

# Changing Distribution of Ticks and Tick-borne Agents

Clinician Outreach and Communication Activity (COCA)  
Webinar

Thursday, December 7, 2017



## **Continuing Education Disclaimer**

**CDC, our planners, presenters, and their spouses or partners wish to disclose they have no financial interests or other relationships with the manufacturers of commercial products, suppliers of commercial services, or commercial supporters, except Dr. Little would like to disclose that she has received research funding in the past 12 months from multiple animal health companies that manufacture tick control products for dogs and cats.**

**Planners have reviewed content to ensure there is no bias.**

# To Ask a Question

## □ Using the Webinar System

- Select the “Questions” button at the bottom of the webinar screen
- Type your question

**At the end of this COCA Call, the participants will be able to:**

- Describe some of the drivers that have resulted in the increase and geographic expansion of tick populations in North America.
- Identify regions where certain tick-borne infections are likely to emerge or increase in prevalence, and describe strategies to prevent infections in individuals and communities.
- List specific examples that highlight the recognition of new tick-borne agents and the spread of established tick-borne infections.

## Today's Presenter



**Susan Little, DVM, PhD, DACVM (Parasit.)**  
Regents Professor of Parasitology  
Oklahoma State University

# CHANGING DISTRIBUTION OF TICKS AND TICK-BORNE DISEASE AGENTS

---

SUSAN E. LITTLE, DVM, PHD, DACVM (PARASIT.)

OKLAHOMA STATE UNIVERSITY



# Drivers for tick populations

---

Climate/seasonality

Habitat

Wildlife populations

Lifestyle of pets and people



# Brown dog ticks (*Rhipicephalus sanguineus*)

---

Indoor premise infestations difficult to eradicate

- Expect 6 months of environmental treatments
- Risk for boarding kennels, groomers, dog day care, etc...
- Recommend routine tick control for all dogs in shared housing environments

Transmit *Rickettsia rickettsii* and...

- Other spotted fever group *Rickettsia* spp.
- *Ehrlichia canis* (dogs)
- *Babesia vogeli* (dogs)
- *Hepatozoon canis* (dogs)





# Brown dog ticks (*Rhipicephalus sanguineus*)

---

## Climate/seasonality

- Survives well in high temperature, arid environments
- Indoors and immediately around homes and kennels
- Increased activity and breeding when temperatures increase
  - thrives during extremely hot weather, drought tolerant
- Can be found anywhere there are dogs

Habitat: home/yard/kennel

Wildlife: not involved

## Lifestyle

- Multi-dog households
- Dogs in contact with other dogs and not on tick control

# Brown dog ticks – home infestation

---



# Diversity of ticks

---



# Ticks and tick-borne infections

---

## Diverse array of tick species

- higher tick populations
- expanding geographic distribution

## Complex biology, phenology, and feeding habits

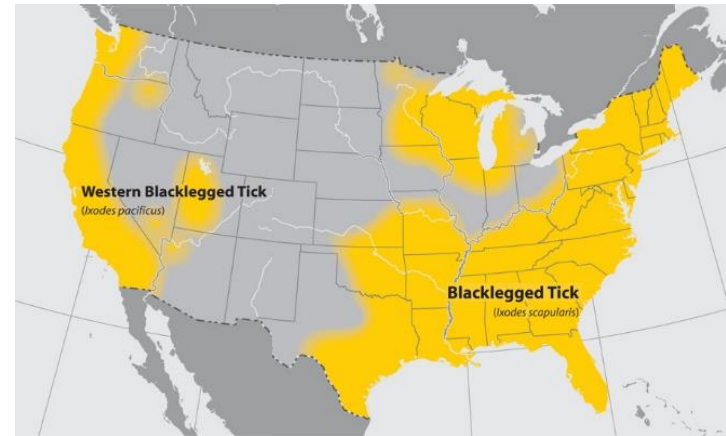
- *Ixodes scapularis*
- *Amblyomma americanum*
- *Dermacentor variabilis*
- *Rhipicephalus sanguineus*

## Transmit wide variety of tick-borne pathogens

- viral, bacterial, protozoal, helminth

Comprehensive tick control remains best way to minimize the risk of infection

# Distribution of ticks



# Deer ticks / black-legged ticks

---

## *Ixodes scapularis*

- wooded areas around homes
- widespread distribution
- northeastern/midwestern populations intense and expanding

## Timing of activity

- Adults in cooler months (October – February)
- Nymphs in warmer months (May – June)

## Transmit Lyme disease, and...

- Anaplasmosis
- Human babesiosis
- Ehrlichiosis (*E. muris*)
- Powassan virus



# Deer ticks (*Ixodes scapularis*)

---

## Climate/seasonality

- Adults in fall/winter, survive cold very well
- Nymphs and larvae in warmer months
- Susceptible to desiccation

## Habitat

- Wooded environment; shelter from understory

## Wildlife

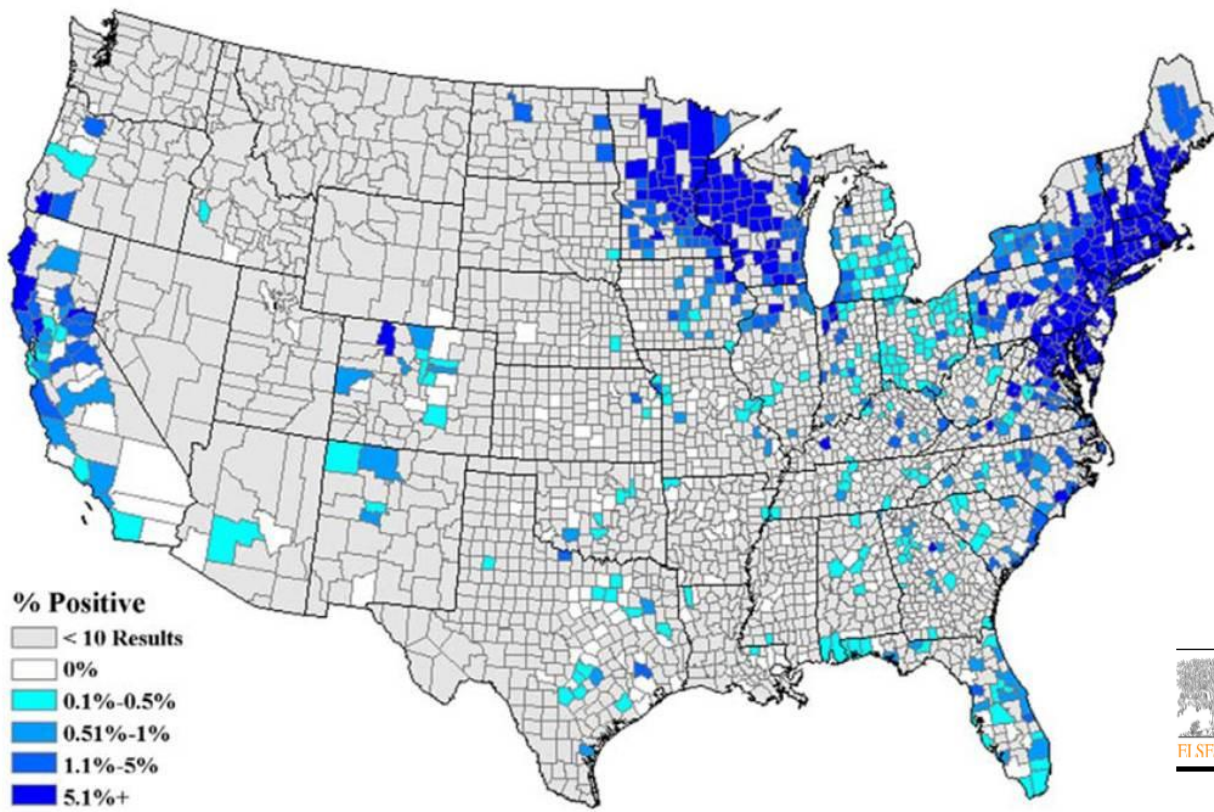
- Deer are key, cornerstone host for adults
- Rodents, small mammals for immatures
  - Lizards in southern US

## Lifestyle

- Outdoor access



# Lyme disease spreading



Veterinary Parasitology 100 (2009) 138–148



Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: [www.elsevier.com/locate/vetpar](http://www.elsevier.com/locate/vetpar)



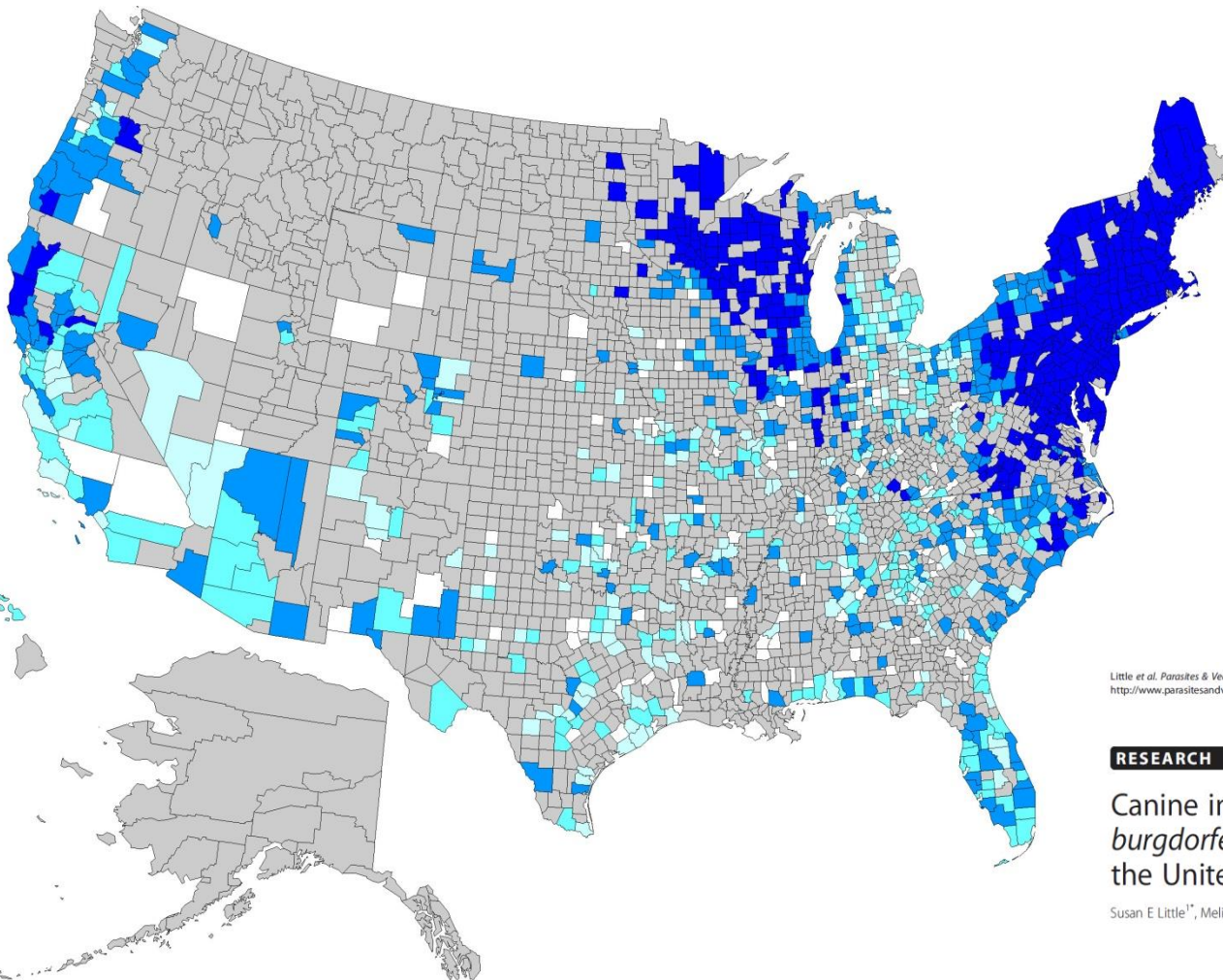
Prevalence and geographic distribution of *Dirofilaria immitis*, *Borrelia burgdorferi*, *Ehrlichia canis*, and *Anaplasma phagocytophilum* in dogs in the United States: Results of a national clinic-based serologic survey

Dwight Bowman<sup>A,1</sup>, Susan E. Little<sup>B,2</sup>, Leif Lorentzen<sup>C</sup>, James Shields<sup>C</sup>, Michael P. Sullivan<sup>C</sup>, Ellen P. Carlin<sup>A,4</sup>



# Lyme disease spreading

---



Little et al. *Parasites & Vectors* 2014, 7:257  
<http://www.parasitesandvectors.com/content/7/1/257>



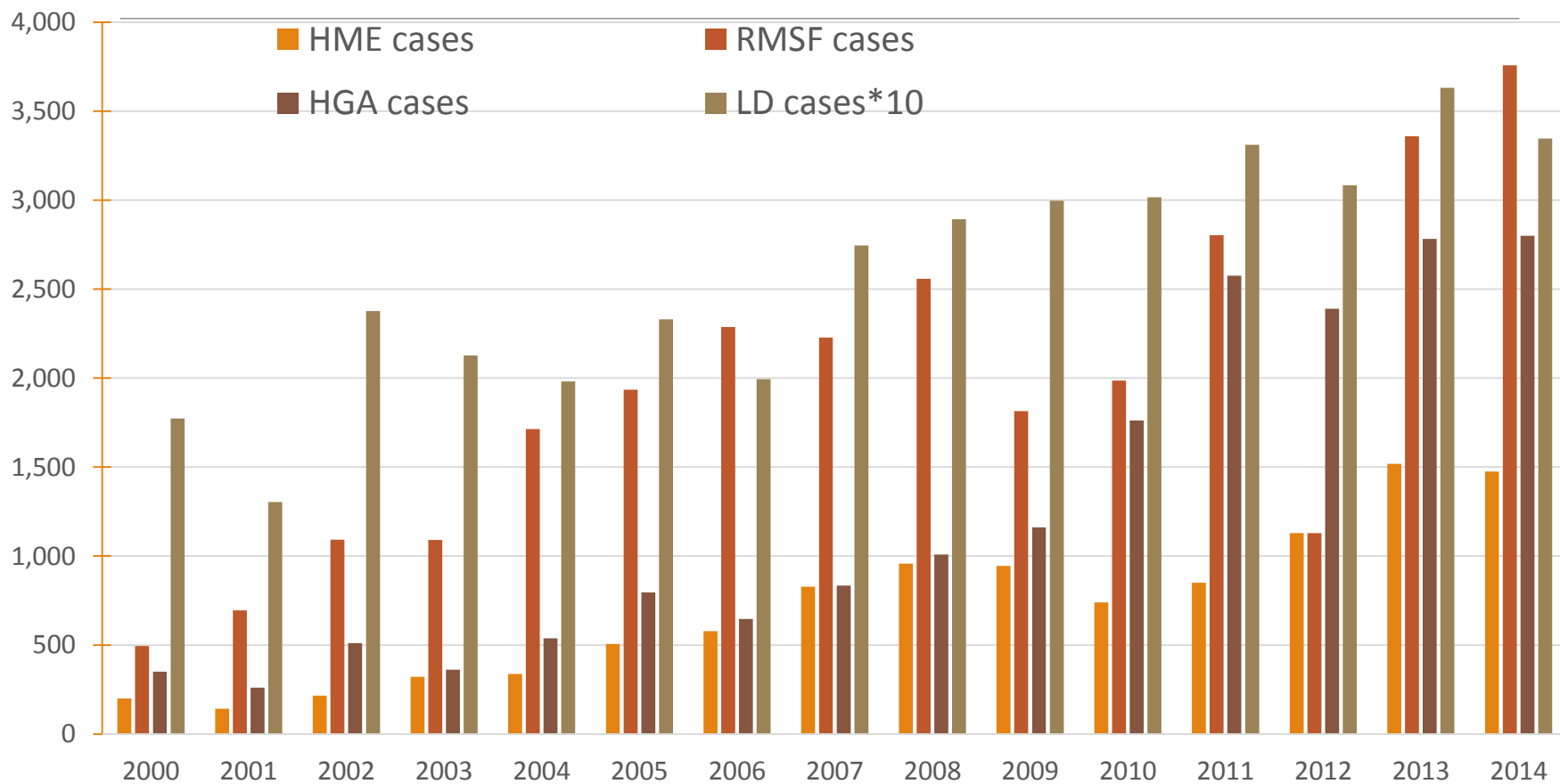
RESEARCH

Open Access

Canine infection with *Dirofilaria immitis*, *Borrelia burgdorferi*, *Anaplasma* spp., and *Ehrlichia* spp. in the United States, 2010–2012

Susan E Little<sup>1\*</sup>, Melissa J Beall<sup>2</sup>, Dwight D Bowman<sup>3</sup>, Ramaswamy Chandrashekar<sup>2</sup> and John Stamatis<sup>2</sup>

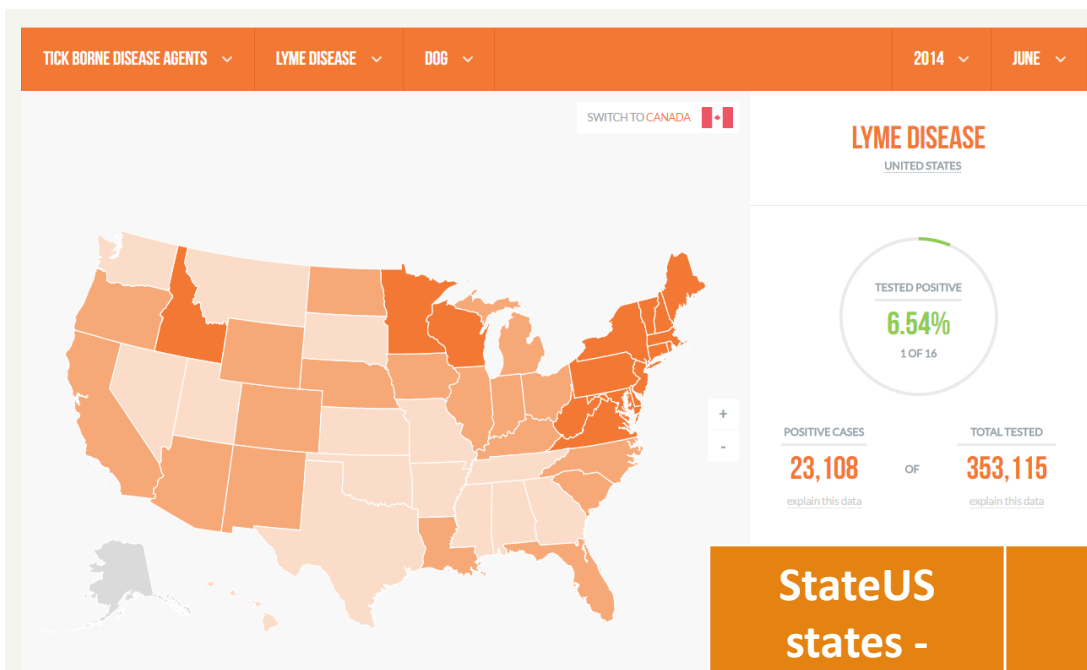
# Number of human cases increasing



CDC. *Morbidity and Mortality Weekly Report*. Summary of Notifiable Diseases – United States, 2000-2014.

<http://www.cdc.gov/mmwr/mmwr su/mmwr nd/>

# Transmission risk for dogs increasing



| StateUS states - | 2013  | 2015  | 2017  |
|------------------|-------|-------|-------|
| Connecticut      | 15.1% | 16.1% | 17.3% |
| Pennsylvania     | 12.0% | 13.5% | 14.6% |
| New York         | 9.4%  | 10.3% | 11.4% |

# Diversity of ticks

---



# Lone star ticks

---

## *Amblyomma americanum*

- wooded areas around homes
- widespread and growing distribution
- intense populations, aggressive feeders

## Timing of activity

- Adults in spring and summer (February-June)
- Nymphs in summer and fall (May – September)

## Transmit ehrlichiosis agents and...

- RMSF agent and other *Rickettsia* spp.
- STARI agent (southern Lyme disease-like illness)
- Cytauxzoonosis
- Suspected in Heartland virus & Bourbon virus



# Lone star ticks (*Amblyomma americanum*)

---

## Climate/seasonality

- Warm, humid environment
- Adults emerge in early spring
- Very susceptible to desiccation

## Habitat

- Wooded environment
- Needs shelter from understory

## Wildlife

- Deer are key, cornerstone host
- Birds for immature stages

## Lifestyle

- Outdoor access



# Lone star ticks

---

Intense populations



# Lone star tick habitat?

---





# American dog ticks, wood ticks

---

*Dermacentor variabilis* & *Dermacentor andersoni*

- tall, grassy areas; fields and meadows
- throughout most of United States

Timing of activity

- Adults in warmer months
- Nymphal activity varies

Transmit RMSF and...

- other SFG *Rickettsia* spp.
- Anaplasmosis, Ehrlichiosis
- Tularemia



# American dog ticks (*Dermacentor variabilis*)

---

## Climate/seasonality

- Warmer times of year
- Adults emerge in late spring - summer

## Habitat

- Grassy, meadow environment
- Edge of trails

## Wildlife

- Medium size mammals for adults
  - Fox, raccoon, coyote, bobcat
- Rodents for immature stages

## Lifestyle

- Outdoor access



# Gulf Coast ticks



## *Amblyomma maculatum*

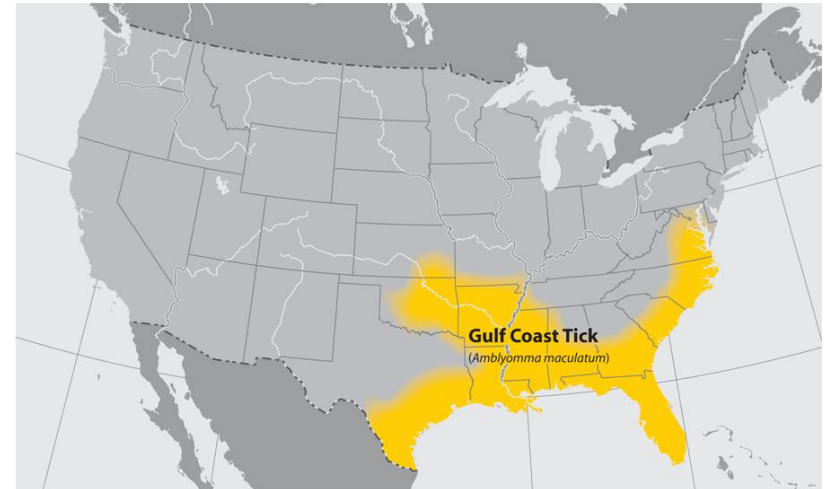
- Historically in coast areas along Atlantic and Gulf of Mexico
- Also common in grass prairies

## Timing of activity

- Adults and immatures in warmer months
- Seasonal peaks vary with geography

## Transmit *Rickettsia parkeri* and...

- Hepatozoonosis (dogs)
- Heartwater (ruminants)



# Gulf Coast ticks (*Amblyomma maculatum*)

---

## Climate/seasonality

- Warmer times of year
- May be active in “winter” months in southern part of range

## Habitat

- Mowed fields, early to mid-succession fields with open canopy (similar to *D. variabilis*)

## Wildlife

- Medium and large mammals for adults
  - Deer, cattle, coyotes, swine
- Rodents and birds for immature stages

## Lifestyle

- Outdoor access



NCVP

# Tick Challenges

---

## Geographic expansion

- Habitat change
- Increasing temperature and humidity

## Increased abundance

- Presence of ideal environmental conditions
- Ample wildlife reservoir hosts

Very little ability to limit tick reproduction

# Tick myths and misperceptions

---

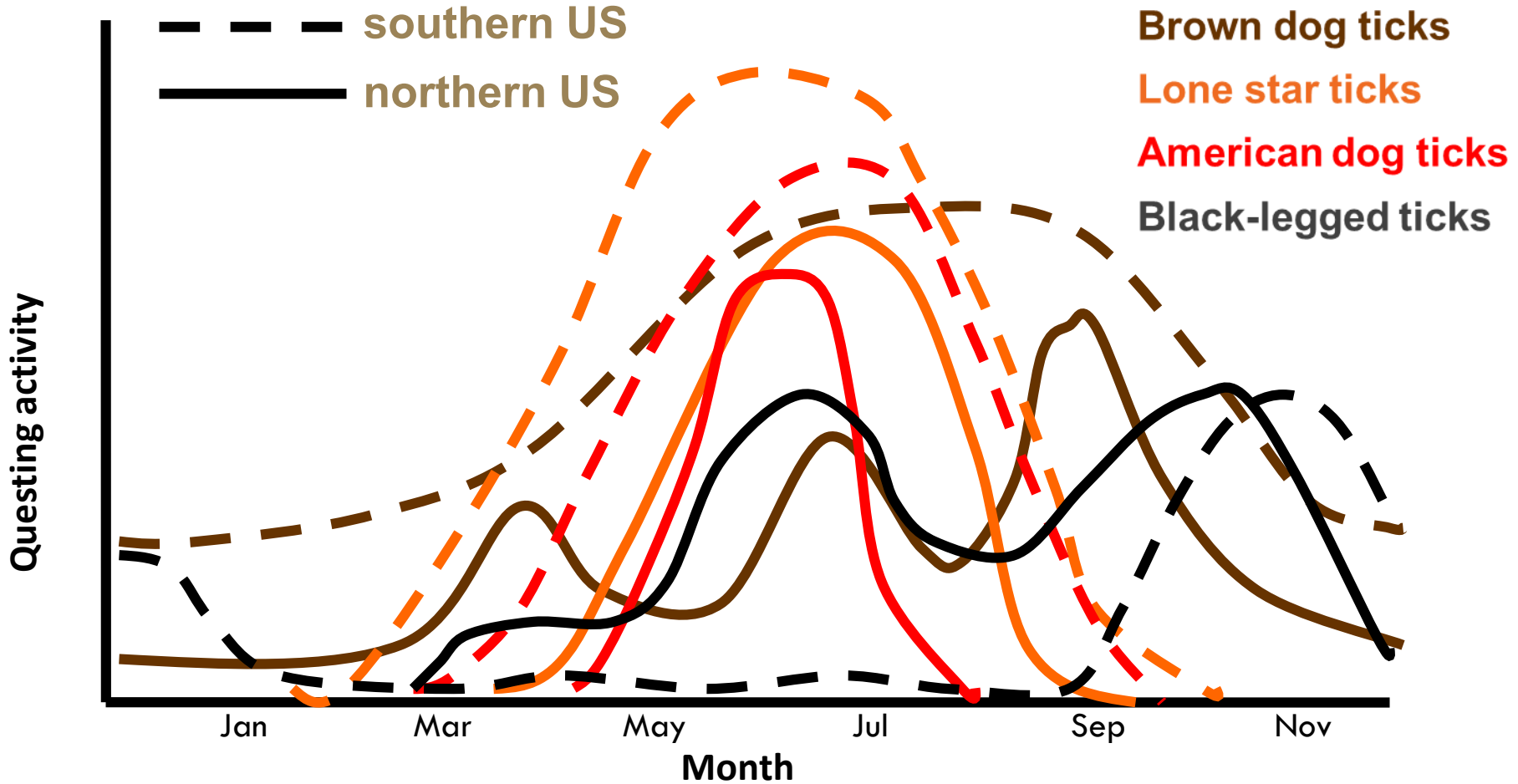
## Misunderstandings about lifestyle and habits of ticks

- Seasonal timing of activity
- Stages likely to feed on people and pets
- Relative risk of infestation
- Pathogen transmission risk and ease of managing disease

## Many consistently underestimate risk of tick infestations on pets

- Particular concern for cats

# Seasonal timing of activity



# Immature and adult ticks

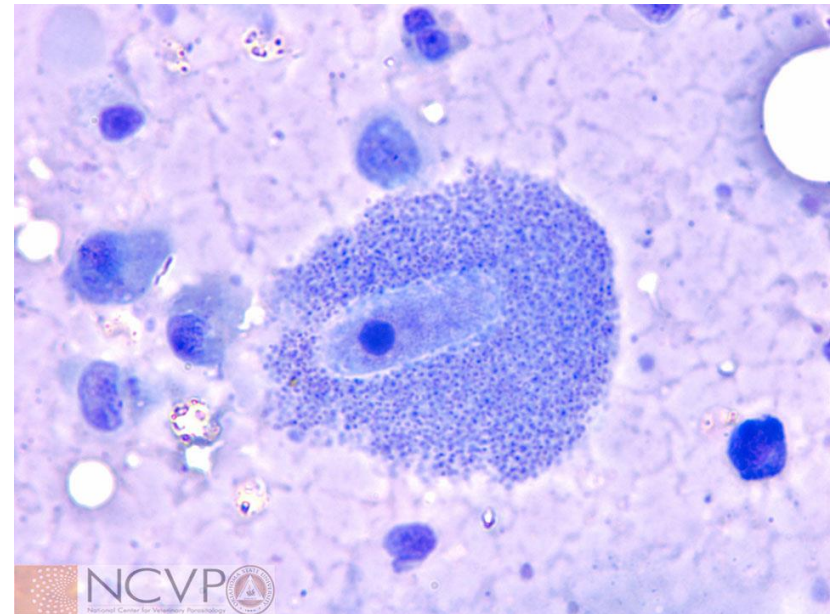
---





# Severity of Disease

---



# How long must tick feed to transmit?

---

- *Borrelia burgdorferi*
  
- *Anaplasma phagocytophilum*
- *Ehrlichia canis*
- *Rickettsia rickettsii*
  
- *Babesia canis vogeli*
- *Cytauxzoon felis*
  
- Viral pathogens

# More than just tick control

---

Vaccination key for canine protection, but...

Prevent pets from roaming

Limit tick habitat

- Remove leaf litter, burn debris
- Barrier between wood & yard

Exclude/discourage wildlife

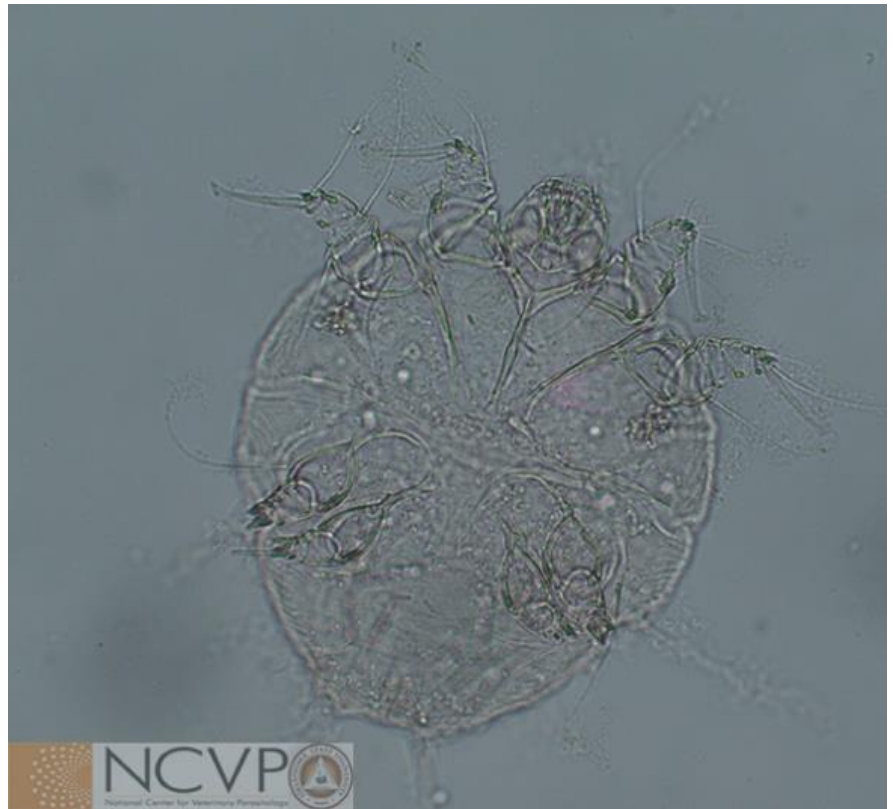
- Remove debris close to home where rodents may nest

Treatment of wildlife



# More than just tick control

---



# Thank you!

---



CENTER FOR VETERINARY HEALTH SCIENCES  
**Healthy Animals – Healthy People**

# To Ask a Question

## □ Using the Webinar System

- Select the “Questions” button at the bottom of the webinar screen
- Type your question

# Today's webinar will be archived

**When:** A few days after the live call

**What:** All call recordings

**Where:** On the COCA Call webpage

**[https://emergency.cdc.gov/coca/calls/2017/callinfo\\_12072017.asp](https://emergency.cdc.gov/coca/calls/2017/callinfo_12072017.asp)**

## Continuing Education for COCA Calls

All continuing education (CME, CNE, CEU, CECH, ACPE, CPH, and AAVSB/RACE) for COCA Calls are issued online through the [CDC Training & Continuing Education Online system \(http://www.cdc.gov/TCEOnline/\)](http://www.cdc.gov/TCEOnline/).

Those who participated in today's COCA Call and who wish to receive continuing education should complete the online evaluation by January 7, 2018 with the course code **WC2286**. Those who will participate in the on demand activity and wish to receive continuing education should complete the online evaluation between January 8, 2018 and December 7, 2020 will use course code **WD2286**.

Continuing education certificates can be printed immediately upon completion of your online evaluation. A cumulative transcript of all CDC/ATSDR CE's obtained through the CDC Training & Continuing Education Online System will be maintained for each user.



## Join the COCA Mailing List

Receive information about:

- Upcoming COCA Calls
- Health Alert Network notices
- CDC public health activations
- Emerging health threats
- Emergency preparedness and response conferences and training opportunities



<http://emergency.cdc.gov/coca>