Ticks and Tick-borne Diseases in New York State

Town of Bethlehem Deer and Tick-borne Diseases Committee Meeting
June 3rd 2014

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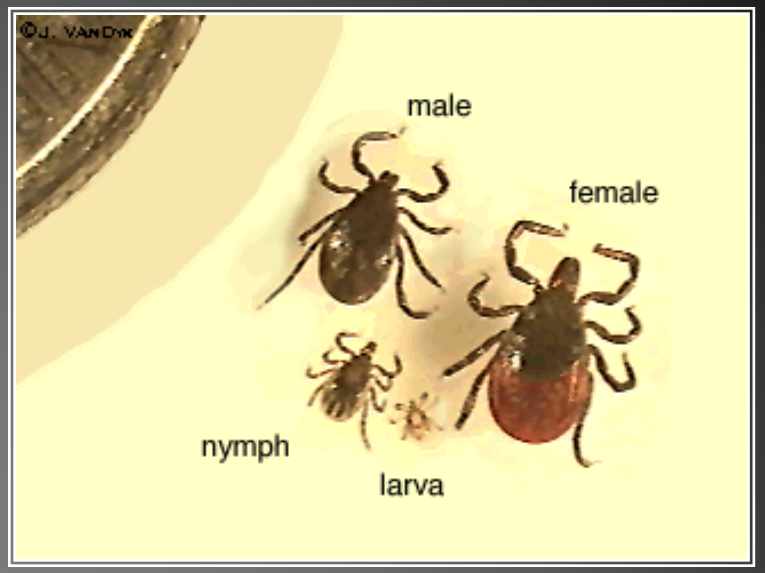
Bureau of Communicable Disease Control
Vector Ecology Laboratory

Tick Bio 101:



Hard-bodied ticks

Taxonomic family:

Ixodidae

4 life stages:

Egg, Larva, Nymph, and Adult

Each active life-stage must feed once on blood in order to develop into the next life-stage.

Ticks in New York State:

- 30 species of ticks
- 10 species commonly bite humans
- 4 species can transmit diseases

Deer tick
Ixodes scapularis

Lone Star tick
Amblyomma americanum

American Dog tick
Dermacentor variabilis

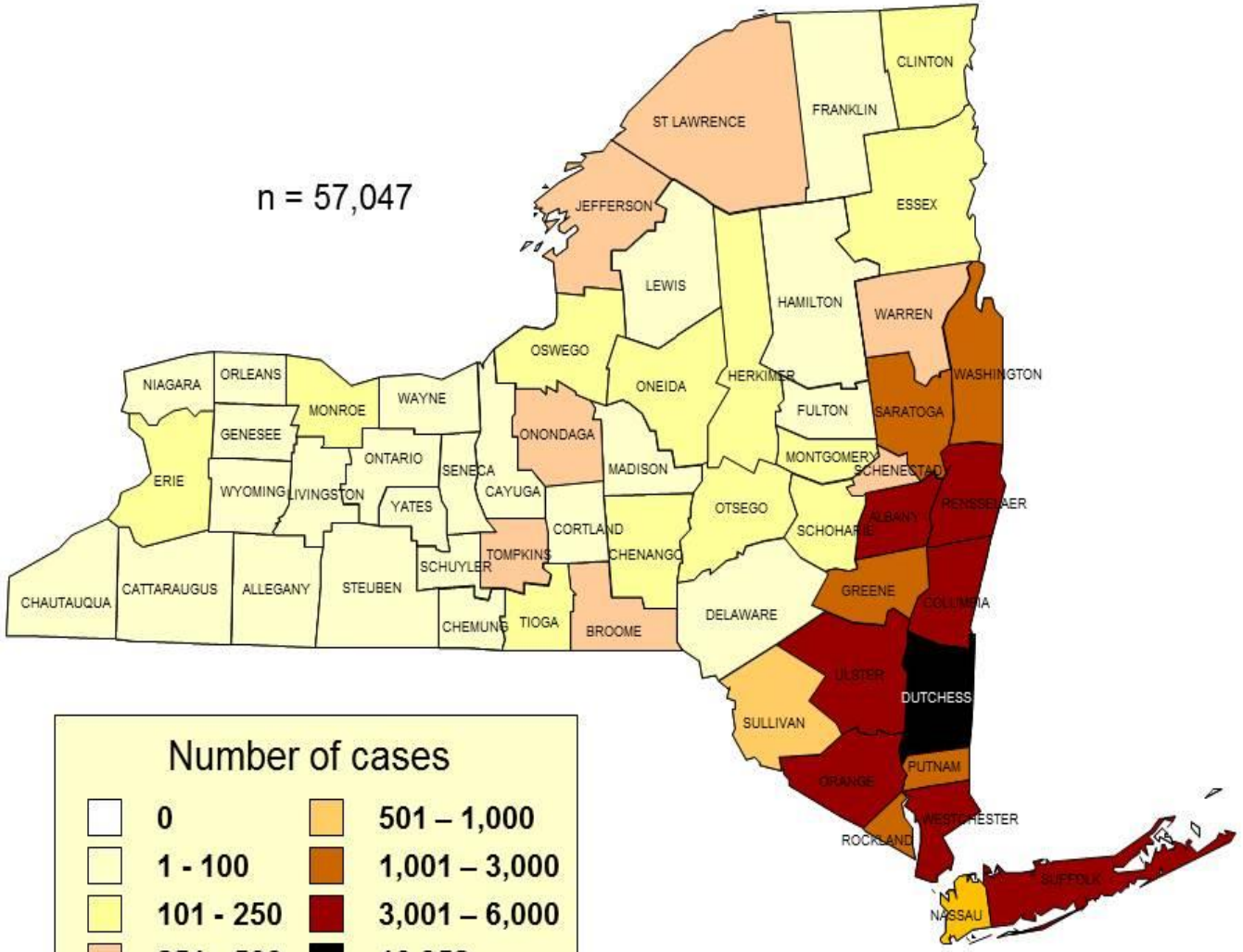
Woodchuck tick
Ixodes cookei

Tick-borne Diseases in NY:

Disease (causative agent)	Reported NY Cases 2001-2013*
Lyme Disease (*Borrelia burgdorferi*)	57,047
Human Granulocytic Anaplasmosis (*Anaplasma phagocytophilum*)	2,784
Babesiosis (*Babesia microti*)	2,596
Human Monocytic Ehrlichiosis (*Ehrlichia chaffeensis*)	693
Rocky Mountain Spotted fever (*Rickettsia rickettsii*)	179
Powassan encephalitis (Powassan virus or Deer Tick virus)	18
Tick-borne relapsing fever (*Borrelia miyamotoi*)	5 **
Tularemia (*Fransicella tularensis*)	4

* Reported to the NYSDOH by medical providers and clinical laboratories
** Identified in a NYSDOH retrospective study of patients screening negative for anaplasmosis

Lyme Disease cases reported in New York State* 2001 - 2013

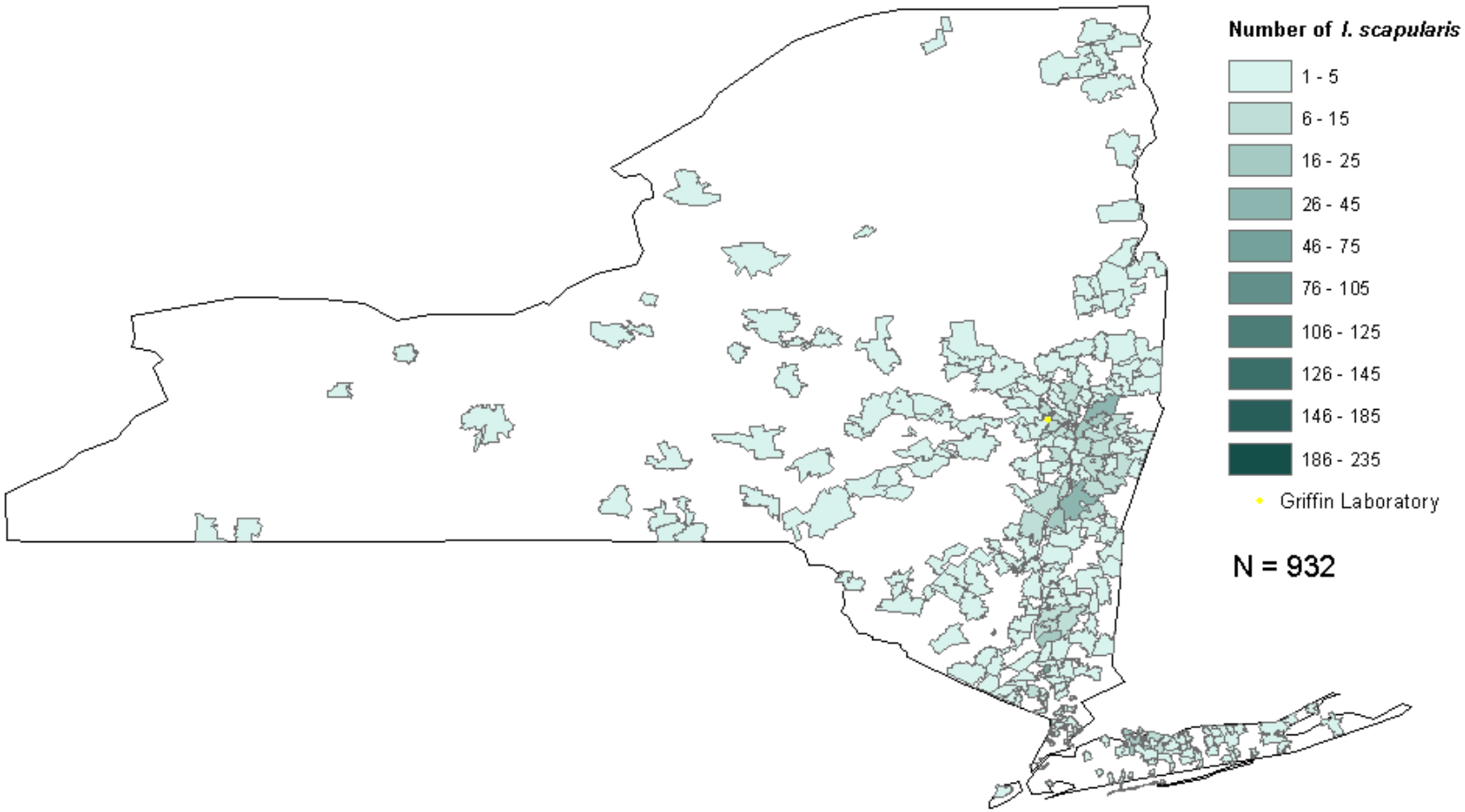


*Exclusive of New York City. Sentinel surveillance conducted in 19 counties in at least one year. Confirmed and probable cases, 2013 provisional data.

The Deer tick can potentially transmit **5 diseases**: (in New York State)

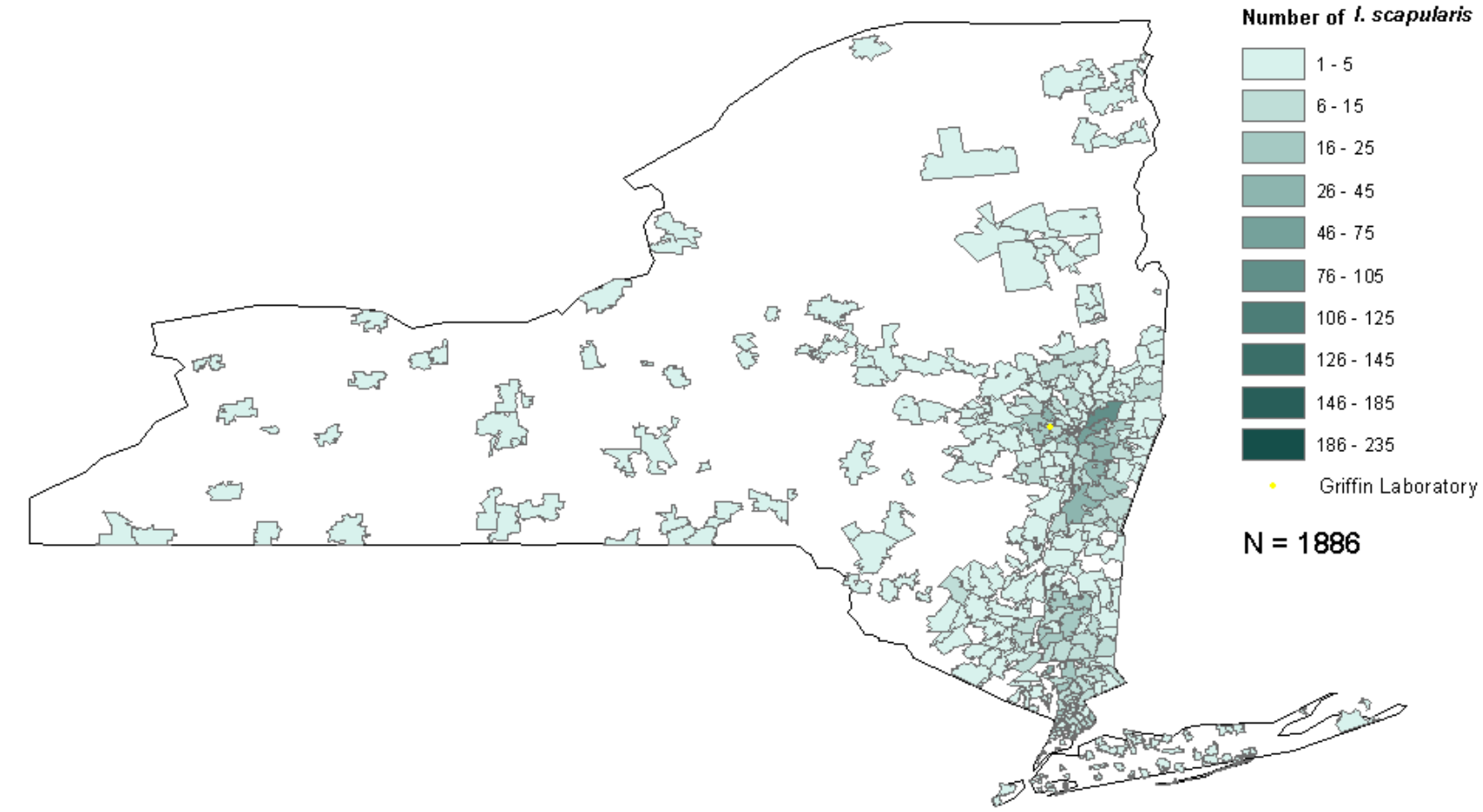
- **Lyme disease**
  Most common tick-borne disease in New York State (and the nation)
- **Babesiosis**
  Expanding northward in NY
- **Anaplasmosis**
  Expanding north and westward in NY
- **Powassan encephalitis (Deer Tick virus/DTV)**
  Emerging pathogen, sporadic cases
- **Tick-borne Relapsing Fever (*Borrelia miyamotoi*)**
  Emerging pathogen, sporadic cases identified retrospectively – no commercial lab test available

Locally Acquired *Ixodes scapularis* Mapped by Zip Code 1991-1993*



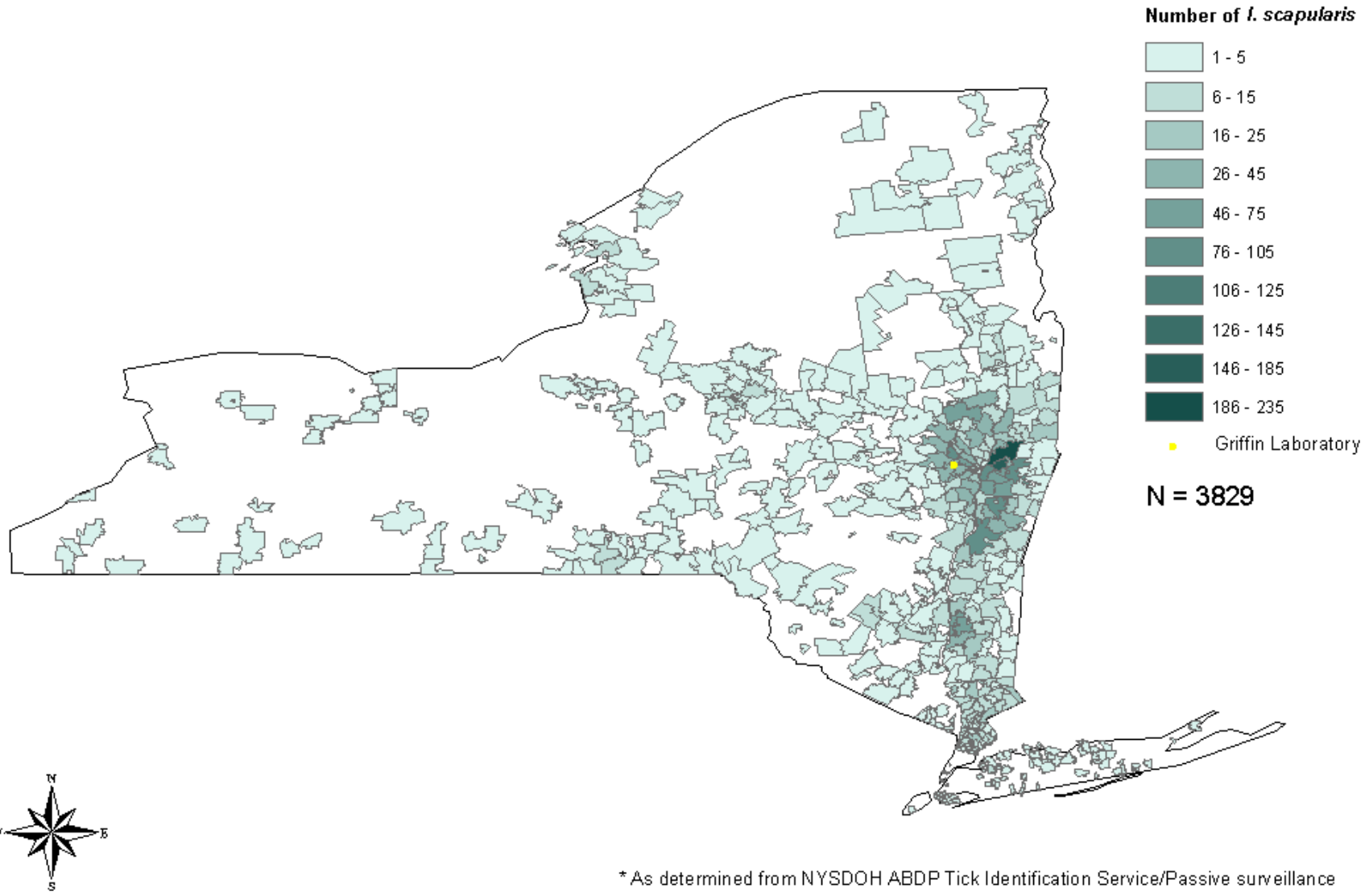
* As determined from NYSDOH ABDP Tick Identification Service/Passive surveillance

Locally Acquired *Ixodes scapularis* Mapped by Zip Code 1994-1996*



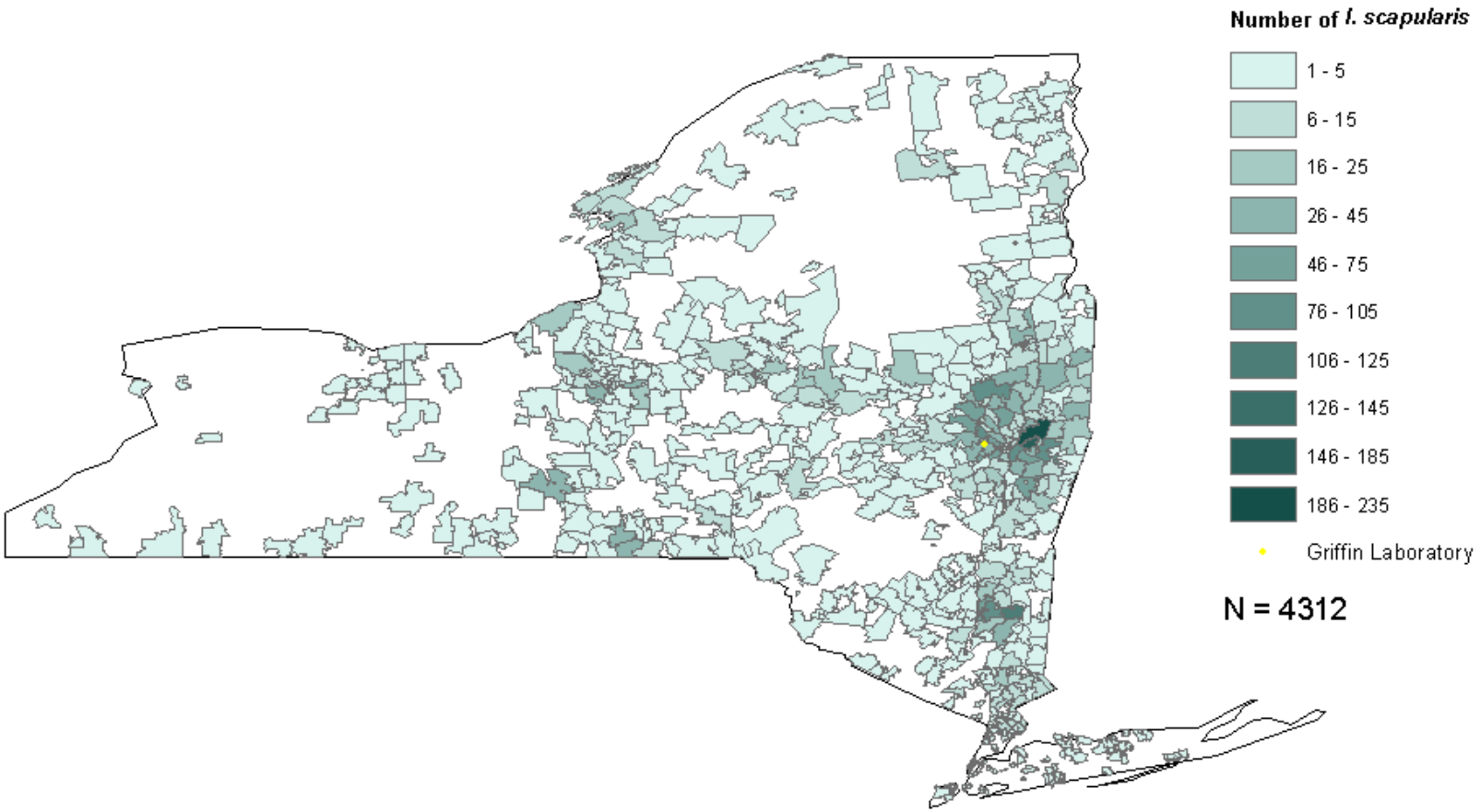
* As determined from NYSDOH ABDP Tick Identification Service/Passive surveillance

Locally Acquired *Ixodes scapularis* Mapped by Zip Code 1997-1999*



* As determined from NYSDOH ABDP Tick Identification Service/Passive surveillance

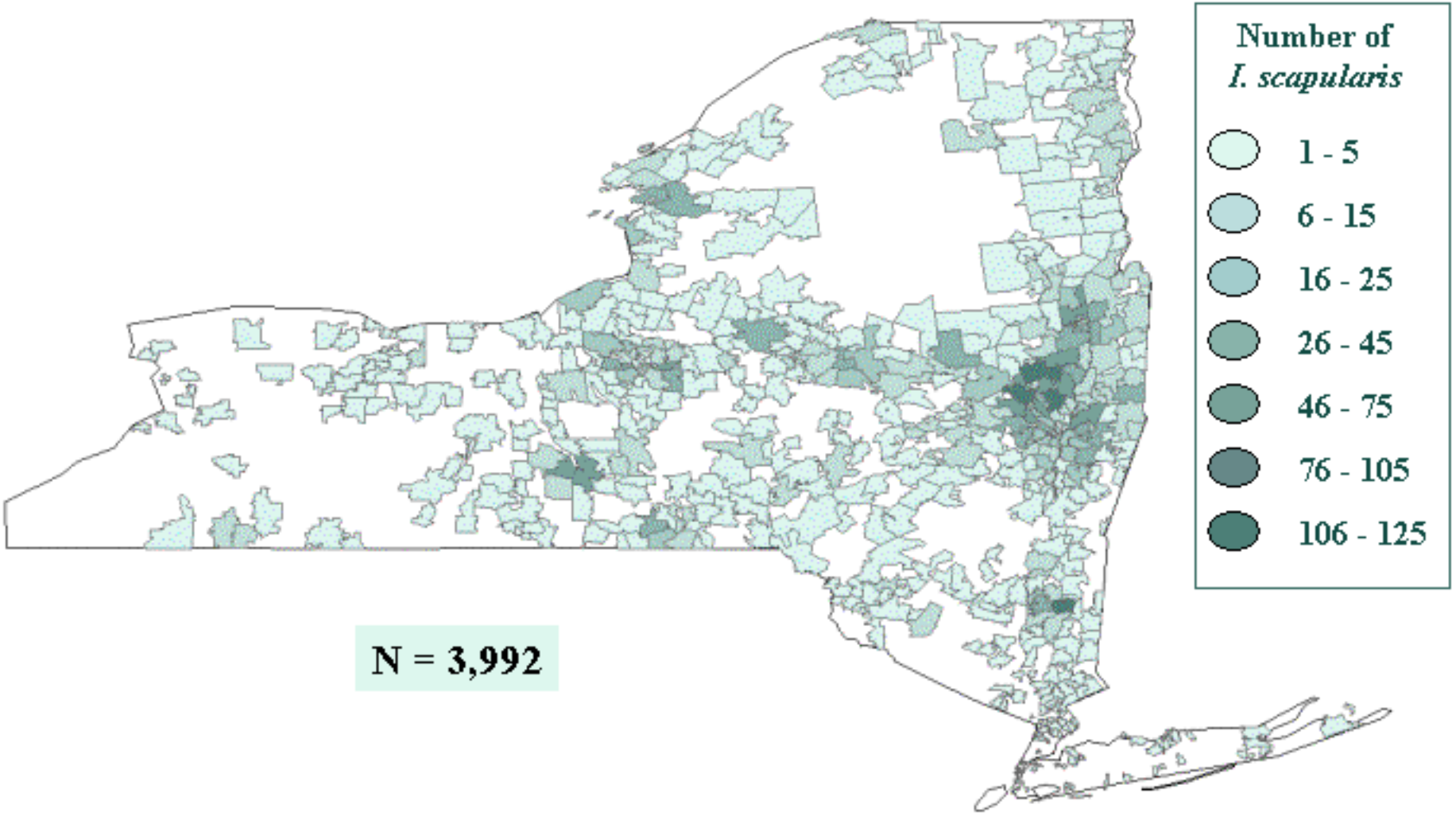
Locally Acquired *Ixodes scapularis* Mapped by Zip Code 2000 - 2002*



*As determined from NYSDOH ABDP Tick Identification Service/Passive Surviellance

Locally acquired *Ixodes scapularis*

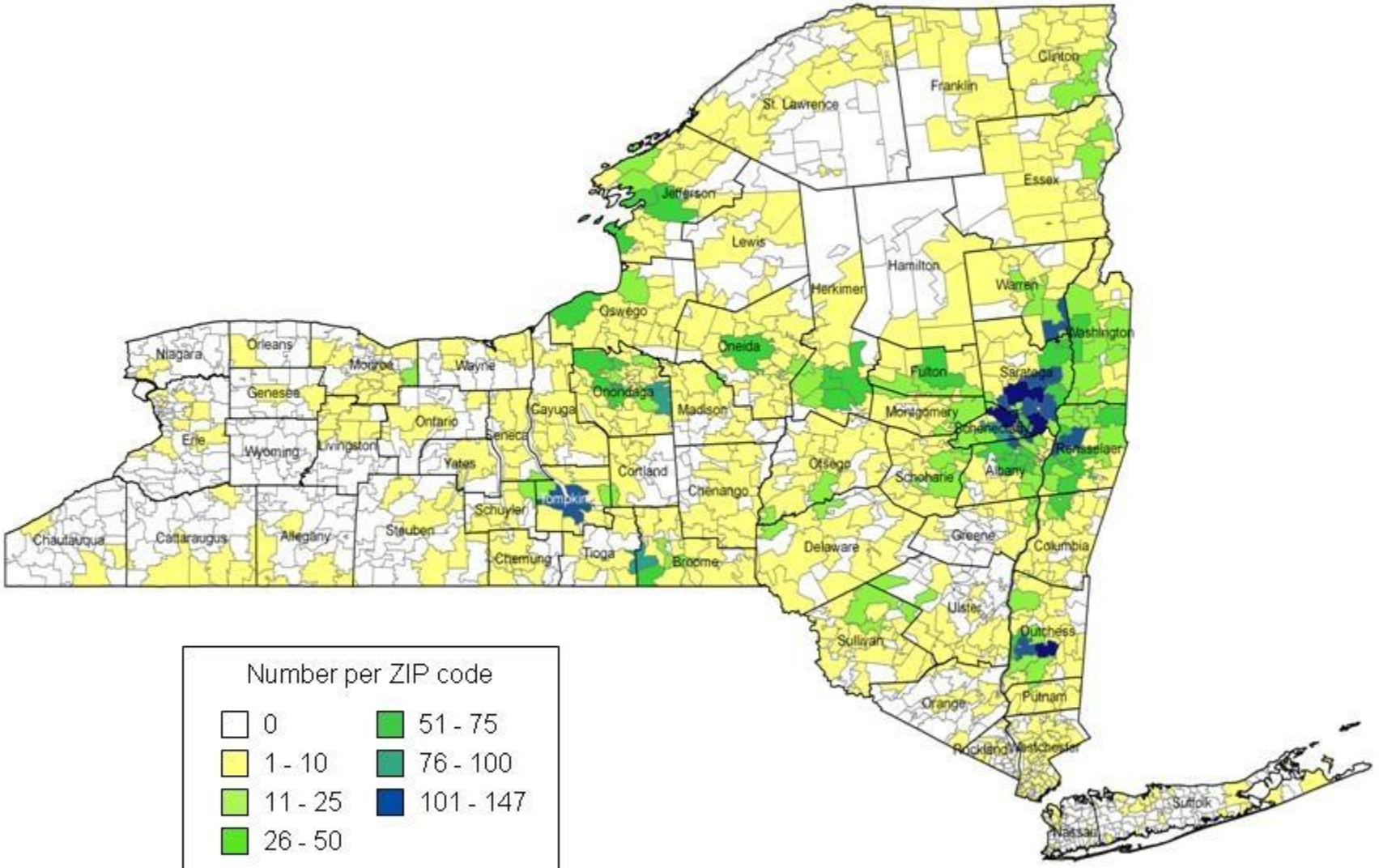
by zip code 2003 – 2004*



* As determined from NYSDOH ABDP Tick Identification Service / Passive Surveillance

Locally Acquired Deer Ticks (*Ixodes scapularis*) Mapped by ZIP code*

New York State** 2003 - 2005



Number per ZIP code

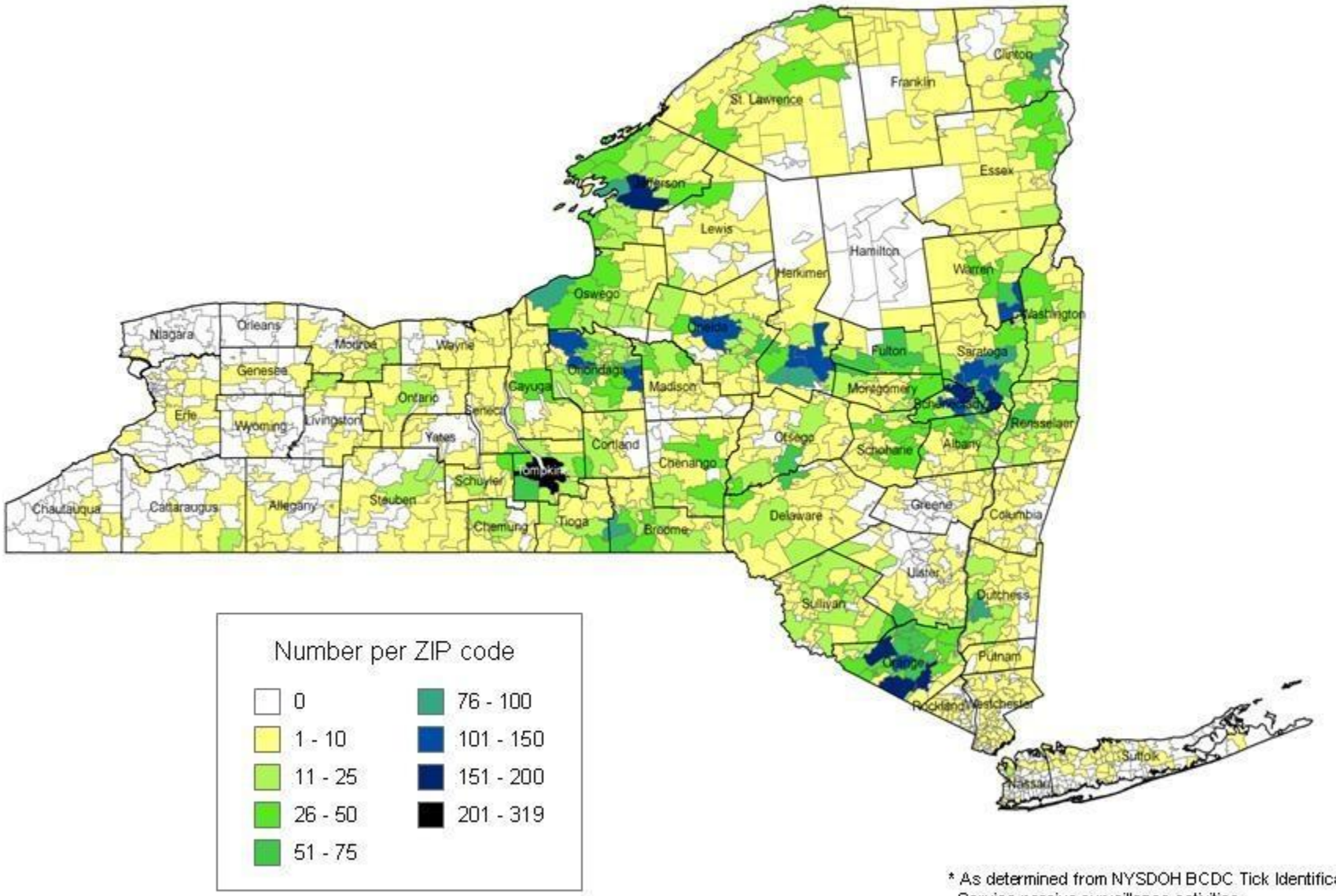
0	51 - 75
1 - 10	76 - 100
11 - 25	101 - 147
26 - 50	

* As determined from NYS BCDC Tick Identification Service passive surveillance activities

** Exclusive of New York City

Locally Acquired Deer Ticks (*Ixodes scapularis*) Mapped by ZIP Code*

New York State** 2006 - 2008



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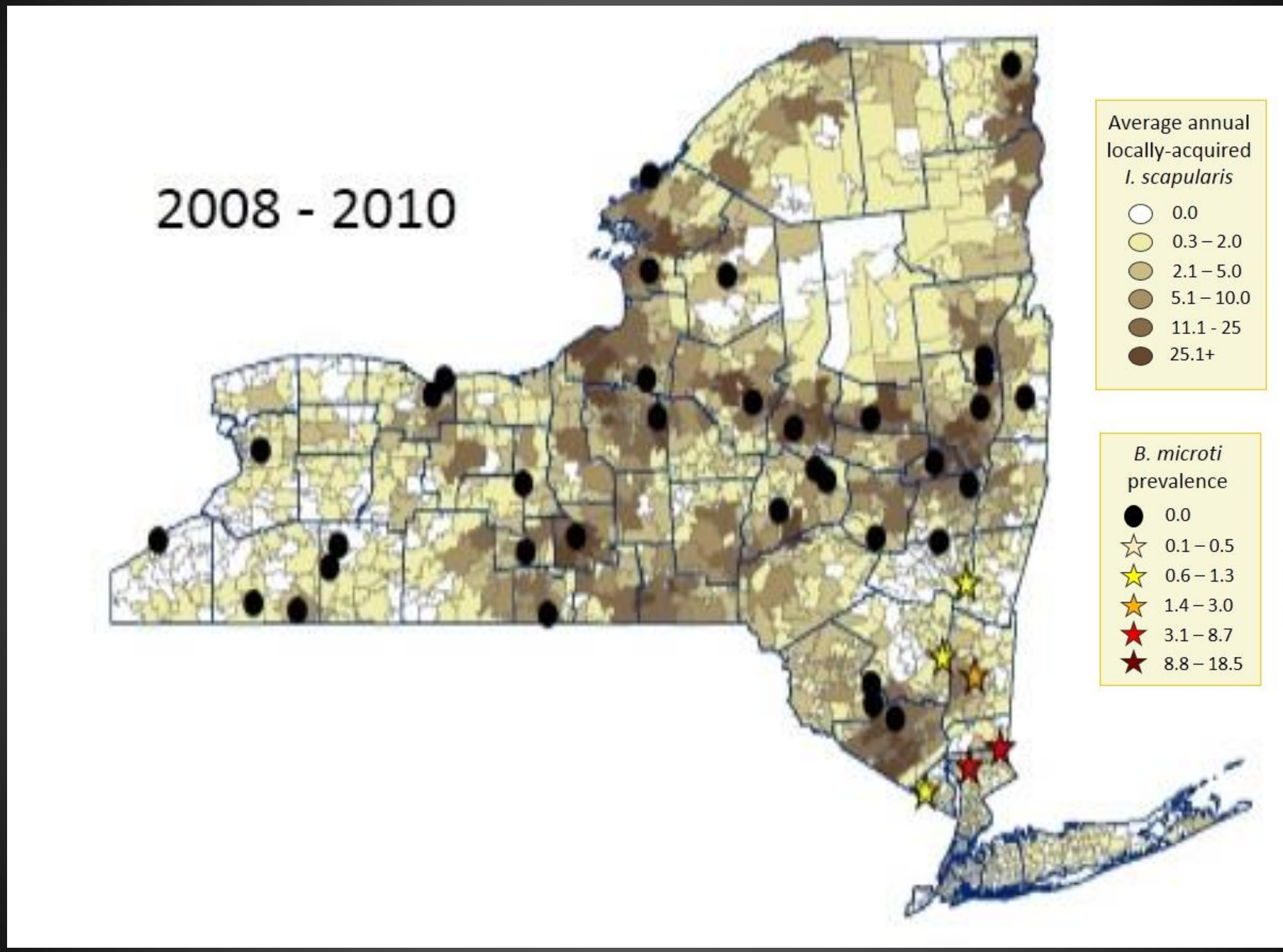
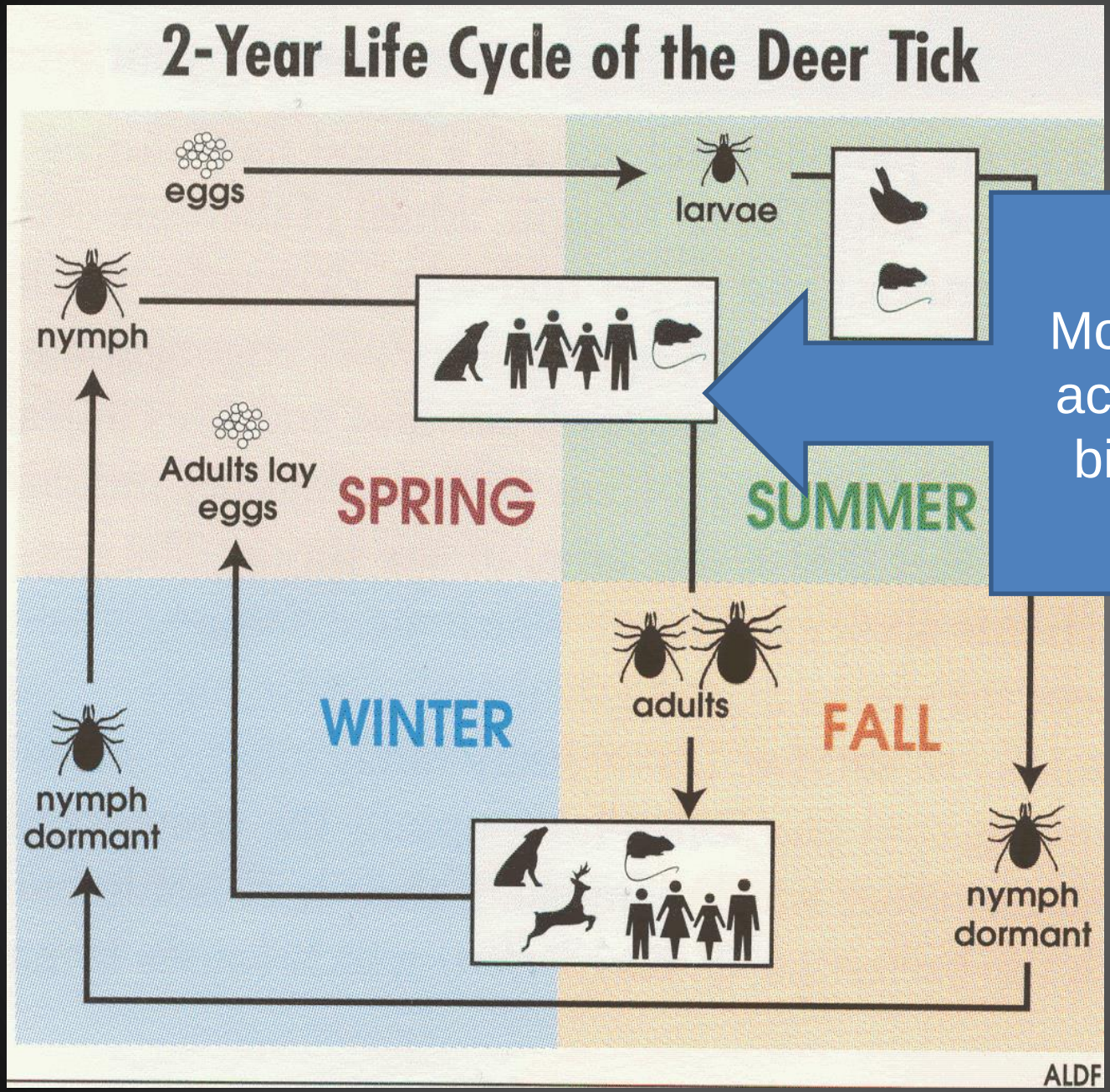
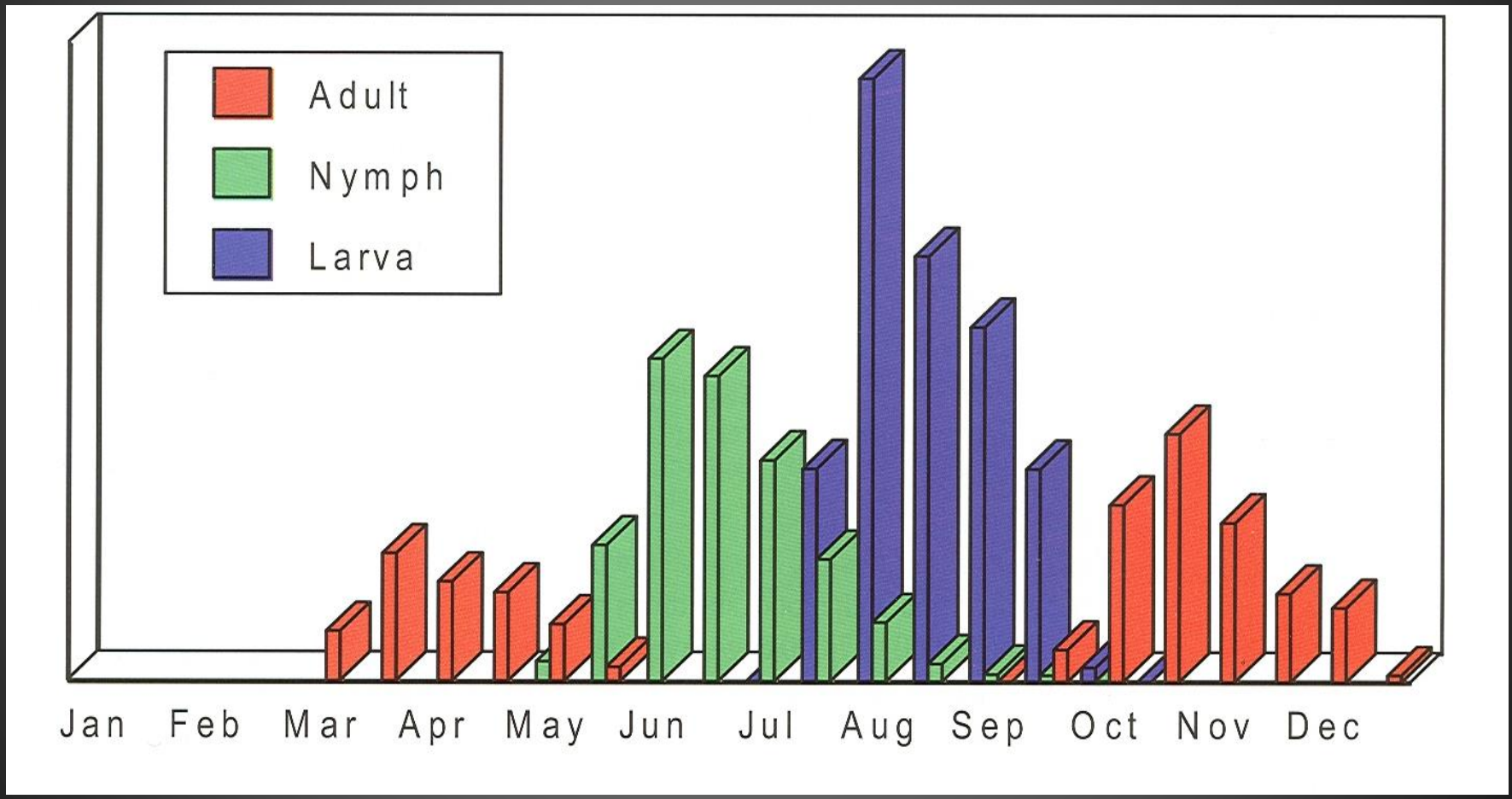
** Exclusive of New York City


2008 - 2010
Average annual locally-acquired *I. scapularis*
0.0
0.3 – 2.0
2.1 – 5.0
5.1 – 10.0
11.1 - 25
25.1+
B. microti prevalence
0.0
0.1 – 0.5
0.6 – 1.3
1.4 – 3.0
3.1 – 8.7
8.8 – 18.5



Most Lyme cases acquired thru the bite of a nymph

The Seasonal Life cycle of the Deer tick*:



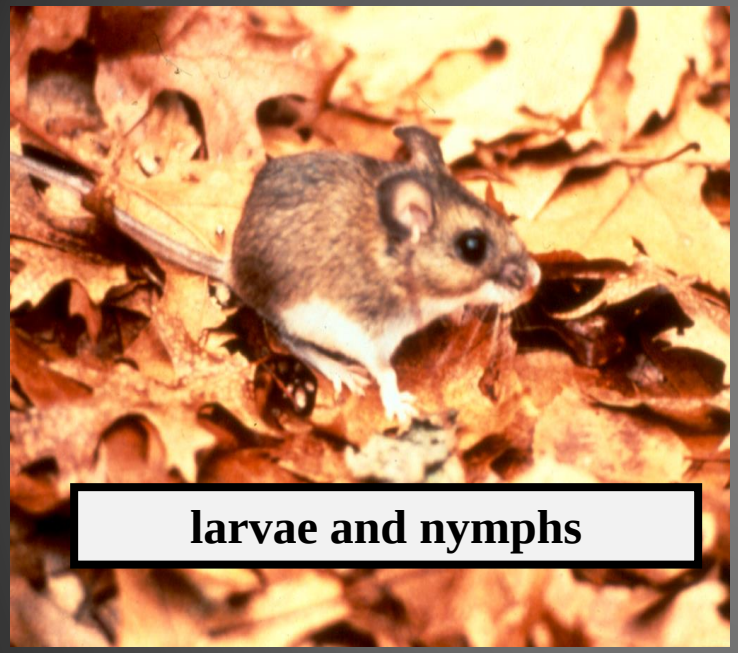
* CT Agricultural Experimental Field Station

Deer tick “questing”

How a Deer tick finds and attaches to a host…

…they do not jump, fly or drop out of trees

Common (and important) hosts of the Deer tick:



Mice, chipmunks, shrews, and other small mammals

white-tailed deer

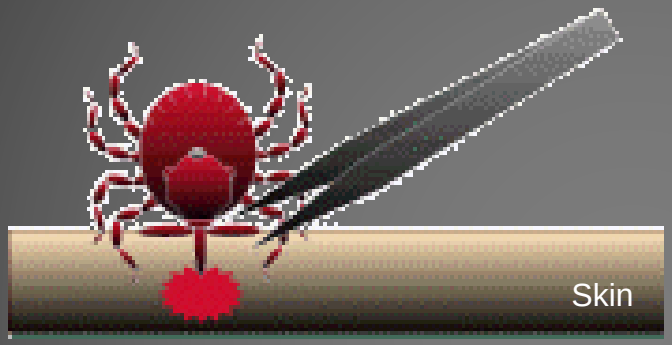
Integrated Tick Management for control of *Ixodes scapularis*

- Personal protection
- Landscape management
- Management of host abundance
- Host-targeted acaricides
- Area application acaricides
- Biological control

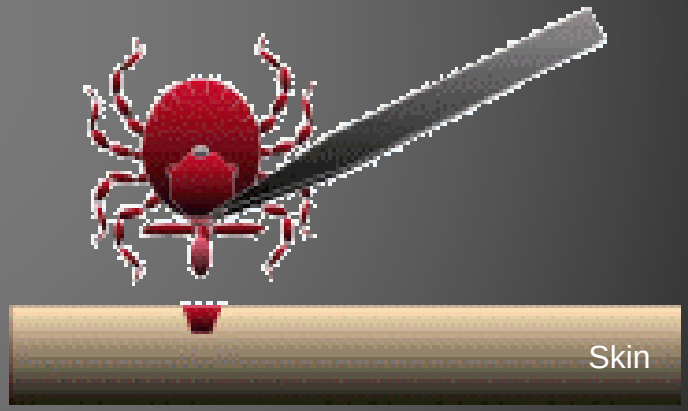
Personal protection:

Personal protection:

Correct Tick Removal Technique:



Grasp tick with tweezers, as close to the skin as possible (i.e. by the mouthparts or “head” of the tick)



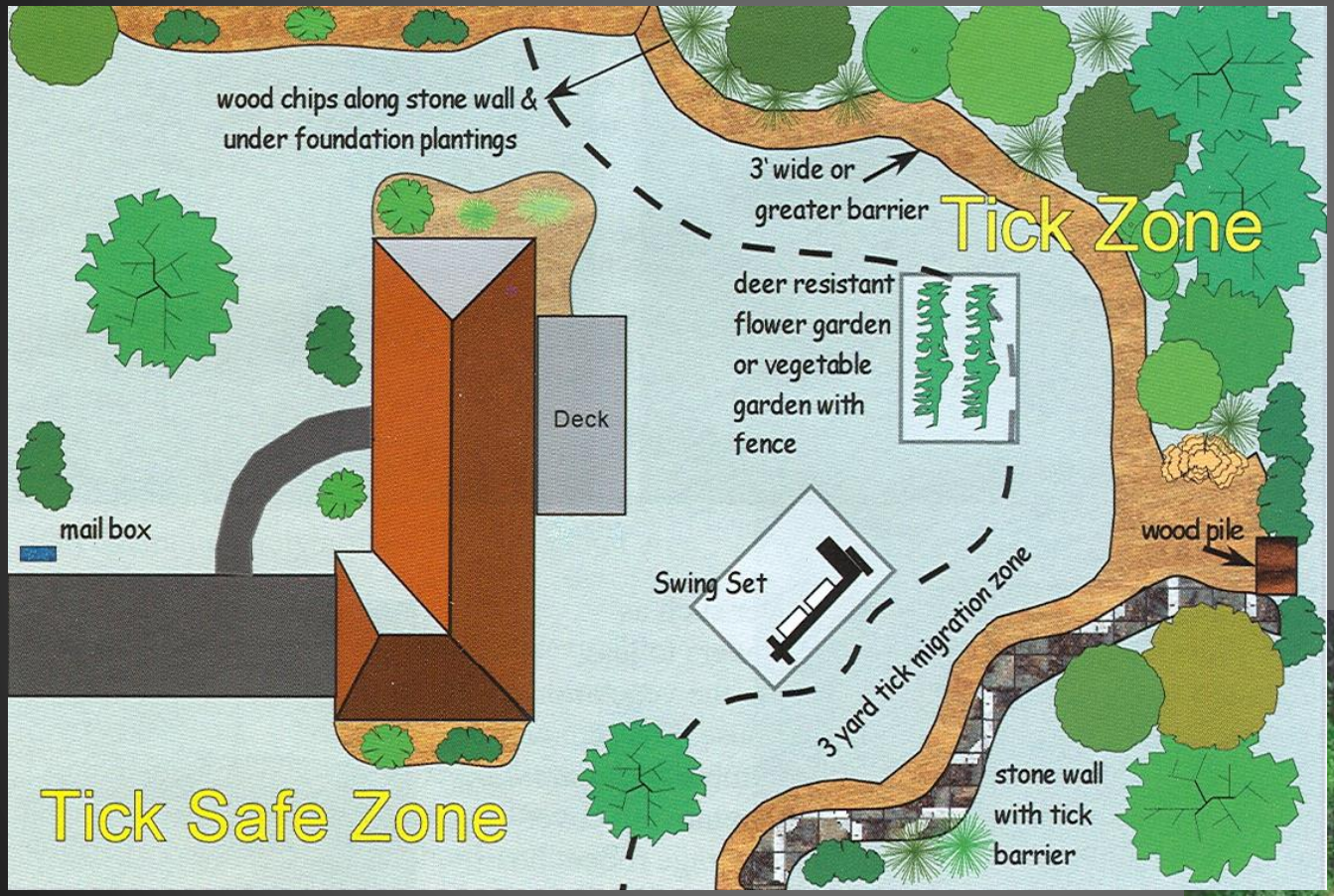
Pull slowly, with a constant motion away from the skin (perpendicular to skin surface)

STOP

Do not use petroleum jelly, gasoline, lit match or cigarette, nail polish or any other method.

You may be increasing your risk of acquiring a tick-borne disease!

Landscape management:



* CT Agricultural Experimental Field Station

Landscape management:

Before

After

* CT Agricultural Experimental Field Station

Landscape management:

Before

After

* CT Agricultural Experimental Field Statio

Management of host abundance:

Eliminate bird feeders or relocate
to distant area of yard (reduce mice)

Use of deer fencing (excludes deer)

Host-targeted acaricides:

Deer may harbor hundreds of ticks, transporting and dispersing them over many miles!

Host-targeted acaricides:

- Small mammals serve as hosts to hundreds of immature ticks.
- Many infected nymphs and adult ticks result if the mouse is carrying *B. burgdorferi*.

Host-targeted acaricides:

"4 Poster" deer feeding station applies pesticide as deer eat

"Maxforce Baitbox" applies pesticide to rodents as they go through a maze to locate bait inside

Area application acaricides:

Target tick “hot-spots”: edges of lawns & woods in May/early June for nymphs & October for adult *I. scapularis*

Biological control:

- Minute parasitic wasp (*Ixodiphagus hookeri*) parasitizes *I. scapularis,* but usefulness is limited.
- Engorged *I. scapularis* susceptible to certain nematodes; but to sensitive to ↓ autumn temps.
- Some birds (chickens, guinea fowl, etc.) will eat ticks
- Entomopathogenic fungi most promising, some (*Beauveria bassiana* & *Metarhizium anisopliae*) pathogenic to *I. scapularis.*

Future Option?

Reservoir Targeted Vaccination of Mice

- OspA-based oral vaccine
- 5-year field trial
- 23% reduction in nymphal infection prevalence by year 2
- 76% reduction by year 5

Richer et al. 2014. Reservoir Targeted Vaccine Against *Borrelia burgdorferi*: A New Strategy to Prevent Lyme Disease Transmission. **Journal of Infectious Diseases**

Resources:

Stafford, K.C. Tick Management Handbook, an integrated guide for homeowners, Pest control operators, and public health officials for the prevention of tick-associated Disease.
http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1010.pdf

Cornell Coorperative Extension of Suffolk County. Integrated Pest Management for the Deer Tick.
http://ccesuffolk.org/assets/Horticulture-Leaflets/Integrated-Pest-Management-For-The-Deer-Tick.pdf

Curtis, P.D. et al. 2011. Shelter Island and Fire Island 4-poster Deer and Tick Study Final Report.
http://wildlifecontrol.info/TickStudy/Documents/PDF/Final%20Report/4-PosterFinalReportpart1.pdf
http://wildlifecontrol.info/TickStudy/Documents/PDF/Final%20Report/4-PosterFinalReportpart2.pdf
http://wildlifecontrol.info/TickStudy/Documents/PDF/Final%20Report/4-PosterFinalReportpart3.pdf
http://wildlifecontrol.info/TickStudy/Documents/PDF/Final%20Report/4-PosterFinalReportpart4.pdf

Questions?