



# Ticks and Tick-borne Illnesses of Alabama

Emily Merritt and Dr. Graeme Lockaby

1 inch

**Blacklegged Tick (*Ixodes scapularis*)**



adult female

adult male

nymph

larva



**Lone Star Tick (*Amblyomma americanum*)**



**Dog Tick (*Dermacentor variabilis*)**



<http://uszo.com/sites/default/files/photos/promoted/killancsallatban.jpg>



[http://media.npr.org/assets/img/2012/02/01/female2\\_wide-f852898d0f116eabb286178c40ca664dc836945-s6-c30.jpg](http://media.npr.org/assets/img/2012/02/01/female2_wide-f852898d0f116eabb286178c40ca664dc836945-s6-c30.jpg)



[http://www.billhubick.com/images/lonestar\\_tick\\_wi\\_md\\_20070727.jpg](http://www.billhubick.com/images/lonestar_tick_wi_md_20070727.jpg)

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# Some Ticks in Alabama

## Lone star tick

*Amblyomma americanum*

- Most abundant, woods
- Humans and pets
- Year round, most active spring-fall



## Black-legged tick

*Ixodes scapularis*

- AKA “deer tick”
- Common, woods/pine
- Humans and pets
- Active fall-winter



# Some Ticks in Alabama

## American dog tick

*Dermacentor variabilis*

- Common, backyards/woods
- Humans and pets
- Active spring-fall



## Gulf Coast tick

*Amblyomma maculatum*

- Common, shrub
- Humans and pets
- Active spring-fall



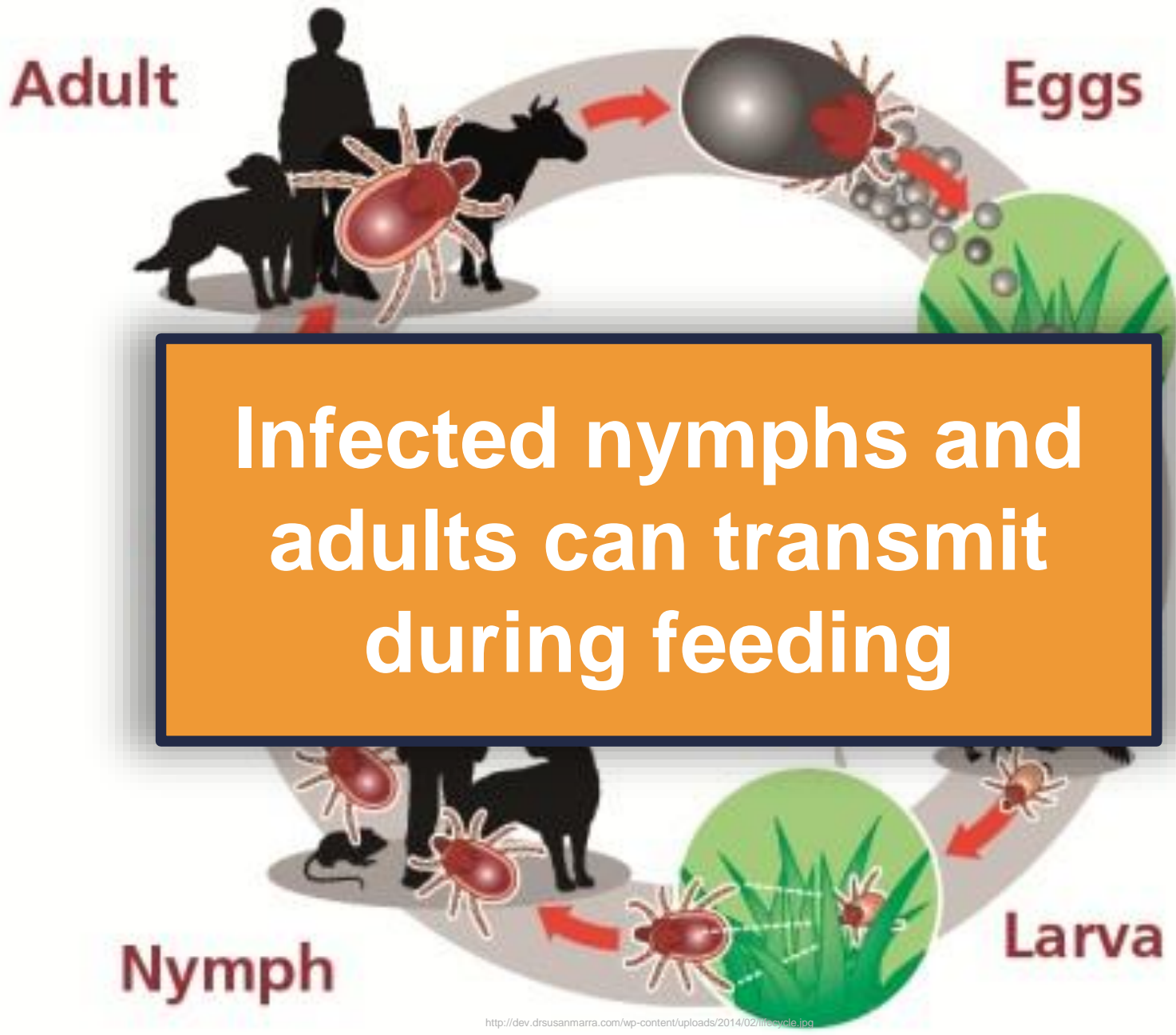
# Some Ticks in Alabama

## Brown dog tick

*Rhipicephalus sanguineus*

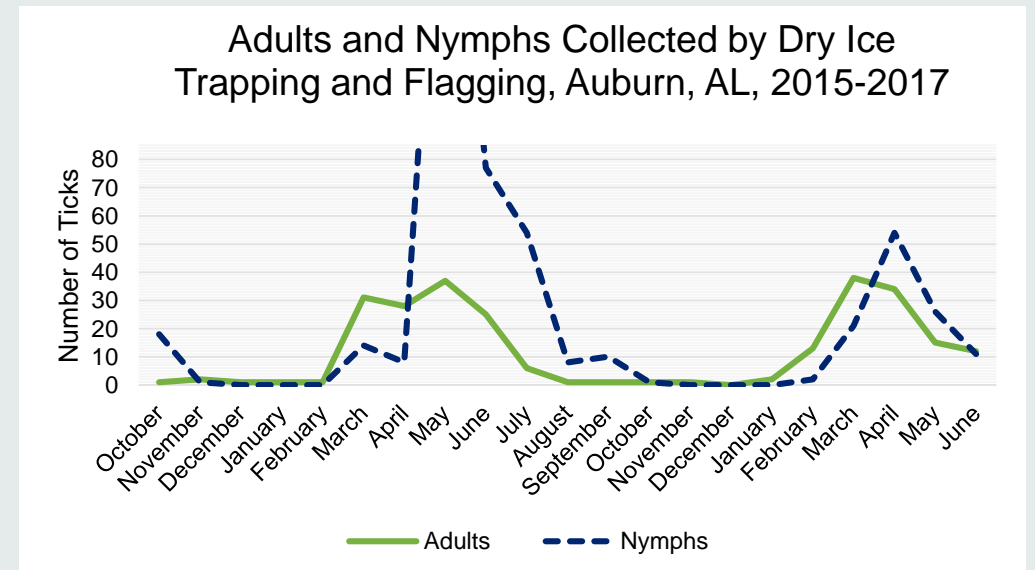
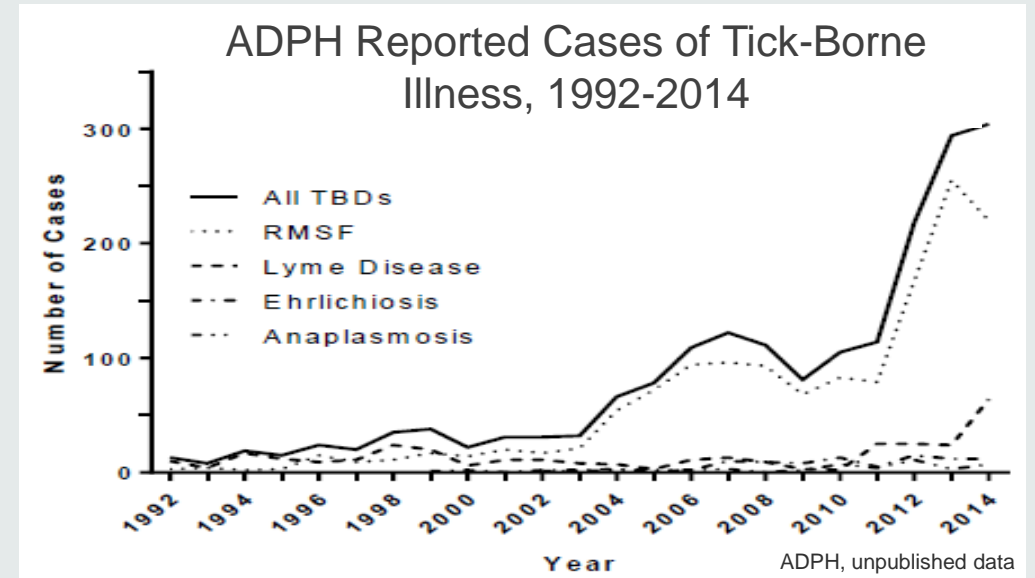
- Infest homes, animal pens/kennels
  - Controlling infestation difficult
- Prefer dogs, will bite humans
- Active all year





# Current Status

- Reports have increased
  - Greater awareness, better testing
  - May continue with climate, habitat change → ticks, hosts, TBDs
  - ADPH Lyme endemic Co's: Calhoun, Chambers, Jefferson, Mobile, ~~Russell~~, Shelby, Tuscaloosa
- AL: Warm winters → Ticks year round → TBDs a constant concern
  - Winter hunting, early springs, nice summers → humans active → more tick encounters



# Rocky Mountain Spotted Fever

- *Rickettsia rickettsii* and other spp., most commonly reported
- Symptoms a few days to 2 weeks
  - Fever
  - Headache
  - Abdominal or muscle pain
  - Nausea/vomiting
  - Spotted red rash
  - Treated with antibiotics
- Diagnosis difficult → lifelong illness or fatality
- Infects dogs





# Lyme Disease – *Borrelia burgdorferi*



- Most commonly reported vector-borne illness in US → ~300,000 cases/yr
- Symptoms a few days to weeks
  - Flu-like: fever, headache, chills
  - Muscle, neck, joint pain
  - Brain fog, depression
  - Expanding red rash, bull's eye (maybe)
  - Treated with antibiotics
- Diagnosis difficult → lifelong illness/chronic issues
- Infects dogs, horses



# Southern Tick-Associated Rash Illness



- STARI - unclear agent, growing problem
- Symptoms within a weeks
  - Flu-like: fever, headache, fatigue
  - Muscle or joint pain
  - Expanding red rash, bull's eye (maybe)
  - Treated with antibiotics, not all Docs treat
- Diagnosis difficult → not much known about long-term
- Not reportable, prevalence unknown



# Tularemia – *Francisella tularensis*

- Transmitted by ticks or handling infected carcasses (i.e., rabbits)
- Symptoms within 3-5 days
  - Fever, headache, chills, coughing, vomiting, muscle ache
  - Skin ulcers, ~80%
  - May disappear and return
  - Treated with antibiotics
- Fatality can occur



# Other Tick-borne Illnesses

## Ehrlichiosis – *Ehrlichia spp.*

- Symptoms within 5-10 days
  - Headache, muscle ache, confusion, nausea/vomiting
  - Nonspecific rash,  $\leq 30\%$
- Lifelong illness or fatality
- Common in Alabama dogs



## Anaplasmosis – *Anaplasma phagocytophilum*

- Symptoms within 1-2 weeks
  - Fever, headache, chills, coughing, nausea, abdominal or muscle pain, confusion
  - Rash is rare
- Lifelong illness or fatality



# Other Tick-borne Illnesses

## Babesiosis – *Babesia divergens*

- Symptoms may or may not present
  - Fever, chills, sweats, headache, muscle ache, confusion, nausea, anemia
  - “Stretch marks” rash
  - Treated with antibiotics
- Lifelong illness or fatality
- Common co-infection
- Infects dogs



## Tick paralysis

- Caused by a neurotoxin
- Symptoms within 2-7 days
  - Headache, vomiting, fatigue, loss of muscle function
  - Treatment = remove tick
  - No treatment = death
- Rural children in spring
- Infects dogs



# Other Tick-borne Illnesses

- Bartonella
- Alpha-gal/red meat allergy
- Powassan virus
- Q fever
- Boutonneuse fever
- More...



# Who is at Risk?

- Hikers
- Campers
- Golfers
- Hunters
- Fishermen
- Gardeners
- Landscapers
- Foresters
- You in your home and backyard!
- Your children!
- Dogs
- Cats
- Horses
- Cattle



**Anyone that spends time outdoors for work or play**

# Keep In Mind...

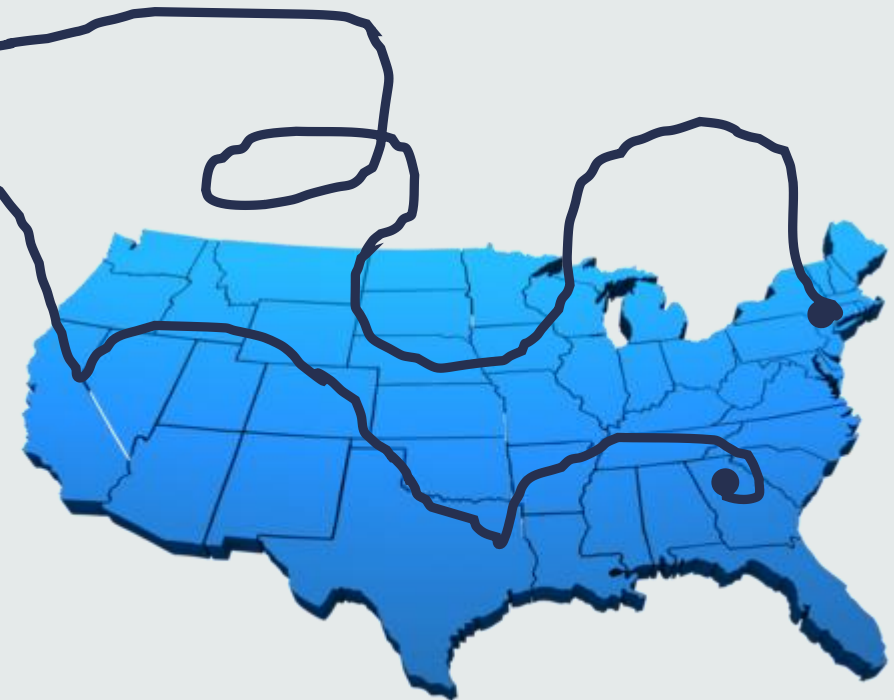
- Individuals may not develop all symptoms
- Number/combo of symptoms can vary
- Co-infections (having more than one TBD) are possible
- Proper recognition and diagnosis difficult
- Many successfully treated during early stages
- No early diagnosis → treatment difficult, chronic symptoms or death

**!!! If you feel sick and tick bite possible,  
see doctor immediately and insist on treatment !!!**



# Patient's Problems

- New problem, little past research, little (but recent) outreach
- “We don’t have that down here. It’s all in your head.”
  - False → scientific and anecdotal evidence
  - AL patients denied testing or treatment
  - Misdiagnosis or improper treatment
    - Unreliable tests → variable sensitivity
      - Due to test timing, genetic markers
  - Many people get very, very sick



# From Dr. Ryan McWhorter, Montgomery

“A better test for Lyme disease has made all of the difference in helping several of my patients with their serious illnesses. To learn that Lyme is common and is curable gives them great relief, as they knew all along it wasn’t ‘in their heads.’ Finding answers and then cures has been extremely gratifying...It’s a lot of fun helping those that have been frustrated by current medical misunderstanding. I only wish more physicians had the latest information regarding how Lyme strikes in Alabama.”



# Before Going Outside...

- Light-colored, long pants and long-sleeved shirts
- Tuck shirt into pants, tuck pants into socks/boots
- Put long hair in bun or pull up into hat
- Wear close-toed shoes
- $\geq 20\%$  DEET repellent on skin, clothing
- **Most effective** = 0.5% Permethrin treatment on clothing, gear



# While Outside...

- Avoid:
  - Tall grasses
  - Shrubs, brush
  - Low lying branches
  - Leaf litter/piles
  - Rotten logs/stumps
  - Stone walls and woodpiles
  - Wooded areas and edges
  - Lawn adjacent to woods/fields



# Immediately After Coming Indoors...

- Examine clothing, gear, pets
  - Ticks ride into home, attach later
- Dryer: high heat 30 min
- Full body check in shower, with partner, or using mirror
  - Check for bumps/scabs
  - Do several days following exposure
  - Make part of daily routine
- Before bed, check sheets, they can wait



# Tick Attachment Awareness Dude



# Awareness Dude says, “Check...

...dark, moist places that bend and fold:

- Hair/scalp
- In and around ears
- Under the arms
- Inside belly button
- Around waist under waistband
- Groin area
- Where bras pull snug to skin
- Inside of thighs
- Around knees, ankles
- In between fingers, toes





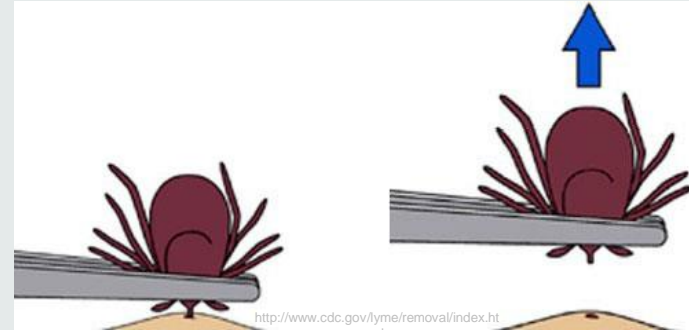
# For Pets...

- Use brush for checks
  - Cats: ears, eyes
  - Dogs: face, ears, neck, armpits, thighs, belly, tail, toes
- Look for lethargy/fatigue, arthritis, lameness, fever, change in appetite
- Use tick control products, **year round**

**Preventing tick-borne diseases in your pets  
may also prevent illness in you!**

DO...

- Remove attached tick with tweezers ASAP



- Longer attachment = increased TBD risk
- Improper removal = increased TBD risk
- Wash, disinfect tweezers and area of attachment
- Dispose of tick:
  - In rubbing alcohol
  - By wrapping in tape, throwing away
  - By flushing down toilet



**DO NOT...**

- Try to scrape tick off
- Twist or squeeze tick
- Burn tick with hot match while still attached
- Apply substance to tick to kill it while still attached
  - i.e., nail polish remover, nail polish, petroleum jelly, gasoline, soap, etc.
- Touch tick with your fingers
  - Use napkin, tissue, etc.
- Wash tick down drain



# What Auburn Is Doing

- Little known about tick/TBD distribution, relationship to wildlife/climate, or TBD infection rates in AL
  - Objectives: Identify vegetation, climatic, and host factors that affect tick and TBD distribution and risk in Alabama
    - 3.5-year project...in year 2
    - Sample state, university, private lands:
      - Ticks, blood from deer: winter + summer
      - Tick CO<sub>2</sub> trapping, flagging: monthly, 1 yr
- PCR testing for:  
*Rickettsia spp.* Lyme  
*Ehrlichia spp.* STARI
- Temperature, relative humidity at forest floor: hourly
  - Trail camera photos of hosts: motion activated
  - Landscape/vegetation survey, foliar and soil analysis: summer '16

# What Auburn Is Doing

- Determine relationship between ticks, TBDs, and wildlife (especially deer=transporter, reservoir)
  - State hunting season, reproductive study deer collections: '15 –'17
    - Tick samples, age, sex, weight, body condition, location
  - Occasional raccoon, coyote, dog, hog collections
- Determine land use change, forest fragmentation effects on ticks/hosts
  - Tick collections, trail cameras, landscape/vegetation survey
- Assess hunter/angler knowledge, experiences related to ticks/TBDs, and estimate economic impact of TBDs in AL
  - Email Qualtrics survey to 10,000 license holders

- CO<sub>2</sub> trap sites
- ★ WMA hunter check stations
- Reproductive study counties

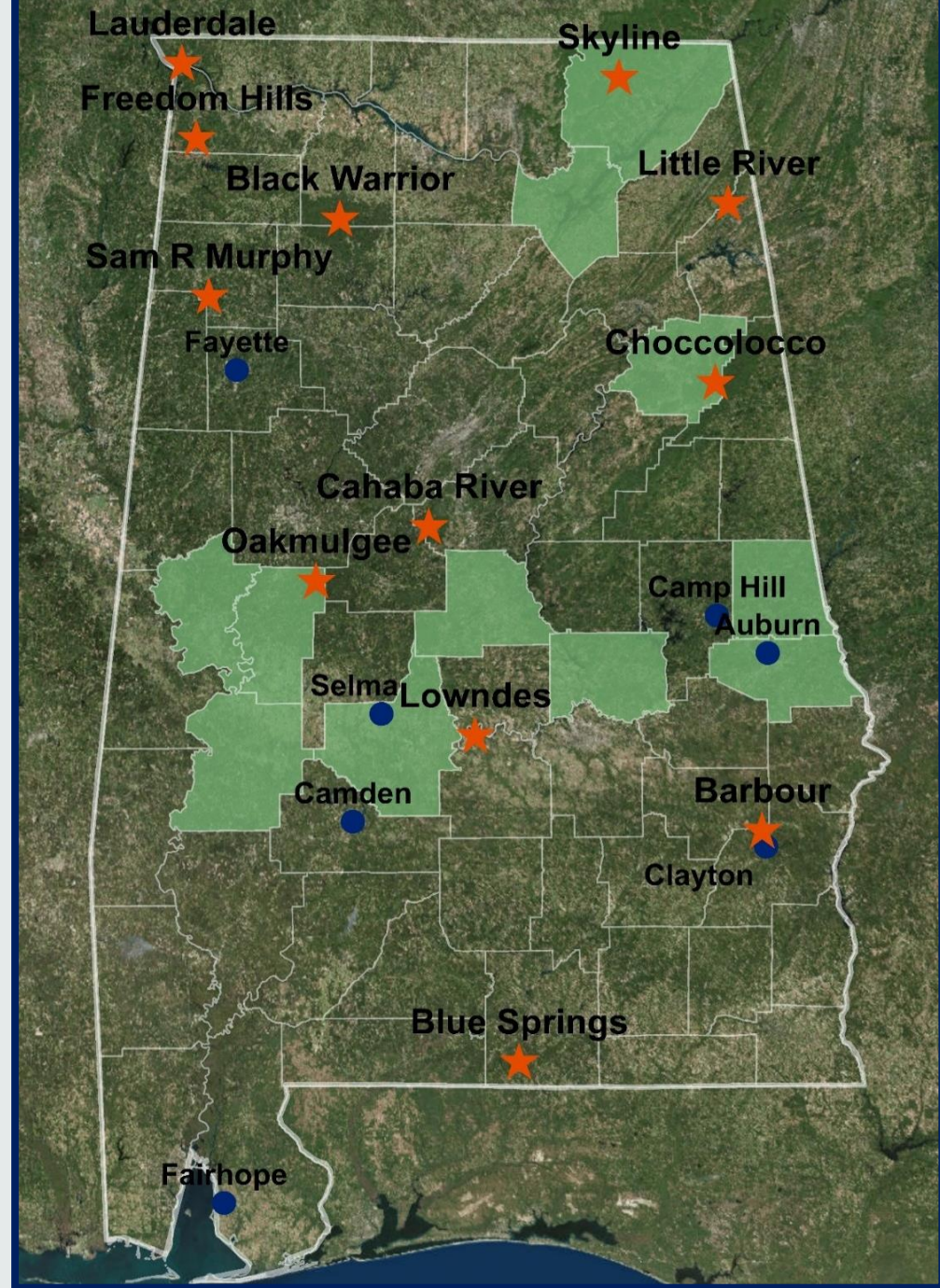
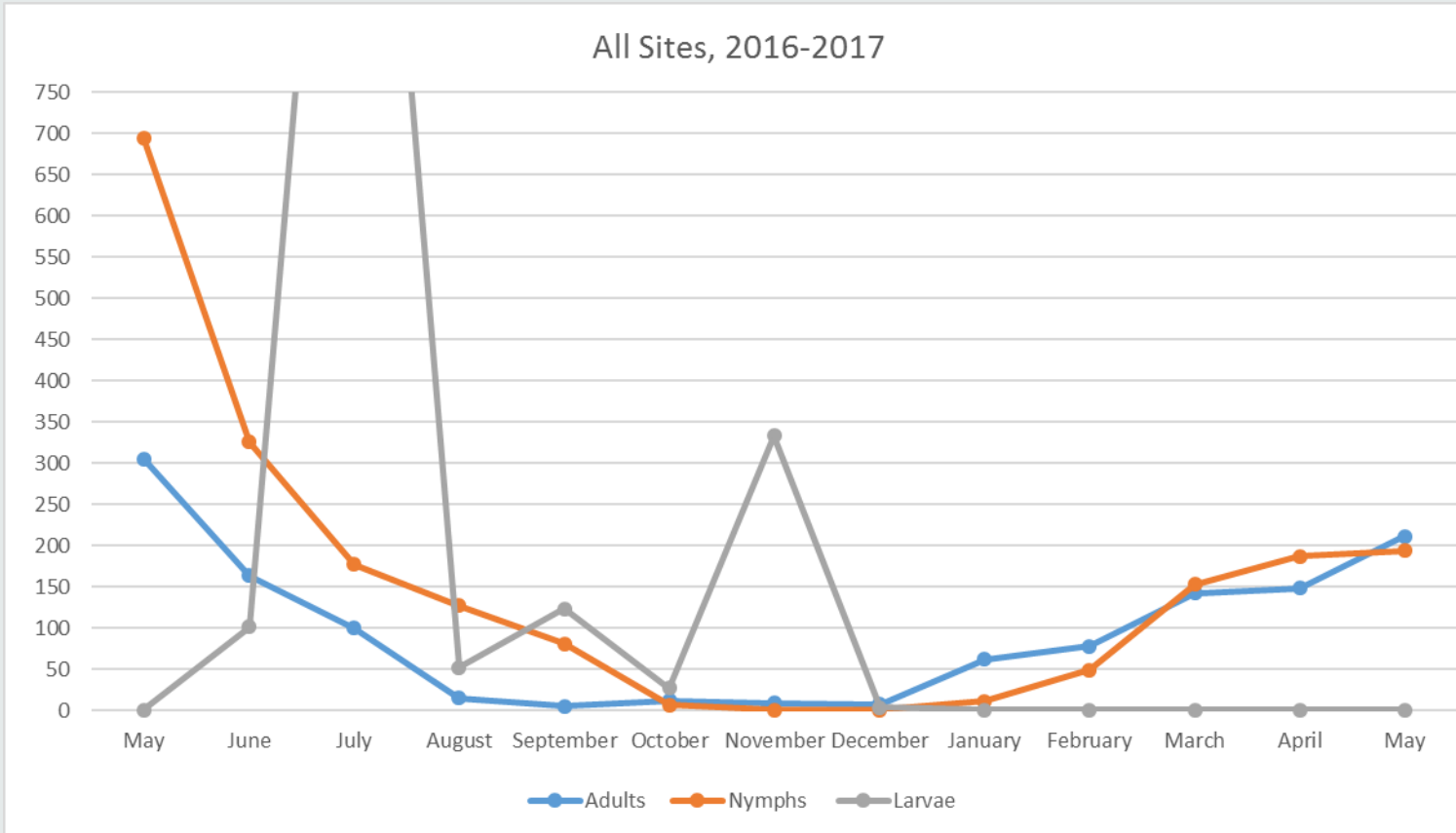




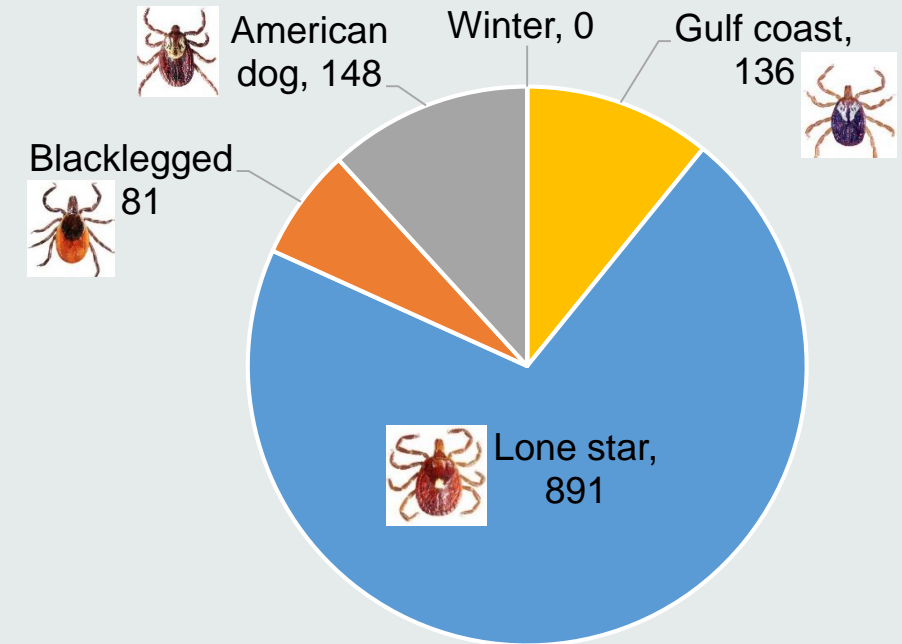
Photo source:  
Emily Merritt



# Preliminary Results – CO<sub>2</sub> Trapping/Flagging



## Monthly Trap Collections

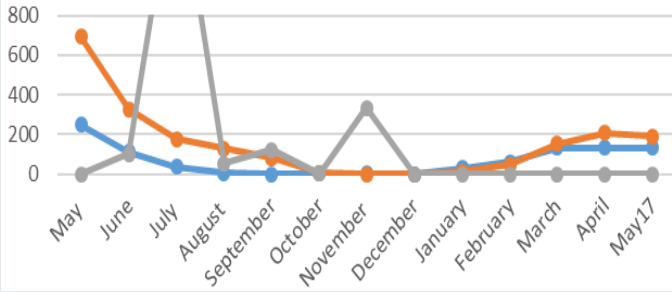


# Preliminary Results – CO<sub>2</sub> Trapping/Flagging



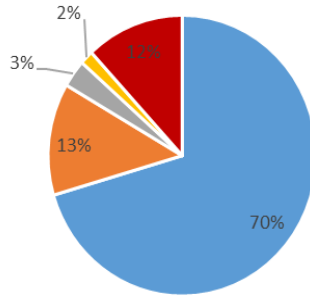
— Adults — Nymphs — Larvae

*A. americanum* Ticks Caught at All Sites, 2016-2017



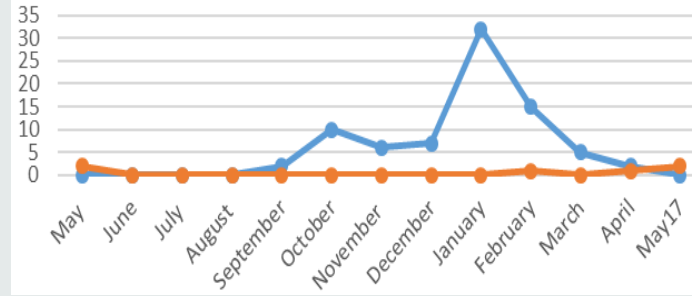
Where All *A. americanum* are Found, 2016-2017

■ Deciduous ■ Coniferous ■ Shrub ■ Pasture ■ Residential



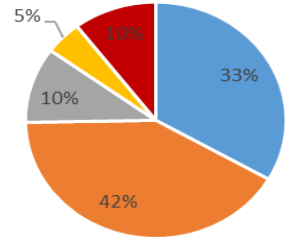
— Adults — Nymphs — Larvae

*I. scapularis* Ticks Caught at All Sites, 2016-2017

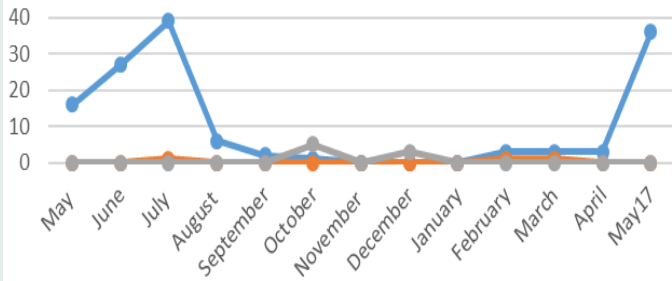


Where All *I. scapularis* are Found, 2016-2017

■ Deciduous ■ Coniferous ■ Shrub ■ Pasture ■ Residential

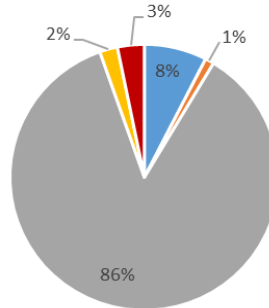


*A. maculatum* Ticks Caught at All Sites, 2016-2017

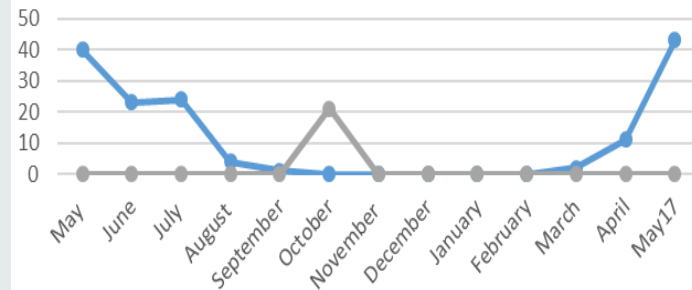


Where All *A. maculatum* are Found, 2016-2017

■ Deciduous ■ Coniferous ■ Shrub ■ Pasture ■ Residential

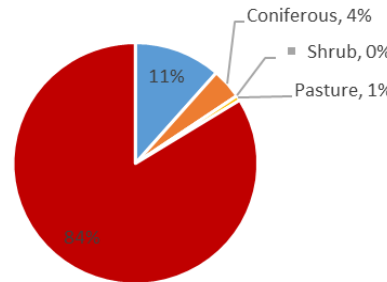


*Dermacentor* sp. Ticks Caught at All Sites, 2016-2017



Where All *D. variabilis* are Found, 2016-2017

■ Deciduous ■ Coniferous ■ Shrub ■ Pasture ■ Residential




# Preliminary Results – Pathogen Screening

- ~75% of ticks tested up to December '16, no Lyme – remainder in progress
  - ***Ehrlichia chaffensis***: causes human monocytic ehrlichiosis
  - ***E. ewingii***: emerging pathogen, not yet reportable, causes illness
  - ***Rickettsia rickettsia***: causes Rocky Mountain spotted fever
  - ***R. parkeri***: emerging pathogen, causes illness
  - ***R. amblyommii***: emerging pathogen, role uncertain, possibly symbiont or infectious
- Currently, nothing found in American dog or blacklegged ticks

# Preliminary Results – Pathogen Screening

- Lone star Minimum Infection Rate (# pos. indivs or pools ÷ total tested):

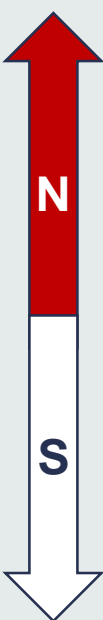


Location	<i>E. chaffeensis</i>	<i>E. ewingii</i>	<i>R. rickettsii</i>	<i>R. parkeri</i>	<i>R. amblyommii</i>
Fayette	0.37%	0.18%			24.64%**
Camp Hill	0%*	1.71%			30.77%*
Auburn	0.30%*	0.60%			22.39%*
Selma	0%	0%			16.53%**
Camden	1.03%	0%			22.68%*
Clayton	0%	0%			16.67%*
Fairhope	2.56%*	0%			48.72%*
All sites	<b>0.61%</b>	<b>0.36%</b>			<b>26.06%</b>

\*Cases reported in county, ADPH 2007-2015

# Preliminary Results – Pathogen Screening

- Gulf coast MIR (# pos. indivs or pools ÷ total tested):

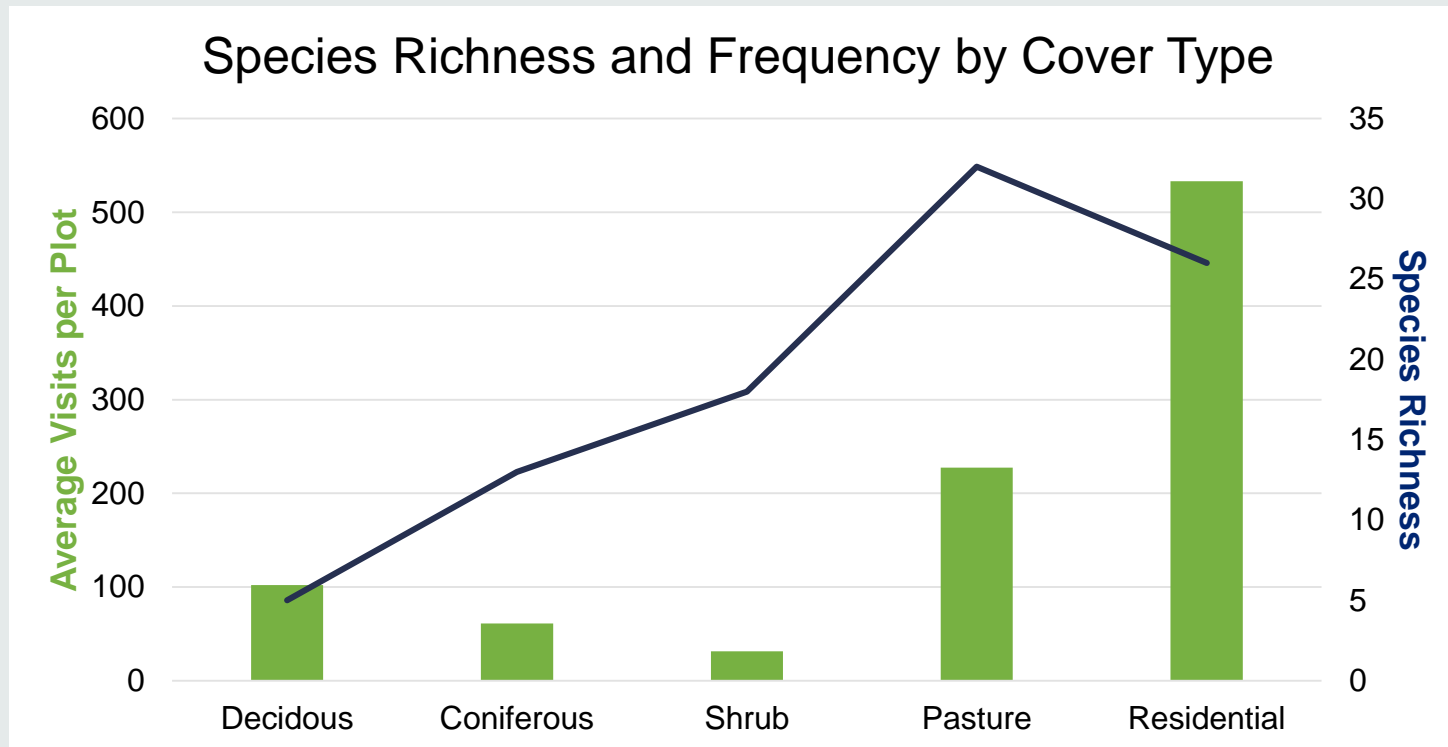


Location	<i>E. chaffeensis</i>	<i>E. ewingii</i>	<i>R. rickettsii</i>	<i>R. parkeri</i>	<i>R. amblyommii</i>
Fayette			**	16.67%**	0%**
Camp Hill			*	N/A*	N/A*
Auburn			*	0%*	33.33%*
Selma			*	23.68%**	5.26%**
Camden			*	14.29%*	0%*
Clayton			*	35.71%*	0%*
Fairhope			*	N/A*	N/A*
All sites				<b>18.07%</b>	<b>7.72%</b>

\*Cases reported in county, ADPH 2007-2015

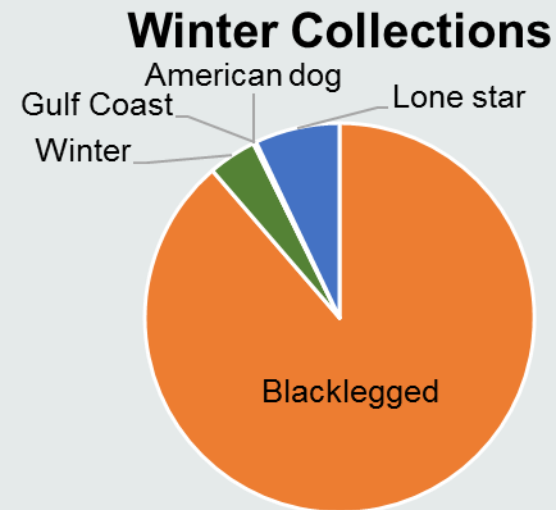
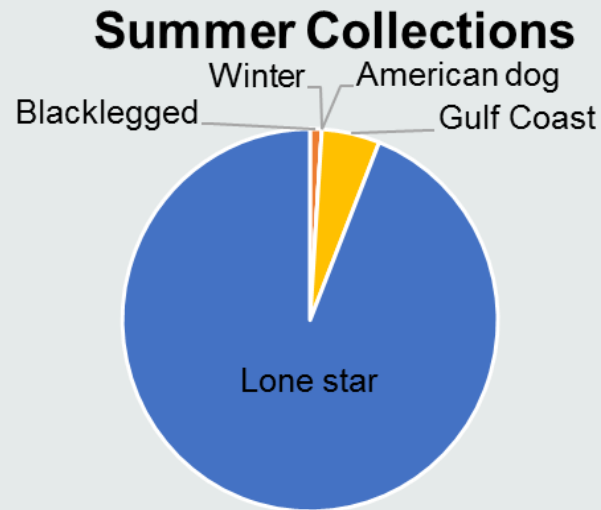
# Preliminary Results – Photos of Wildlife

- Complete results pending
- Captured predators, rodents, birds, pets, game
- No apparent trends by location



# Preliminary Results – State Deer Collections

ADCNR Deer	Summer '15	Winter '15/'16	Summer '16	Winter '16/'17
Ticks	141	1,848	337	1,454
Deer	24	412	65	397
Counties/ WMAs	6	11	9	12



# Preliminary Results - Survey

- Most “moderately knowledgeable” about Lyme disease, “slightly knowledgeable” about Rickettsiosis, and “not knowledgeable at all” about ehrlichiosis, STARI, tularemia, or the alpha-gal allergy
- Most never use Permethrin to treat clothing/gear
- 54% pull attached ticks off with fingers or by burning off with match (25%)
- 6% have or had a TBD → sick at 38 yrs, recovery took 1.72 yrs
  - Suffer from “mild or residual symptoms” (14%) or “long term or chronic illness” (12%)
  - While seeking diagnosis, spent \$2,467 out-of-pocket and \$332 in transportation costs, on average
  - 45% took time off work/school because of TBD





AUBURN  
UNIVERSITY

Have you found at least one tick attached to you in the last year (12 months)?

Yes



No

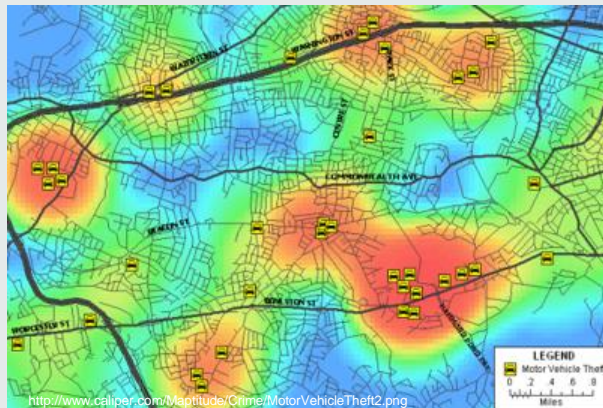


# Next Steps

- Summer 2017 reproductive study tick collections
- In-depth game camera data analysis
- Tick-borne illness testing and results
- In-depth survey analysis and economic impact estimation
- In-depth tick and deer data analysis, distribution mapping, and predictive modeling

# Products

- Factors affecting distribution and risk in relation to humans, wildlife, environment
- Hotspot maps → locations, densities of ticks/TBDs
- Predictive model for disease risk as a function of geographic region, short-term climate, hosts, extent/distribution of forests, etc.
- Identify outreach need, estimate TBD economic impact in State
- Public outreach → events, seminars, publications, radio shows



# Many Thanks To...

Center for Environmental  
Studies at the Urban-Rural  
Interface



Alabama Department of  
Conservation and Natural  
Resources

U.S. Forest Service



Alabama Agricultural  
Experiment Station

# Contact Information

**Emily Merritt**

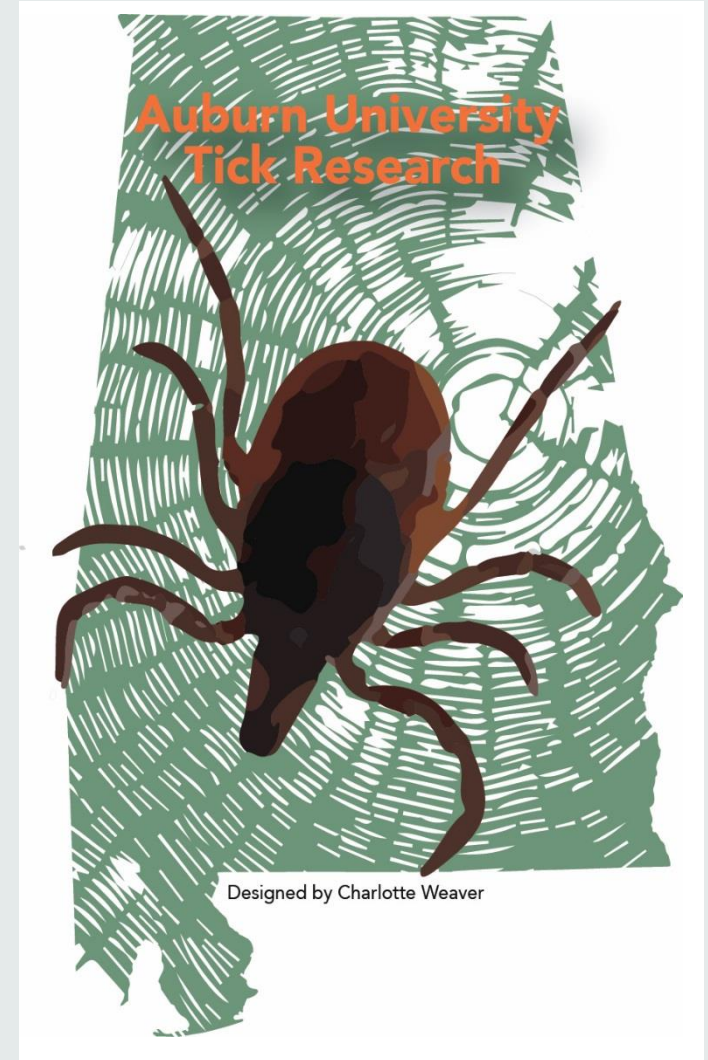
Research Associate

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Auburn University

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334-750-6308



The image features six adult female ticks of various species, including the Lone Star tick (Amblyomma americanum) and the Blacklegged tick (Ixodes scapularis), arranged around the central text. The ticks are shown in various orientations, highlighting their eight legs and segmented bodies. The text "Thank You!" is written in a large, bold, dark blue font, centered over the image.

**Thank You!**

