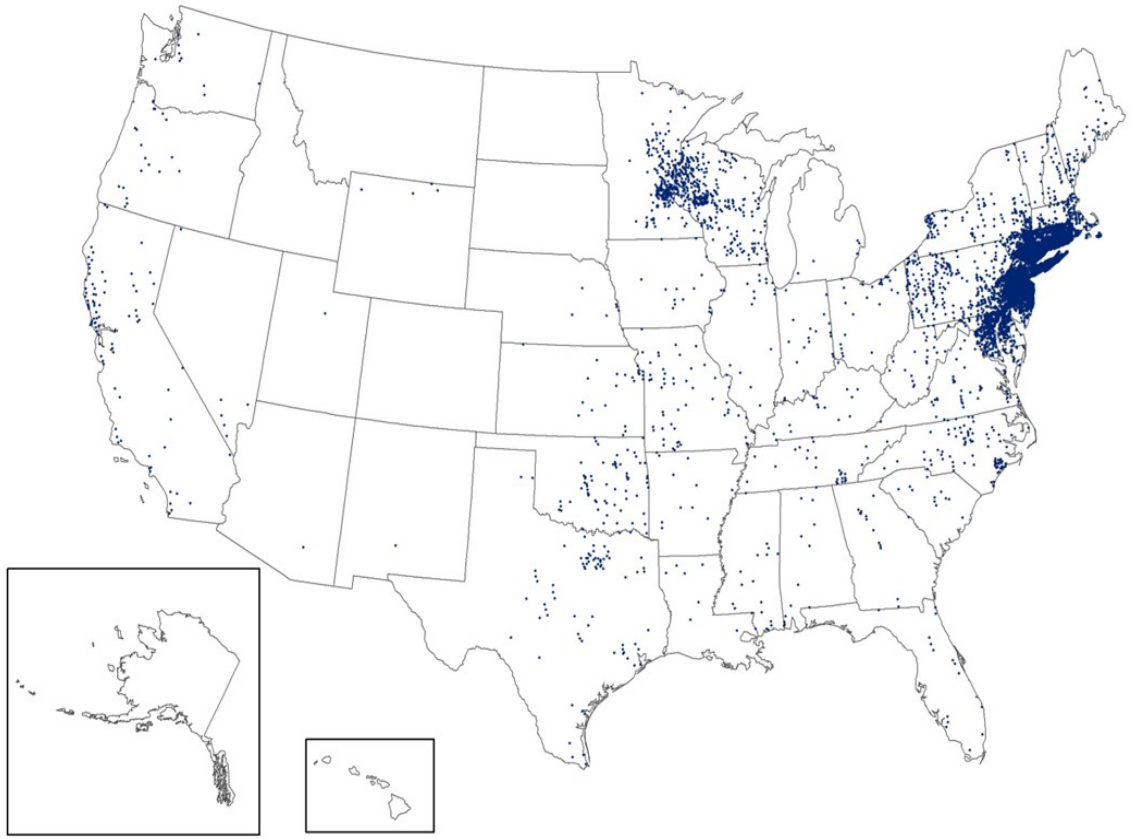
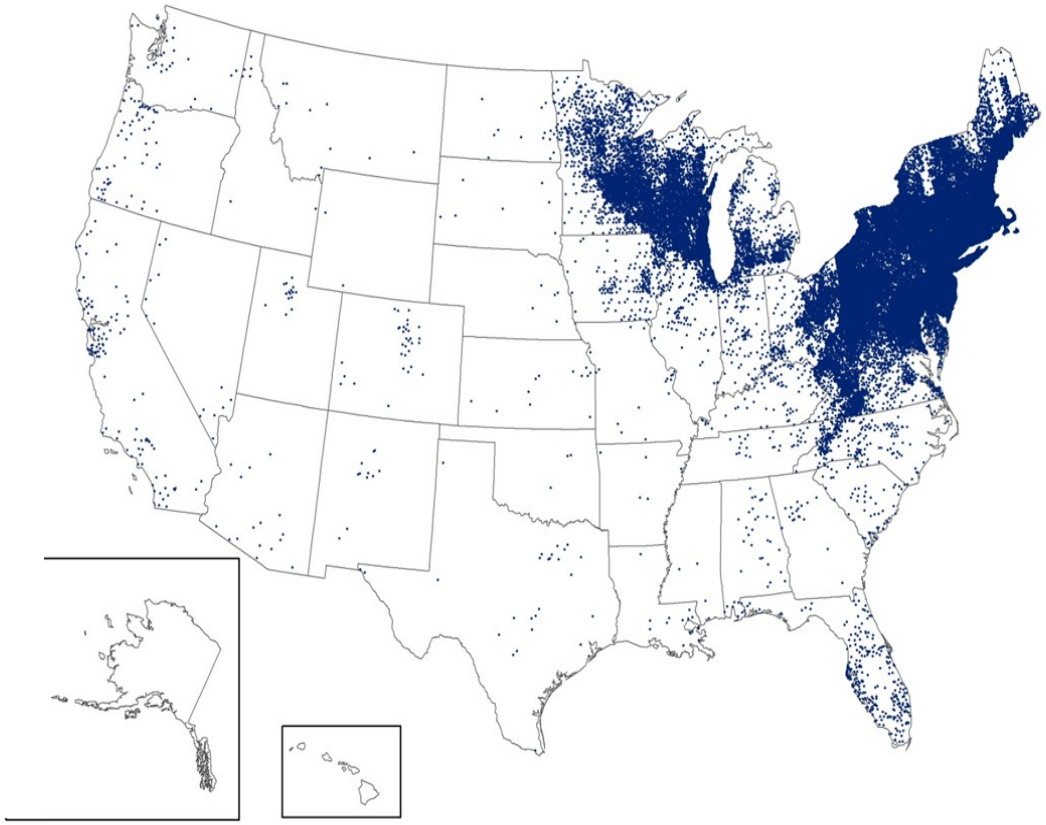

Biltmore Forest
LEADS
Town Hall Meeting
May 4, 2026

Agenda

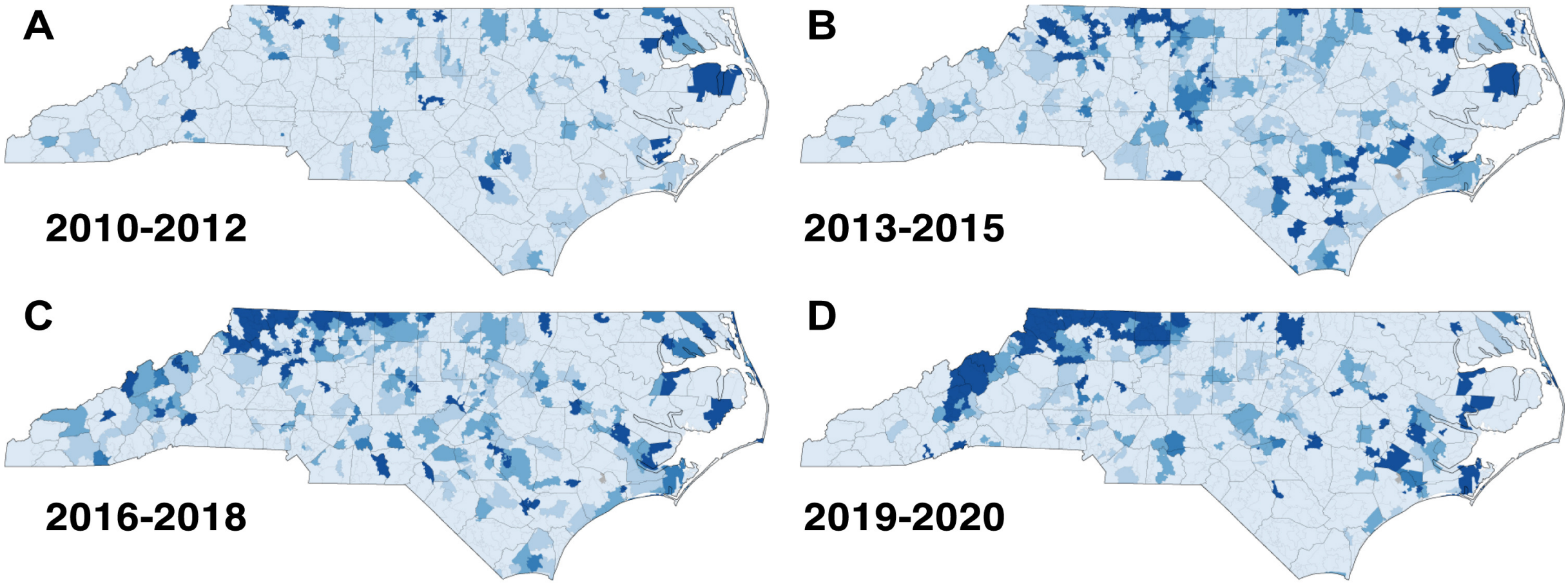
- LEADS Team Introduction
  - Janet Whitworth, Steve Valeika, Angela Newnam, Jonathan Kanipe, Tony Williams, Luke Owen
- The Story in Maps
- University Research Comes to Biltmore Forest
- Next Steps
- Toolkits

CDC Reported Lyme Cases 1995 vs 2023

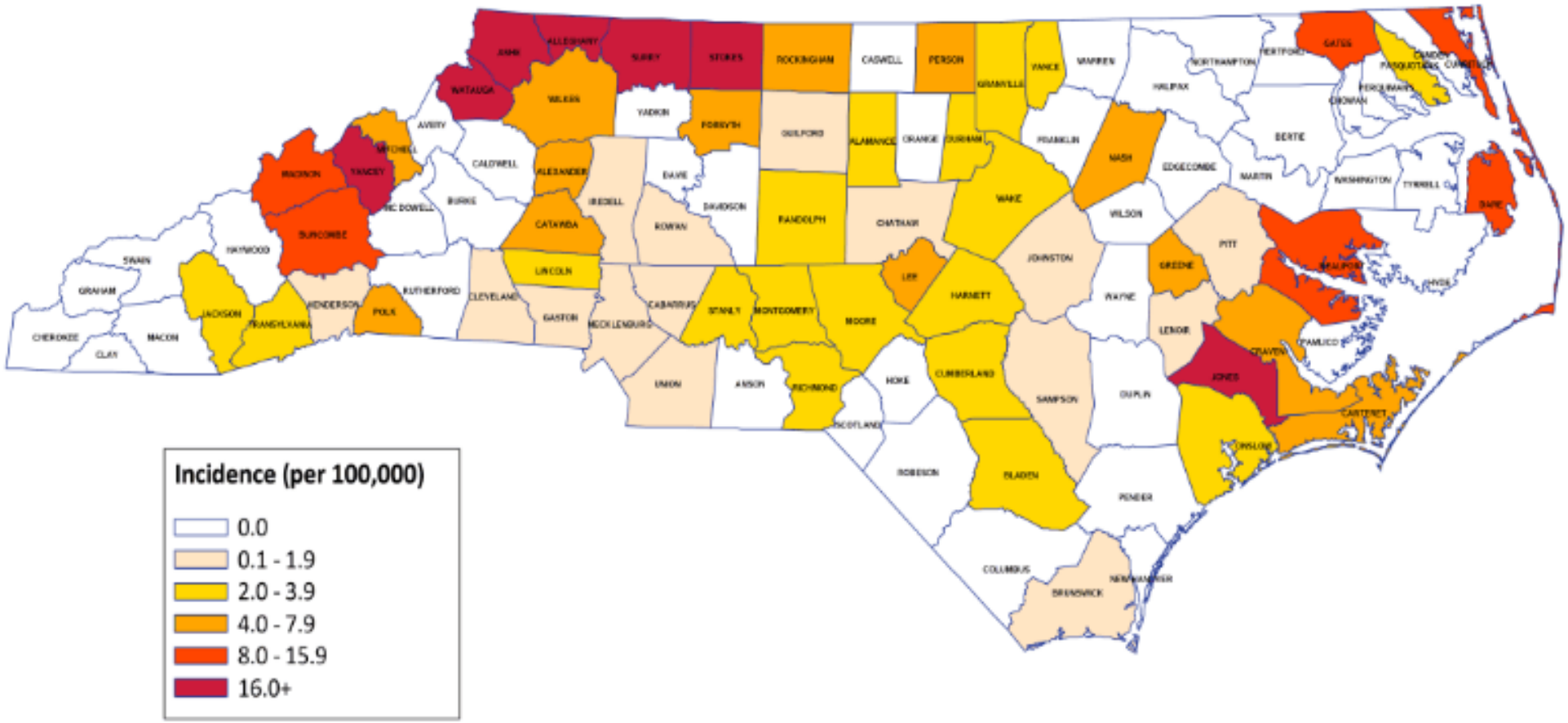




CDC Cases by County



Confirmed and Probable Incidence of Lyme Disease Cases by County of Residence, NC, 2019



North Carolina Endemic Counties- no testing required!

NC Department of Health 2025

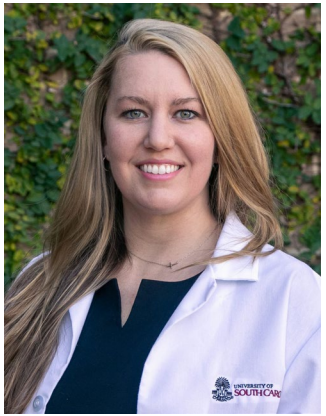
Presenters

UNC Chapel Hill
Infectious Disease Epidemiology and Ecology Lab

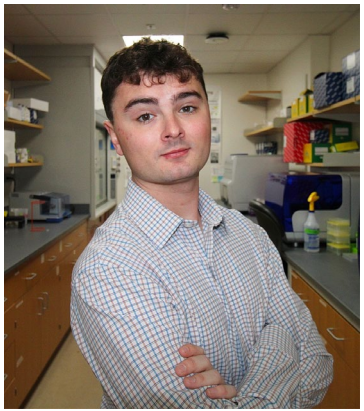
Dr. Ross Boyce, MD, MSc
Assistant Professor of Epidemiology

Ayla Bullock, MPH

University of South Carolina
USC Institute for Infectious Disease Translational Research



Dr. Melissa Nolan, PhD, MPH
Associate Professor of Epidemiology



Sean Sweeney, MSc
PhD Candidate

Community-Academic Collaboration

UNC Chapel Hill

Dr. Ross Boyce, MD, MSc
Ayla Bullock, MPH
Dana Giandomenico, MPH

NC State University

Dr. Michael Reiskind, PhD, MPH
Allison Yackley, MSc

University of South Carolina

Dr. Melissa Nolan, PhD, MPH
Sean Sweeney, MSc
Katherine Brown, MPH
Kia Zellars, MSc
Eden Frick

TOWN of Biltmore Forest

Angela Newnam
Jonathan Kanipe
LEADS Team

Timeline of Events

January 2024

LEADS Team Develops/Distributes Tick Survey

Sent to ~400 households; asked about human + pet tickborne disease cases, tick sightings, prevention efforts, knowledge of ticks and Lyme.

November 2024

University Tick Collection Begins (November 2024)

Existing survey data transferred to UNC. Regimented monthly tick drags, mail-in tick collection kits for households (coordinated by University of South Carolina) begin.

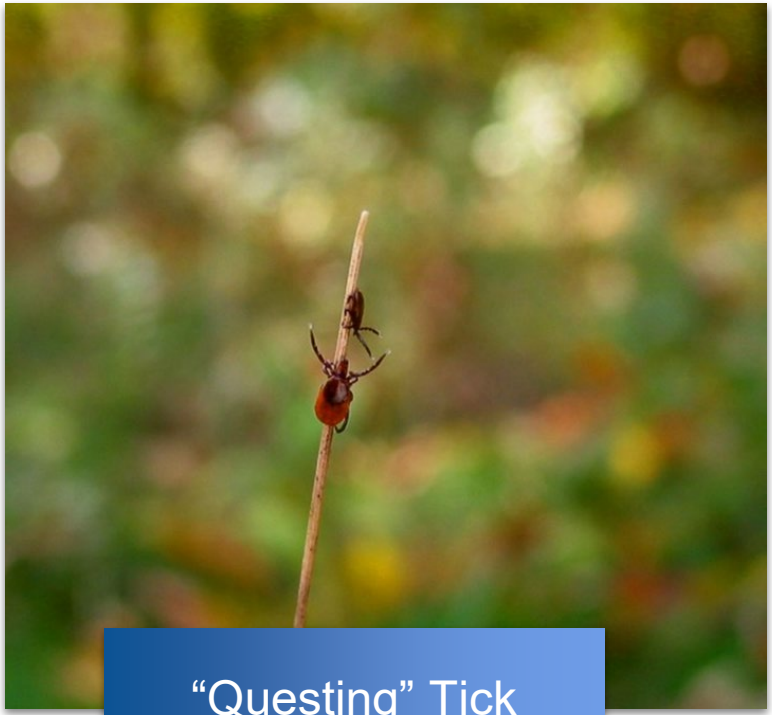
Summer 2025 to August 2025

Tick Collection Continues & UNC Case Followup Begins

UNC follows up with self-reported cases to obtain medical records, treatment/testing information, tickborne diseases diagnoses other than Lyme. Community refers UNC to cases not captured by original survey.

Icons created by Freepik - Flaticon

How Does Tick Collection Work?

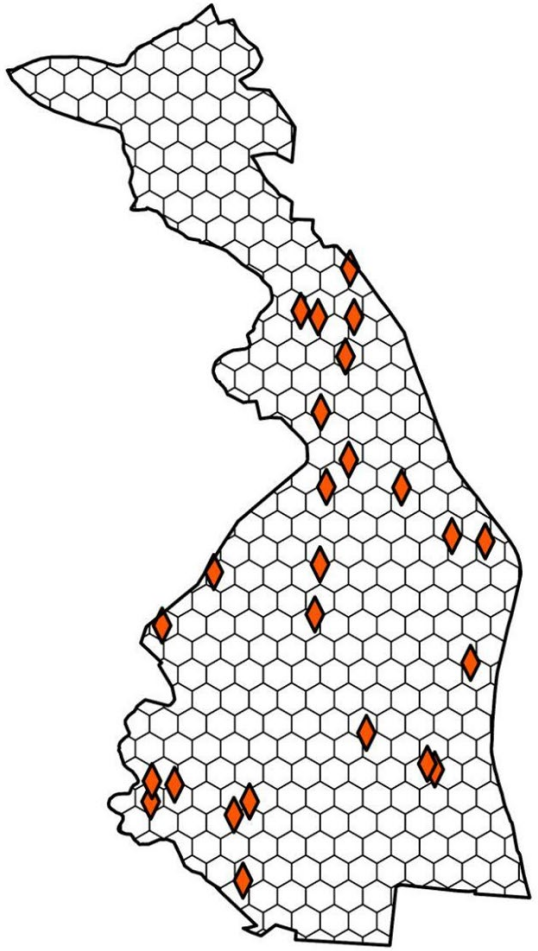


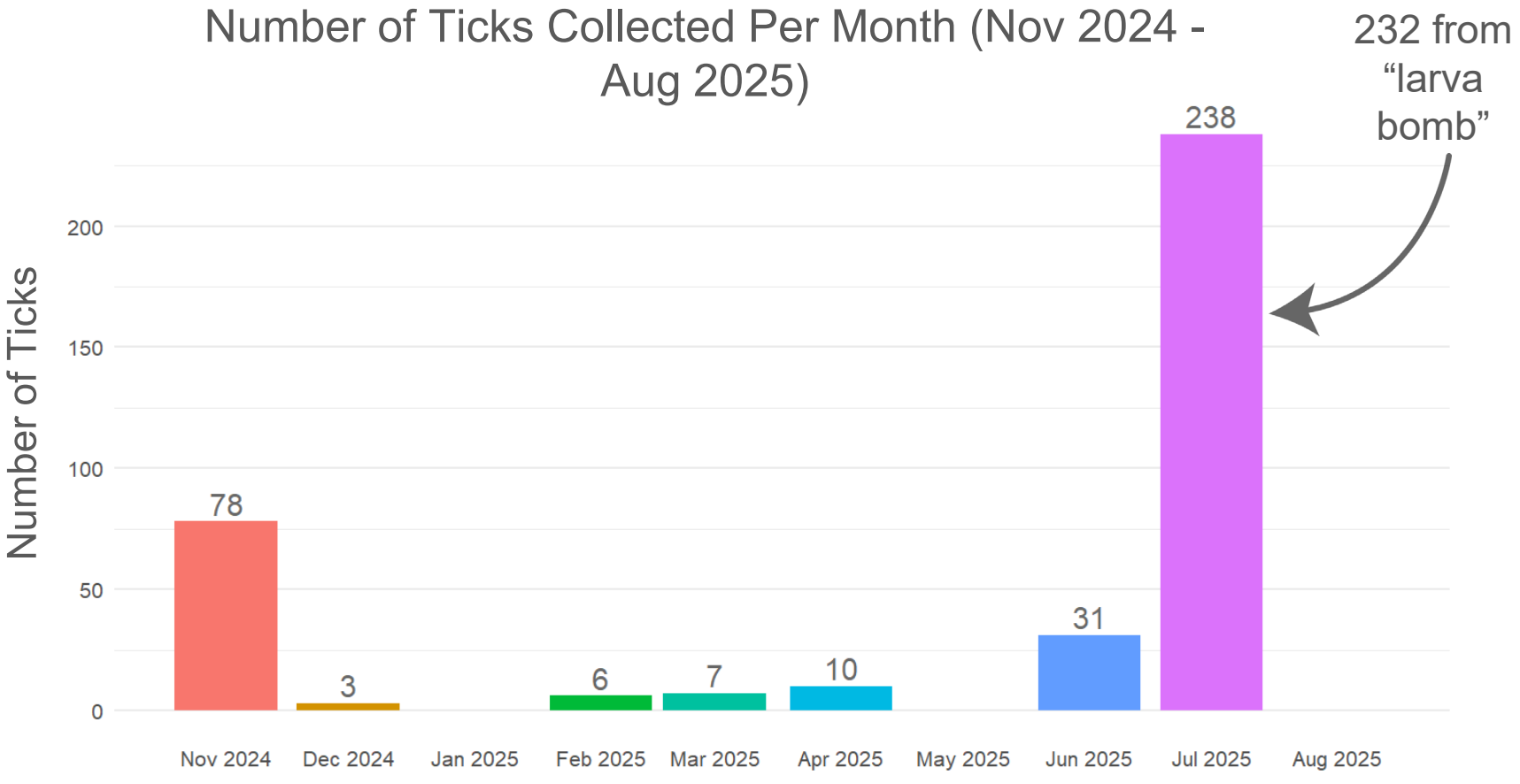
“Questing” Tick

Tick Dragging

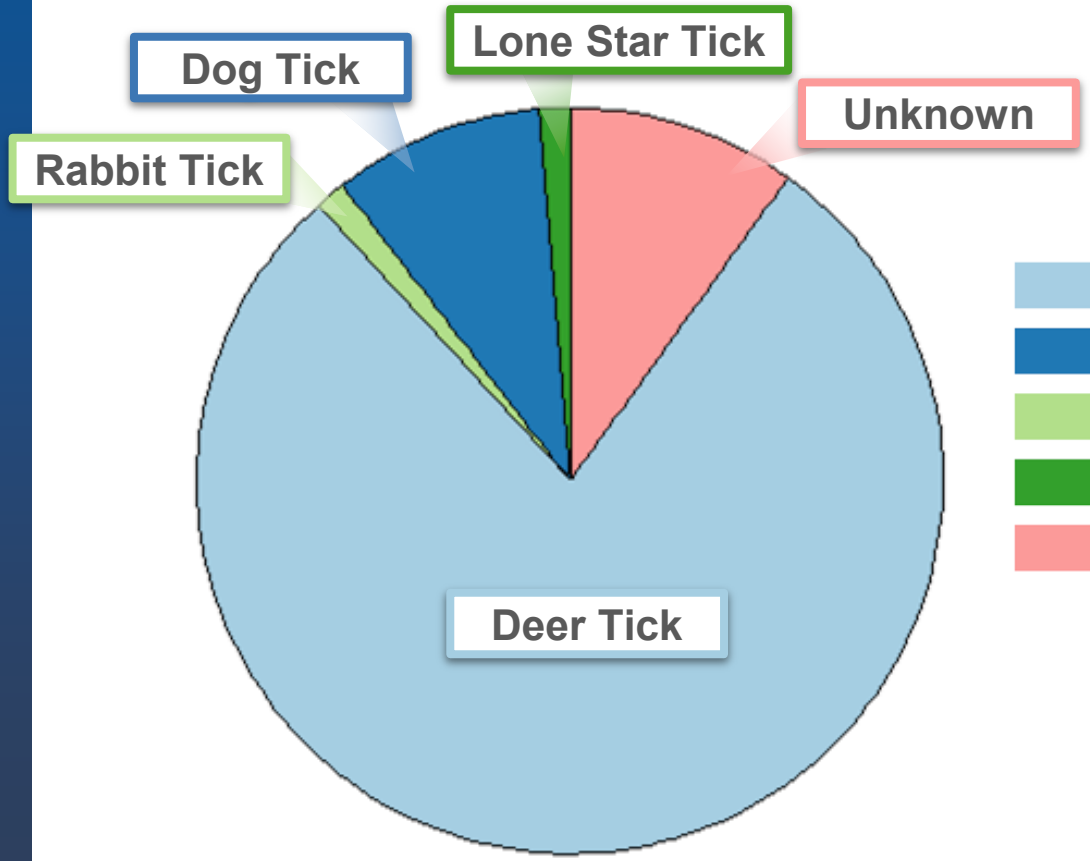
Tick Collection Sites

- Monthly tick collections occurred from:
  November 2024 - August 2025
- Participating Households: **23**
- Total Ticks Collected: **373 ticks**
- Ticks received from ‘tick kits’ given to Biltmore Forest households: **36 ticks**

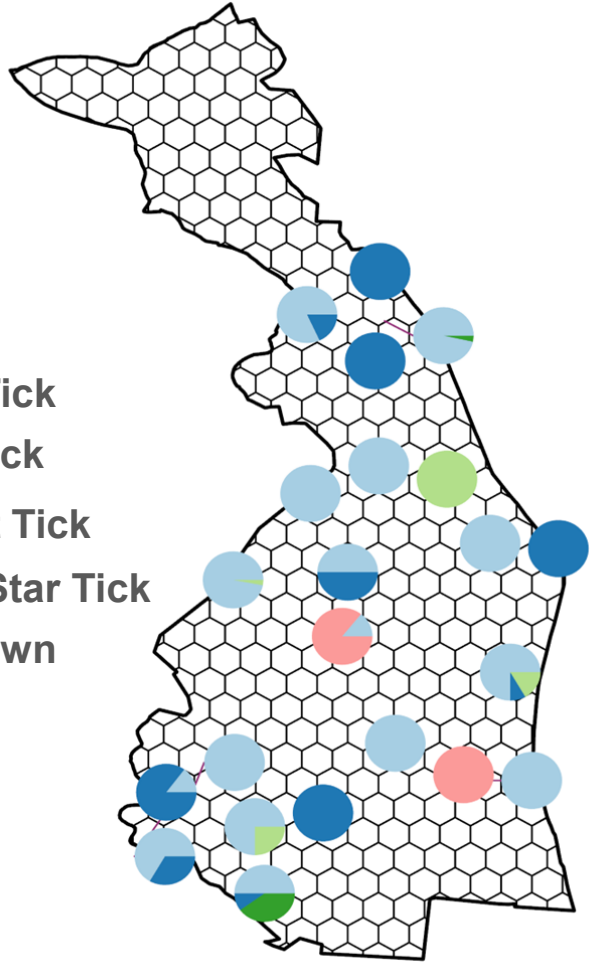



Number of Ticks Collected Per Month (Nov 2024 - Aug 2025)
232 from "larva bomb"
Number of Ticks
0
50
100
150
200
78
3
6
7
10
31
238
Nov 2024
Dec 2024
Jan 2025
Feb 2025
Mar 2025
Apr 2025
May 2025
Jun 2025
Jul 2025
Aug 2025

Tick Genus and Species



Deer Tick
Dog Tick
Rabbit Tick
Lone Star Tick
Unknown

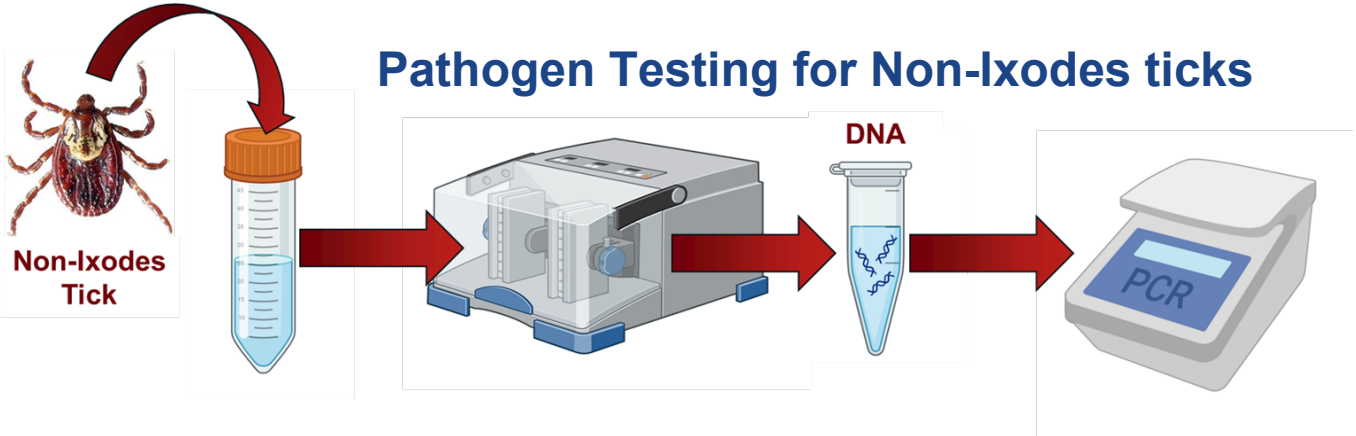


Ticks of Western NC and Diseases They Spread

Common Name	Photo Adult female (left), adult male (right)	Diseases Transmissible to Humans	
Blacklegged tick, Deer tick		Anaplasmosis Babesiosis Borrelia miyamotoi disease	Ehrlichiosis **Lyme disease (Borrelia burgdorferi)** Powassan virus disease
Lone Star tick		Bourbon virus disease Ehrlichiosis Heartland virus disease Rickettsiosis	Southern tick-associated rash illness (STARI) Tularemia Alpha Gal
American dog tick, Wood tick		Rocky Mountain spotted fever Rickettsiosis Tularemia	
Rabbit Tick		Rocky Mountain spotted fever Rickettsiosis Tularemia	

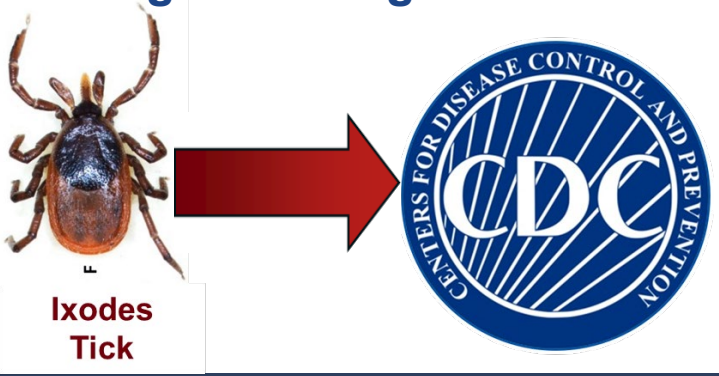
Adapted from: Mayo Clinic, 2023

Tick Testing Methods

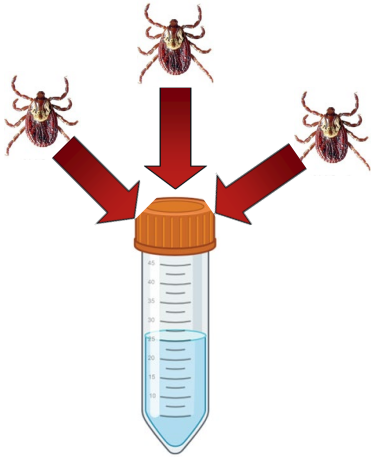


Pathogen Testing for Non-Ixodes ticks

Pathogen Testing for Ixodes ticks



“Pooling” Process



Tick Testing Results

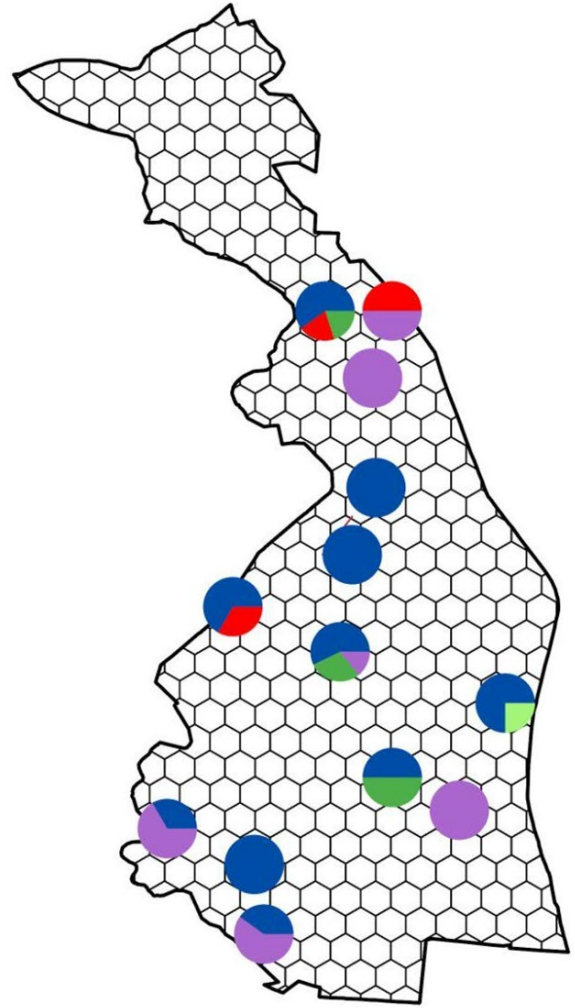
Disease	% of Pools Positive	Total # of Pools Tested
Lyme Disease	**33.33%**	**66**
Rickettsiosis	**21.43%**	**42**
Anaplasmosis	**7.57%**	**66**
Hard Tick Relapsing Fever	**6.06%**	**66**

We tested for **14 distinct pathogens** that can cause **8 different tick borne diseases**, including but not limited to:

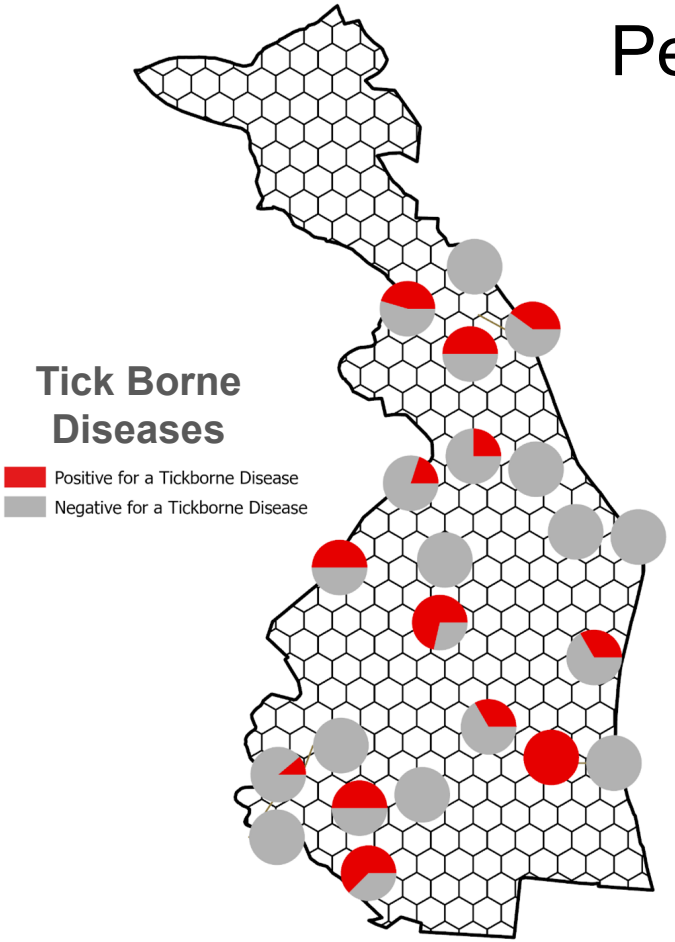
Ehrlichiosis
Anaplasmosis
Babesiosis
Rocky Mountain Spotted Fever
Lyme Disease
Rickettsiosis
Hard Tick Relapsing Fever

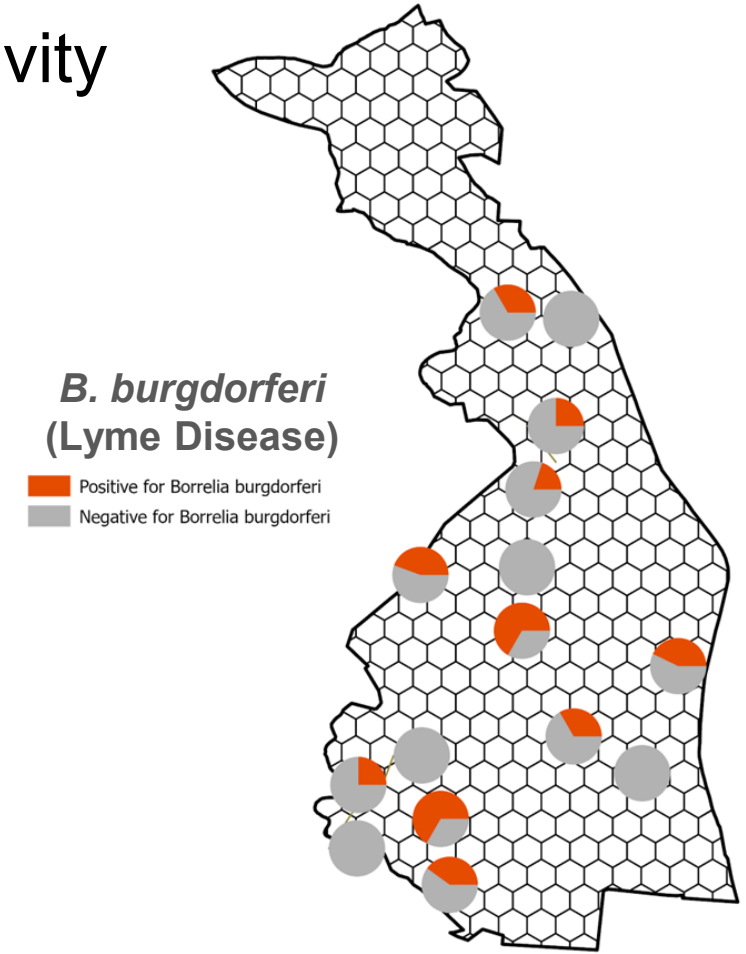
Tick Borne Disease Distribution

Disease	Legend
Lyme Disease	
Hard Tick Relapsing Fever	
Anaplasmosis	
Rickettsiosis	



Percent Positivity





Human Cases vs Tick Positivity

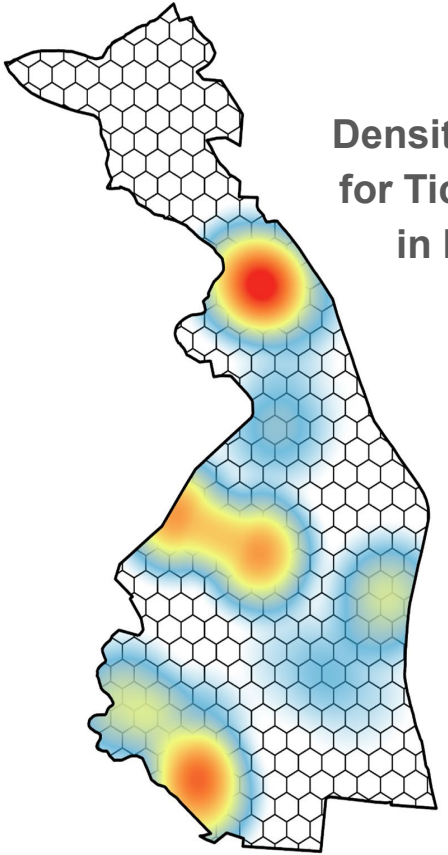
Density of Human Cases of Tickborne Disease in Biltmore Forest

Relative Human Case Density

Sparse

Dense

**1 human case is not mapped due to missing address data*



Density of Ticks Positive for Tick Borne Diseases in Biltmore Forest

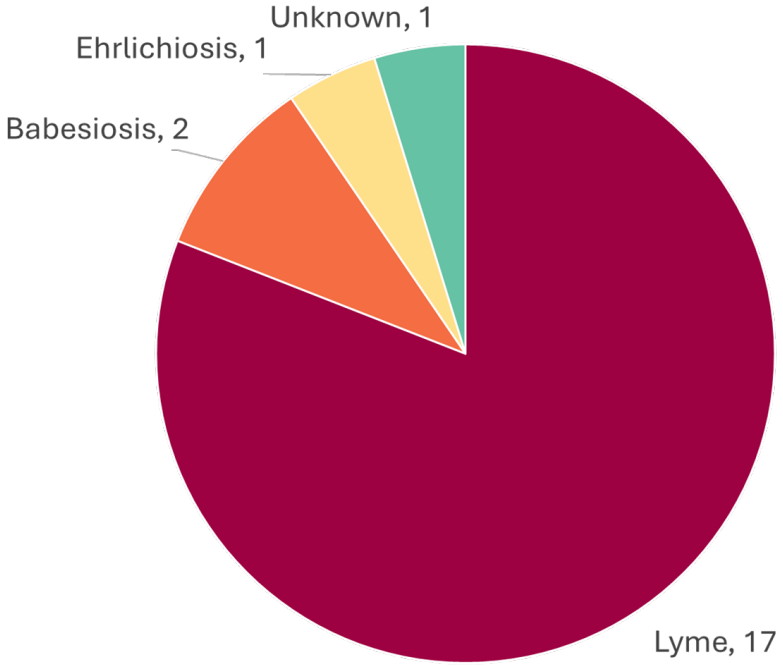
Relative Ticks with Tick Borne Disease Density

Sparse

Dense

Total Individuals with ≥1 Self-Reported Tickborne Disease
19

Self-Reported Tickborne Disease Diagnoses Among 19 Residents



Comparison to Other Locations - Lyme Tick Pool Positivity

Location (Year)	% Pools Positive for Lyme	Notes
Pennsylvania (2013)	45%	299 adult ticks tested from multiple different species
New York (2017-2018)	38%-64%	769 Ixodes ticks, all life stages
Maine (2019)	42%	1,901 blacklegged ticks, adults and nymphs only
New Hampshire (2018-2021)	37%	2,787 blacklegged ticks, all life stages
Biltmore Forest, NC (2024-2025)	33%	66 pools of 288 blacklegged ticks, all life stages

***Note: sampling and testing methods vary by study, so results are not directly comparable to one another. These numbers give context but are not definitive.*

Summary & Key Findings

- There are ticks with the pathogens that cause **Lyme disease, rickettsiosis, anaplasmosis, and hard tick relapsing fever** in Biltmore Forest.
- Percent positivity for Lyme in Biltmore Forest tick pools was larger than expected.
- These data provide a baseline for future work in Biltmore Forest.

Next Steps

We would like to continue partnering with Biltmore Forest to collect additional data and evaluate town interventions.

Acknowledgements

Biltmore Forest LEADS Task Force

Angela Newnam, Biltmore Forest

Jonathan Kanipe, Biltmore Forest

University Tick Collection Volunteers (NC State, USC, UNC-Chapel Hill)

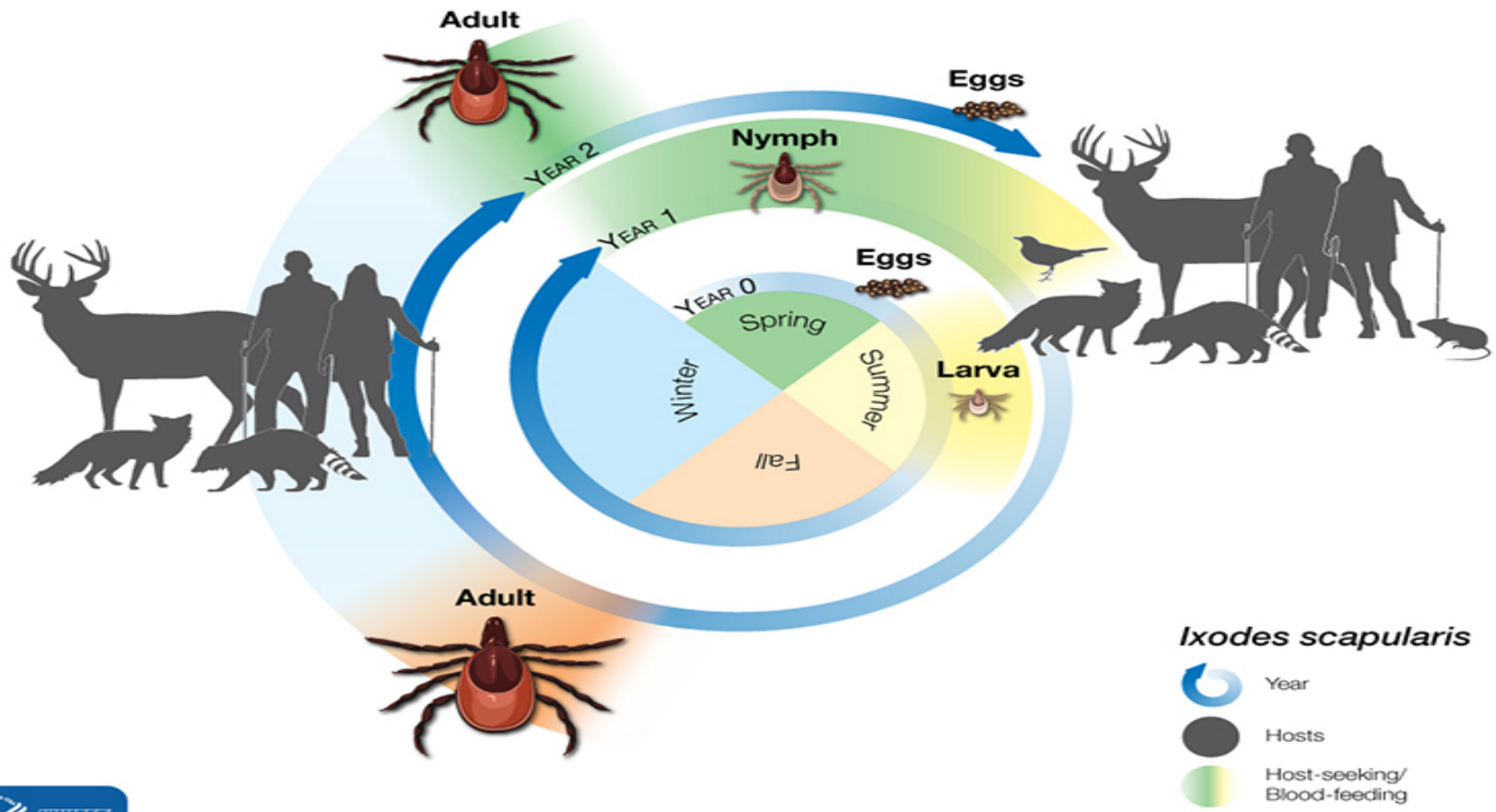
Paul Delamater, PhD - Assoc. Professor of Geography (UNC-Chapel Hill)

Sarah Ulrich, M.A. - PhD Student, Dept. of Geography & Environment (UNC-Chapel Hill)

NEXT STEPS

- Conduct another Town survey
- Raise funds to continue University studies of BF as a pilot
  - Objective - $200,000
    - Town Budget, Private Fundraising, University Grants
  - Objective - $200,000
    - Apply for a Dogwood Trust match to rollout to other counties in WNC
- Continue University-led studies in Biltmore Forest
  - Partner with MAHEC
  - Facilitate hiring full-time WNC researcher - $50,000
  - Purchase tick abatement materials - $50,000
  - Offer lyme exposure testing to residents – tbd
  - Test tick reduction efforts and measure results
  - Communicate and rollout proven efforts
- Rollout for WNC counties- near term
  - Build tick testing baselines in 4-5 other counties
  - Implement awareness programs (local officials, medical professionals, schools)

Tick Life Cycle - Hosts are the Carriers



Toolkit for Residents

Personal protection with repellants, treated clothing, and hot shower

Personal knowledge of symptoms and treatments

Pet protection with treatments

Landscape maintenance (leaves, debris)

Rodent treatment and reduction

Deer repellants

Toolkit for the Town-Near Term

MORE EFFECTIVE LEAF COLLECTION

MORE FREQUENT ROADSIDE AND TRAIL MAINTENANCE

SMALL MAMMAL TREATMENT ON TOWN PROPERTY

TREATED UNIFORMS FOR TOWN EMPLOYEES

EDUCATION AND DEET WIPE KIOSKS AT PARKS AND TRAILS

Reminders

- Unattached tick
  - Collect ticks in ziplock bags
  - Label address
  - Drop at Town Hall for testing
- Attached tick
  - Use tweezers to pull from the head not the belly
  - Consult your PCP for prophylaxis course of antibiotics (doxycycline)
  - Monitor for symptoms – 3-4 weeks
  - Put in a ziplock bag and send to a tick testing lab
    - Tickcheck.com, Tickreport.com - $50 test with results in 3-5 days