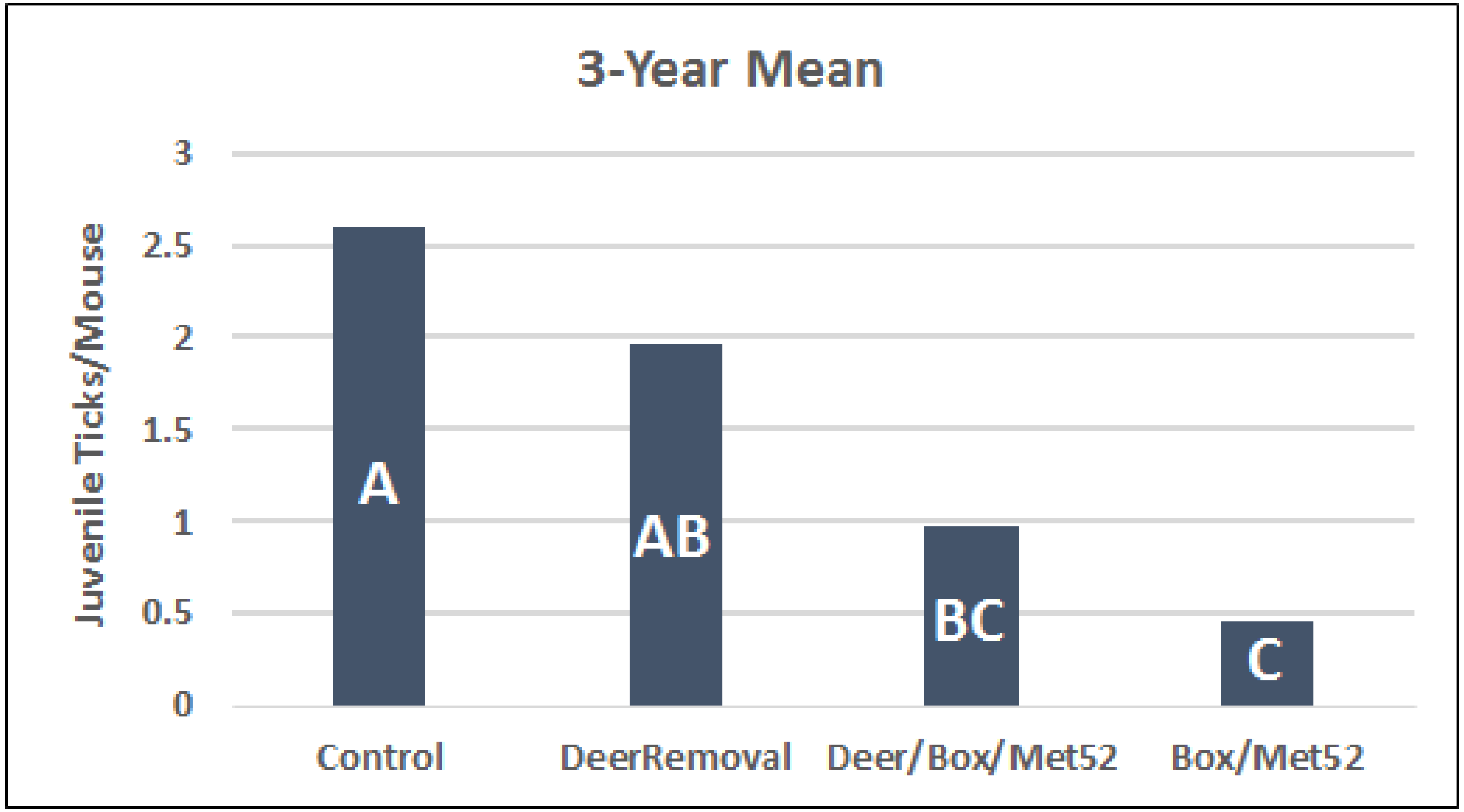
Juvenile *I. scapularis* parasitizing captured *P. leucopus*



The combination of fipronil-based bait boxes and broadcast application of *M. anisopliae* had the most impact of any treatment combination; questing nymphs were reduced 78–95% within each year and *Borrelia burgdorferi*-infected questing nymphal *I. scapularis* encounter potential was reduced by 66% as compared with no treatment in the third year of the study.

USDA-ARS/CAES ITM Study (MD & CT)

Suppression of Vector Tick Populations in Suburban landscape Through Integrated Use of Host-targeted and Non-host targeted Tick Control Measures

Scott Williams, Megan Linske, Kirby Stafford with Michael Short and Heidi Stuber (with Andrew Li, USDA)

Neighborhood	4-poster	Bait Box	Met52	No. 4-poster locations	No. tick sampling properties	No. rodent sampling properties
1	No	Yes	Yes	-	10	9
2	Yes	Yes	No	3	12	9
3	Yes	Yes	Yes	3	12	9
4	Yes	Yes	No	3	10	9
5	No	No	No	-	13	9
6	Yes	Yes	Yes	3	13	9
7	No	Yes	Yes	-	13	9
Total				12	83	63

Summer 2017 Baseline Year Sampling

Spring 2018 began deployment 4-posters for fall and spring each year.

Summer 2018, 2019, 2020 full implementation of treatments with spraying Met52 (*M. anisopliae*) and deployment of fipronil bait boxes.

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USDA-ARS/CAES ITM (MD & CT)

A total of 10 bait boxes were distributed at each of the 9 properties within the 6 treatment neighborhoods (n= 540 boxes).

A 100 gallon spray rig was purchased and the Met52 was applied by CAES staff in mid-June. Nine properties in each of four neighborhoods (n= 36) received Met52 application. Twelve 4-posters placed on land trust, town, and private property.

Stafford III, Kirby C. and Scott C. Williams. 2017. Deer-targeted methods: A review of the use of topical acaricides for the control of ticks on white-tailed deer. J. Integrated Pest Mgmt. 8(1): 19; 1-5. OPEN ACCESS

ELSEVIER
Ticks and Tick-borne Diseases
journal homepage: www.elsevier.com/locate/ttbdis

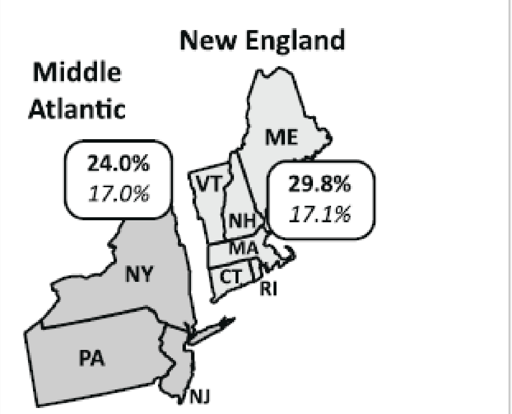
Original article

U.S. public's experience with ticks and tick-borne diseases: Results from national HealthStyles surveys

Sarah A. Hook*, Christina A. Nelson, Paul S. Mead
Division of Vector-Borne Diseases, Centers for Disease Control and Prevention, 3156 Rampart Road, Fort Collins, CO 80521, USA

Hook et al. 2015. 6(4): 483-488.

Public perceptions & prevention measures tick-borne diseases



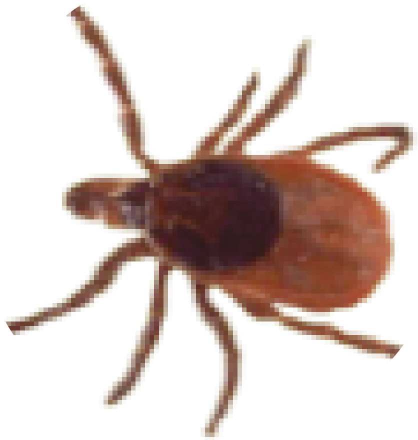
% reporting tick exposure family member past year
% consulting health professional

Use of prevention measures (2011), *n* (% within region)

Region	Use repellent	Shower	Do tick checks	Other steps	Do nothing	Currently Use yard pesticides*	Would not use yard pesticides*
Overall	**826 (21.1)**	**589 (15.7)**	**1316 (30.6)**	**312 (7.6)**	**2066 (51.2)**	**558 (10.7)**	**4476 (10.2)**
New England	53 (25.6)	32 (15.1)	103 (43.2)	25 (13.1)	64 (35.9)	15 (7.2)	21 (14.1)
Mid-Atlantic	127 (26.1)	92 (19.2)	182 (30.7)	49 (9.5)	247 (45.4)	58 (6.8)	76 (10.5)

*2009

Questions



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Challenges to Effective Public Tick Control

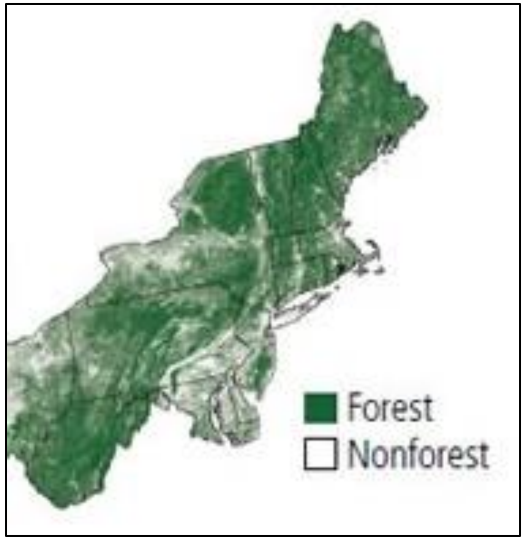
Northeastern IPM Center

USDA United States Department of Agriculture National Institute of Food and Agriculture

The Connecticut Agricultural Experiment Station

Challenges to effective public tick control

1. Differing tick species, ecologies & where ticks are located (much northeast forested with likely tick habitat)
2. Who is responsible for tick control on private properties versus community/public lands, including neighborhood greenbelts, school grounds, and city, county and state parks?
3. How can we deal with low acceptability of many current tick control methods and limited willingness to pay?
4. What methods are novel, ecological or biorational in nature and for what specific ticks and localities? How sustainable are they?
5. Variable, uncertain, unknown efficacy for tick control methods or even **whether any can prevent disease!**



Challenges to effective public tick control

6. Lack of municipal/local vector-control efforts specifically aimed at ticks
7. Little recent research on control of some species of increasing concern (focus on *I. scapularis* due to Lyme disease).
8. How can we get industry to invest in developing new products for an unclear public health tick control market?
9. How effective are broadcast acaricides when applied by homeowners or Pest Management Professionals? i.e., **Efficacy**
10. Homeowner problem; largely rely on licensed commercial pesticide. PMP model doesn't allow time for consideration individual habitat conditions and tick density


K. Stafford


K. Stafford

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Forum

Forum OXFORD

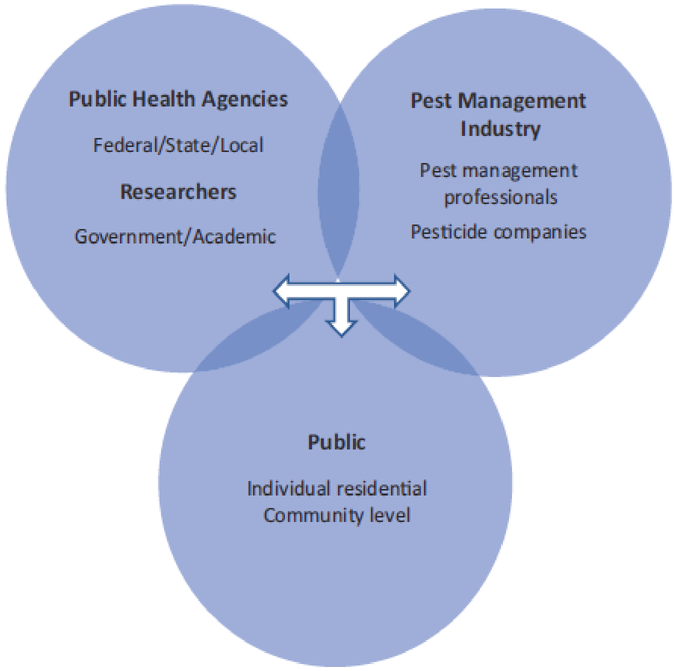
Barriers to Effective Tick Management and Tick-Bite Prevention in the United States (Acari: Ixodidae)

Lars Eisen[1,3] and Kirby C. Stafford III[2]

Epub ahead of print
10.1093/jme/tjaa079
Journal of Medical Entomology

With credit to the HHS Tick-Borne Disease Working Group and Subcommittee reports

- Skepticism and public distrust of chemical pesticides and repellents.
- Social acceptability of deer management.
- Willingness to pay for effective tick-control measures.
- Lack of funding for large-scale neighborhood/community/area-wide studies.
- Increased pesticide resistance concerns, pollinator health concerns.
- Declining public health entomology workforce and lack of funding to support employment to sustain continued tick-borne disease prevention research.
- Effectiveness, scale, cost, and implementation are key components for tick management strategies



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Where do we go from here?

- Widespread and difficult to control, diseases from tick bites are a major problem worldwide. The growing number and spread of tick-borne diseases pose an increasing risk in the U.S.
- There are many tools available for killing ticks, but impact on disease unclear or unproven and few methods available or utilized by homeowners
- Need safe, cost-effective, socially acceptable, and effective prevention tools
- Multiple challenges or barriers to effective tick bite prevention

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One Health Approach

TBDs can be difficult to control due to their complex epidemiology and ecologies that may involve different tick vectors and animal hosts

Animal Branch

Unify
Communicate

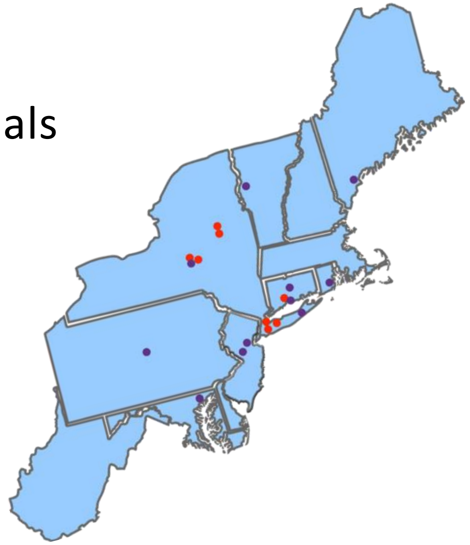
Human Branch

Veterinarians
Veterinary Entomologists
Wildlife Biologists
Animal Scientists
Animal Health Officials

Environmental Health

Physicians
Medical Entomologists
Vector Biologists
Public Health Officials
Epidemiologists
Pest Management Professionals

NEVBD
NORTHEAST REGIONAL CENTER FOR EXCELLENCE IN VECTOR-BORNE DISEASES



Five universities with partners were established as Regional Centers for Excellence in Vector-Borne Diseases (COEs) to help prevent and rapidly respond to emerging vector-borne diseases across the United States.

The Northeast Regional COE at Cornell University
The Pacific Southwest COE at the University of California, Davis and Riverside
The Southeastern Regional COE at the University of Florida
The Western Gulf COE at the University of Texas Medical Branch in Galveston
The Midwest COE at the University of Wisconsin, Madison

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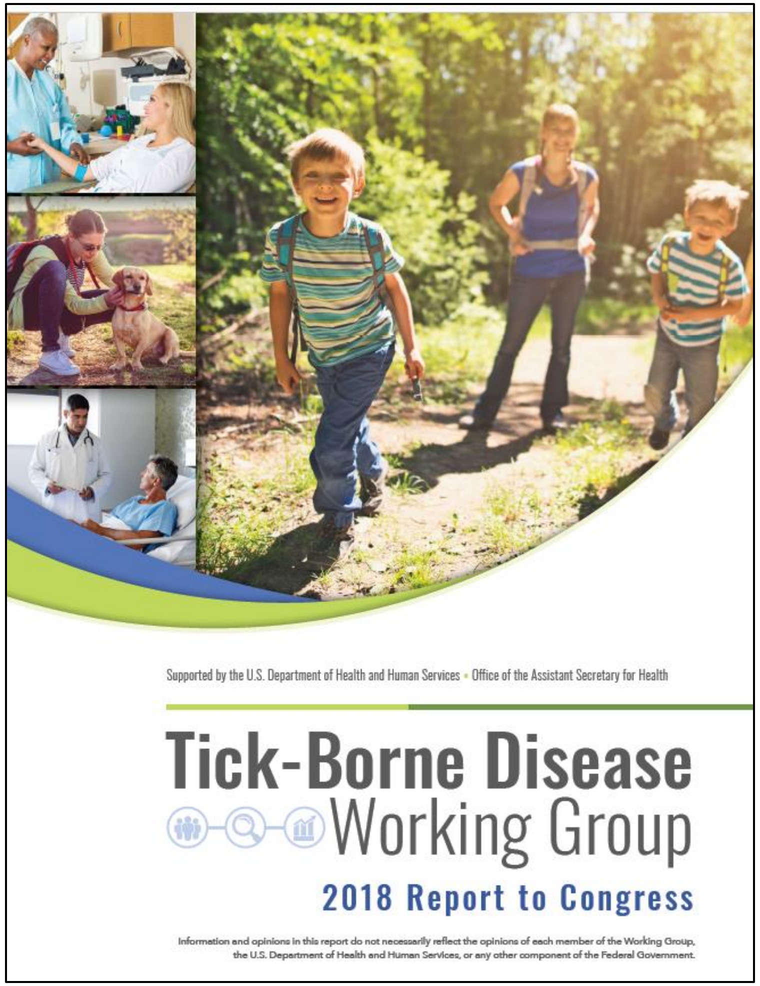
Tick-Borne Disease Working Group



- The charter for the *Tick-Borne Disease Working Group* was approved by the Secretary of Health and Human Services on August 10, 2017, marking the official establishment of the *Working Group* within *HHS*. The *Working Group* was authorized by Congress for a total of six years from the date that the Act became law.
- The charter defines how the Working Group is structured and functions in response to the charge provided by the *21st Century Cures Act*, and is renewed every two years in accordance with Federal advisory committee guidelines. The current charter expires August 10, 2021.

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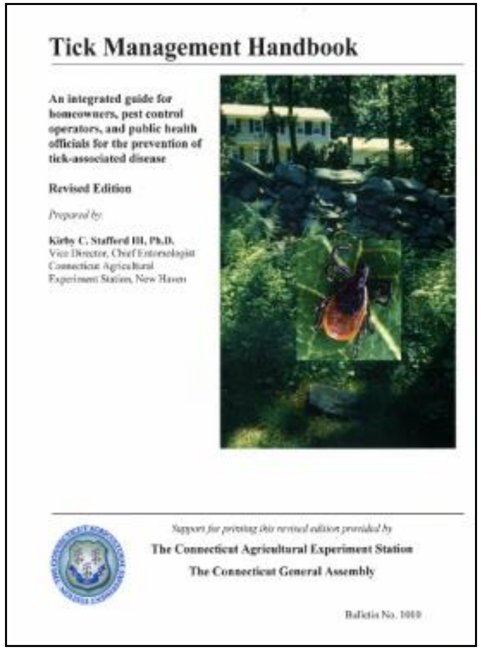
An old prayer, circa 1856

From red-bugs and bed-bugs,
from sand-flies and land-flies,
Mosquitoes, gallinippers*, and fleas,
From hog-ticks and dog-ticks,
from hen-lice and men-lice,
We pray thee, good Lord, give us ease.


Tick Management Handbook

An integrated guide for homeowners, pest control operators, and public health officials for the prevention of tick-associated disease

Revised Edition

Prepared by:

Kirby C. Stafford III, Ph.D.
Vice Director, Chief Entomologist
Connecticut Agricultural Experiment Station, New Haven

Support for printing this revised edition provided by
The Connecticut Agricultural Experiment Station
The Connecticut General Assembly

Bulletin No. 1010

https://portal.ct.gov/CAES
Publ. 2007

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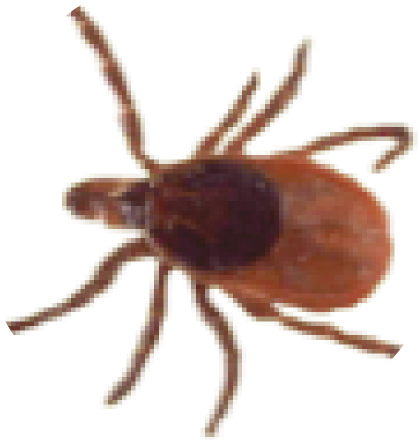
Questions



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Some Questions for You

Find a Colleague

- To post a profile about yourself and your work:
  - http://neipmc.org/go/APra
- “Find a Colleague” site
- http://neipmc.org/go/colleagues

Upcoming Webinars

- **Tick IPM #2: What Happens When/If Reducing Source or Preventing Tick Bites Has Failed**

  Dr. Stephen Rich, University of Massachusetts, Amherst, June 22, 2020. 11:00 a.m.

- **Tick IPM #3: Asian Long-Horned Tick IPM**

  Dr. Dina Fonseca and Dr. Matt Bickerton, Rutgers University, July 13, 2020. 11:00 a.m.

- **Tick IPM #4: Habitat Management for Vector-borne Diseases**

  Allison Gardner, University of Maine, August 10, 2020. 11:00 a.m.

- **Tick IPM #5: Pathogens Found in Ticks Collected on School Grounds and Public Parks**

  Drs. Jody Gangloff-Kaufmann, Joellen Lampman, Matt Frye, NYS IPM Program. Dr. Laura Goodman, College of Veterinary Medicine, Cornell University. Date TBD

- **Tick IPM #6: Host-Targeted Tick Control – What Works, What Doesn't, and What's New**

  Dr. Andrew Li , Research Entomologist, USDA-ARS Invasive Insects Biocontrol and Behavior Laboratory, Beltsville, MD. September 30, 2020, 11:00 am

For Updates: https://www.northeastipm.org/ipm-in-action/the-ipm-toolbox/

Recording of Tick IPM Webinar Series

- Past recordings and today's Webinar will be available to view **on demand** in a few business days.
- http://www.neipmc.org/go/ipmtoolbox
- You can watch as often as you like.

Acknowledgements

Northeastern IPM Center

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