

An Update on Georgia's Insecticide Resistance Testing and Tick Surveillance Program

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Mid-Atlantic Mosquito Control Association Conference

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What Is Pesticide Resistance?



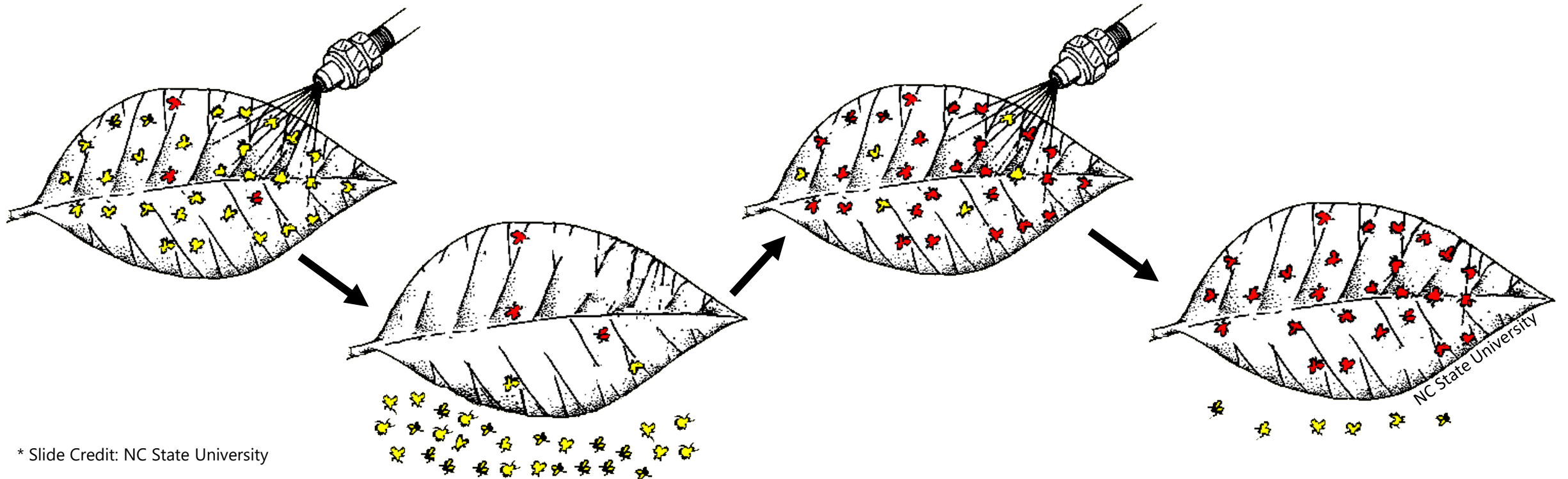
“Insecticide resistance is an overall reduction in the ability of an insecticide to kill mosquitoes. This means that, when used as directed, a product no longer works, or only partially works.” – CDC on Mosquito Resistance

The pesticide no longer effectively kills the mosquitoes.

* Slide Credit: Janet McAllister, Ph.D., CDC

How Do Mosquitoes Become Resistant?

- Using the same pesticide for many years
- Improper application (too weak, too strong, lack of calibration)



* Slide Credit: NC State University

How Can We Prevent Resistance ?

- Follow the label closely
- Calibrate equipment properly
- Rotate chemicals
 - Alternate chemical and non-chemical control
- Integrated Pest Management (IPM)
 - Species-specific treatments
 - Determining thresholds for levels of treatment

How Do We Know If We Have Resistance?

1. Collect mosquito eggs
2. Rear up mosquitoes to adults
3. Expose mosquitoes to known pesticides
4. See if mosquitoes die

Goal

- Determine how well current pesticides are working to kill mosquitoes
- Make even more educated decisions moving forward, with knowledge about resistance in mosquito populations throughout Georgia.



Statewide Insecticide Resistance Testing of Mosquitoes in GA

- The state entomologist and regional entomologist are tasked to conduct insecticide resistance testing in all high-risk urban regions of GA and then continue to the other counties.
- Mosquito egg collections are performed by Vector Surveillance Coordinators and Environmental Health Specialists around the state.
- Testing was performed using the CDC Bottle Bioassay Procedures and the chemicals that were provided in the kits.

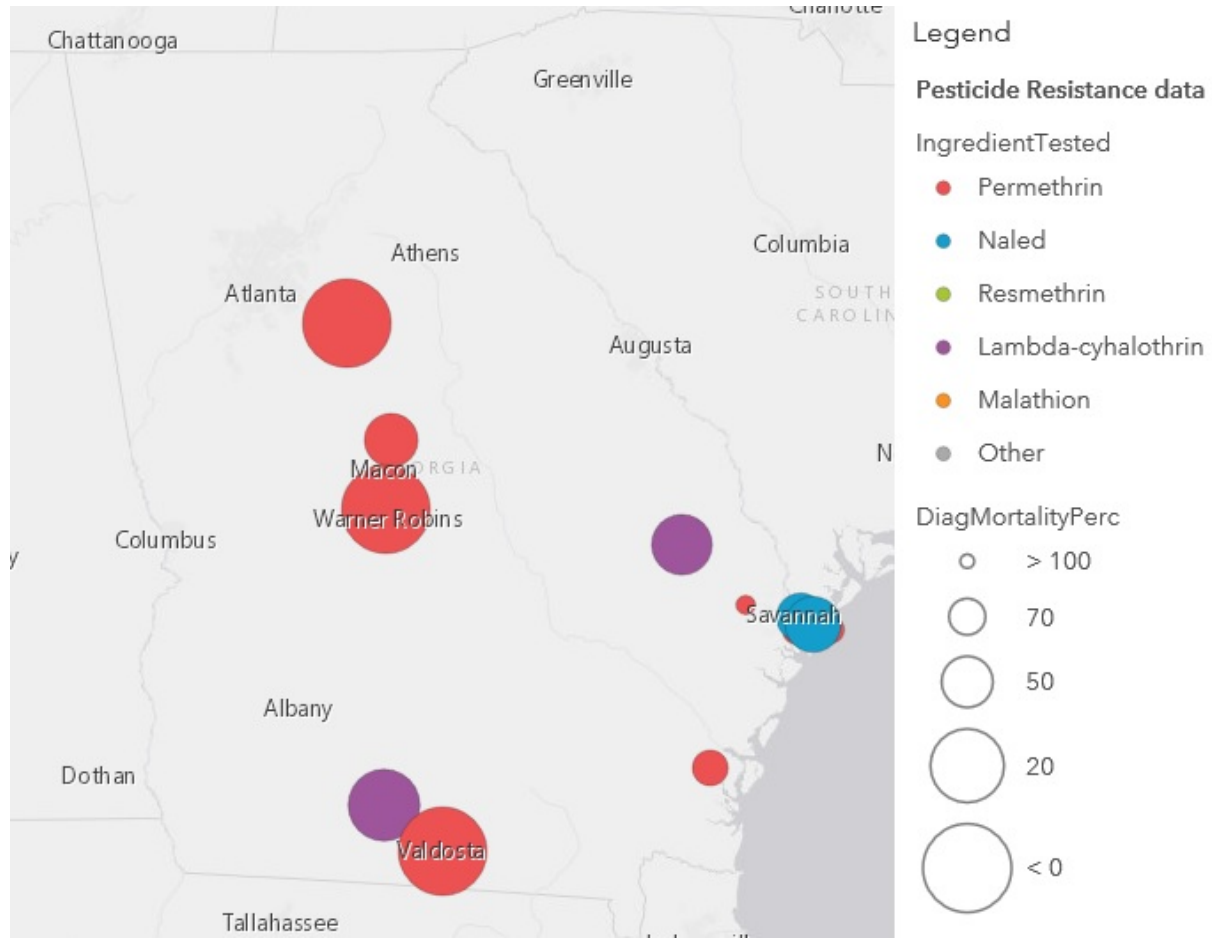
Statewide Insecticide Resistance Testing of Mosquitoes in GA

- September 2018
 - Preliminary data from several southern counties showed *Aedes albopictus* to be susceptible to permethrin, but *Culex quinquefasciatus* showing varied levels of resistance to both permethrin and lambda cyhalothrin.
- June 2019
 - Data from several central and southern counties showed *Aedes albopictus* to exhibit varied levels of resistance to permethrin.
 - *Culex quinquefasciatus* showed varied levels of resistance to both permethrin, but were susceptible to malathion.

Statewide Insecticide Resistance Testing of Mosquitoes in GA

- October 2019
 - Data from several southern and central counties showed *Aedes albopictus* to exhibit varied levels of resistance to permethrin and deltamethrin alone, but were susceptible at varied levels to bifenthrin and deltamethrin used along with the synergist, PBO.
 - *Culex quinquefasciatus* showed varied levels of resistance to, bifenthrin, permethrin and deltamethrin.
 - At one location, *Ae. albopictus* showed high levels of resistance to etofenprox with 30% at the diagnostic time.
 - At another location, *Cx. quinquefasciatus*, showed very high levels of resistance with 7% mortality at diagnostic time and 30% at the end of two hours.

Pesticide Resistance Map





resistance testing
09/04/2018 1:20:47 PM



resistance testing
09/04/2018 1:20:27 PM



- Plastic shoe box (exterior spray painted black)
- Unbleached brown paper towels (multifold)
- Binder clips
- Water or hay infusion



Lessons Learned

Purchasing and Shipping of Supplies

- Approved Vendors
- Approved Purchasing items
 - Plastic Tupperware & boxes
 - Unbleached Paper Towels
 - Unbleached Brown Paper Bags
- Training without supplies to hand out
- Training with general instructions of what can be used, but not with instructions of what CANNOT be used
- Items of concern
 - Larvicide in Hay infusion
 - Milk, Orange Juice and Water gallon jugs vs. Motor oil and Bleach jugs

Sharing our Results

Reaction of the Pest Control Company/Technicians

- Understanding and saw it was helpful to know the results
- Defensive and wanted no part in understanding the results
 - Blamed agricultural pesticides

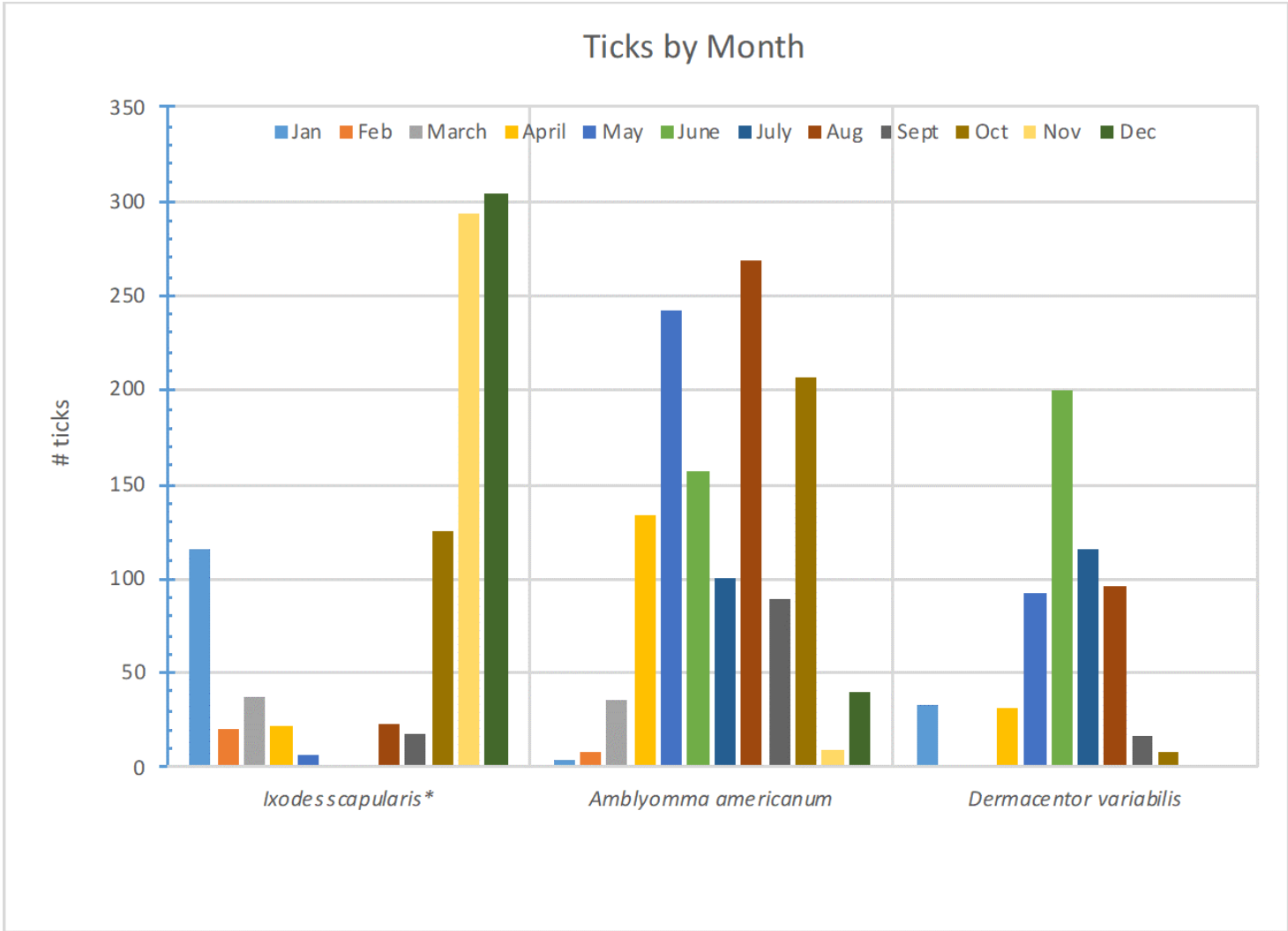
Goal: Share results rather than blaming anyone

- Show cost efficacy
- Show data
- When shown results and presented with actual waste of resources and funds by spraying something that would not work, most are willing to listen

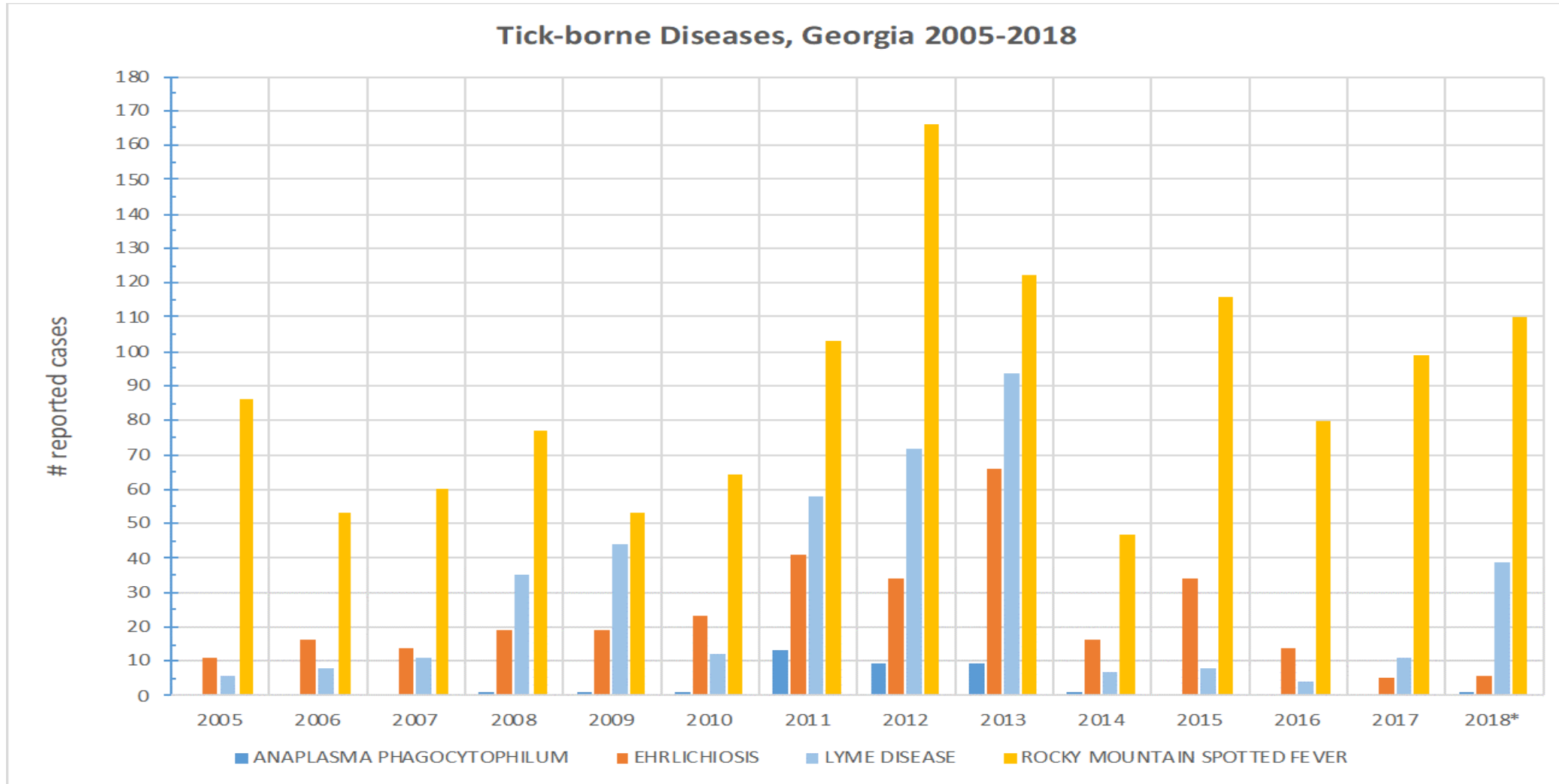
Attached Tick Study

- The Georgia Department of Public Health conducted an attached tick survey (humans) from 2005-2006, when the funding ran out
- The Georgia Department of Agriculture has conducted an ongoing attached tick survey (animals) from 2005, and started sharing data with us in 2018
- Current goals:
 - A better understanding of tick species, and potential diseases, found in Georgia
 - Monitoring for *Haemaphysalis longicornis* species, otherwise known as the East Asian or Longhorned tick (currently found in New Jersey, Pennsylvania, New York, Maryland, Virginia, West Virginia, North Carolina, and Arkansas)
- DPH provides tick collection kits and mailers to local veterinarians around the state; kits are sent to the National Veterinary Services Laboratories in Iowa

Ticks by Month



Ticks and Disease in the Southeast



Lone Star ticks (*Amblyomma americanum*)

- Most important nuisance species the Southeast.
- Most abundant tick species in the southeastern US.
- All stages readily attack humans.



female



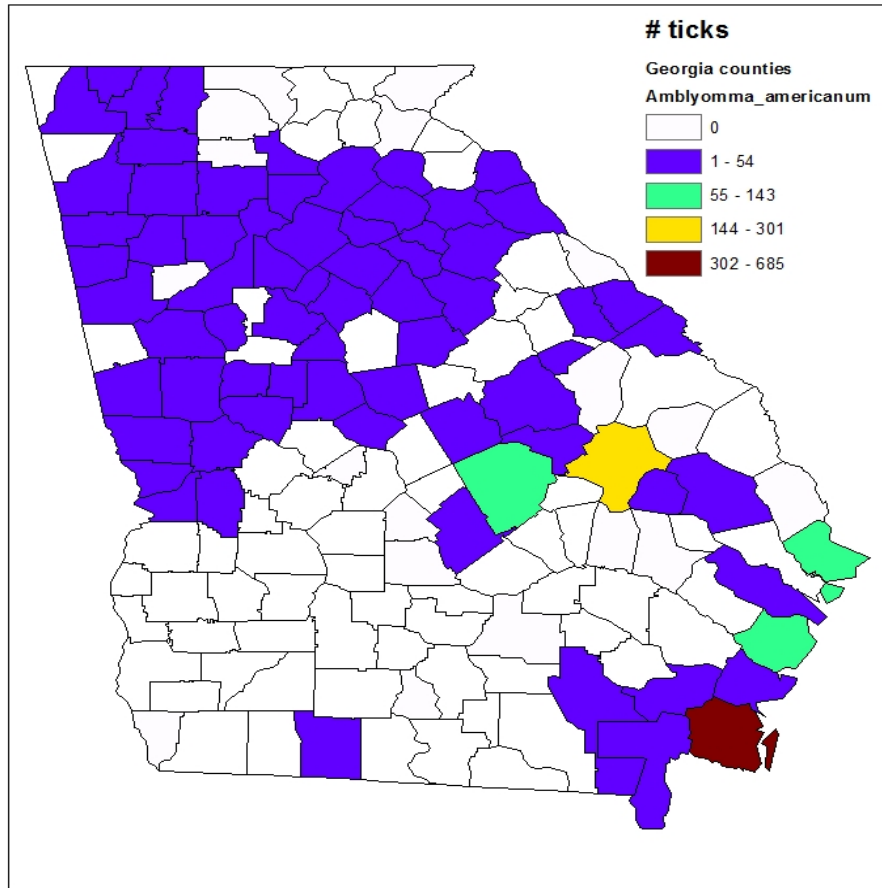
male



larva

Amblyomma americanum

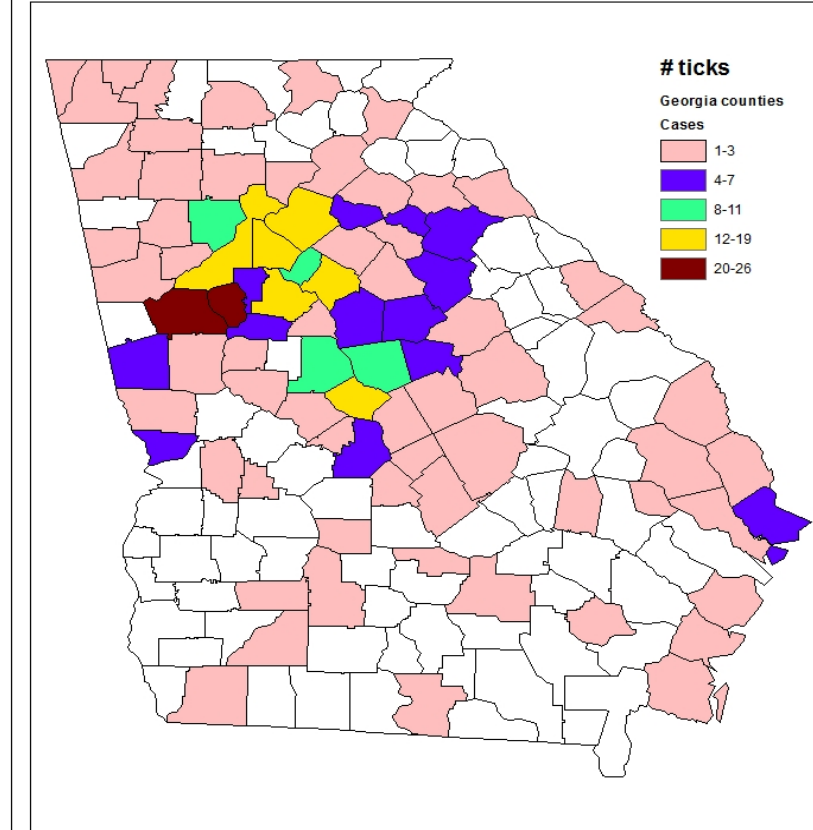
Tick Maps *Amblyomma americanum*



0 25 50 100 Miles



Tick-Borne Diseases Ehrlichiosis



0 25 50 100 Miles



Black-Legged Ticks (*Ixodes scapularis*)

long mouthparts

Identification:

Long mouthparts, black legs, red color, no festoons

Distribution:

Found in varying numbers throughout the southeast

Vector of:

Lyme, Ehrlichiosis, Babesiosis

Nymph

Kent Loeffler

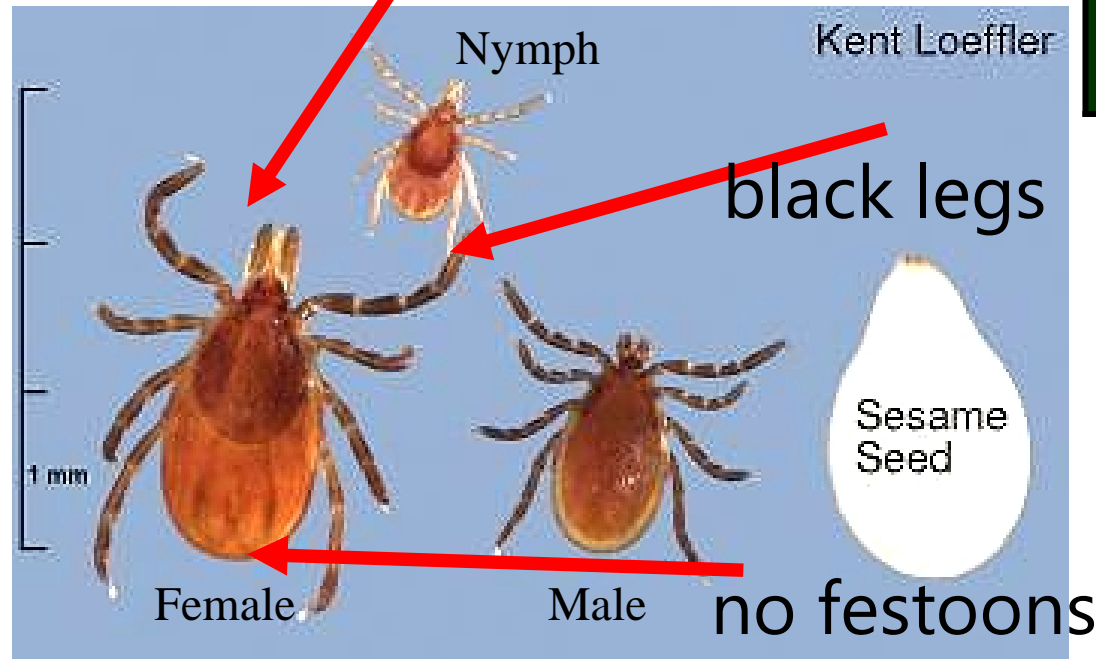
black legs

Sesame Seed

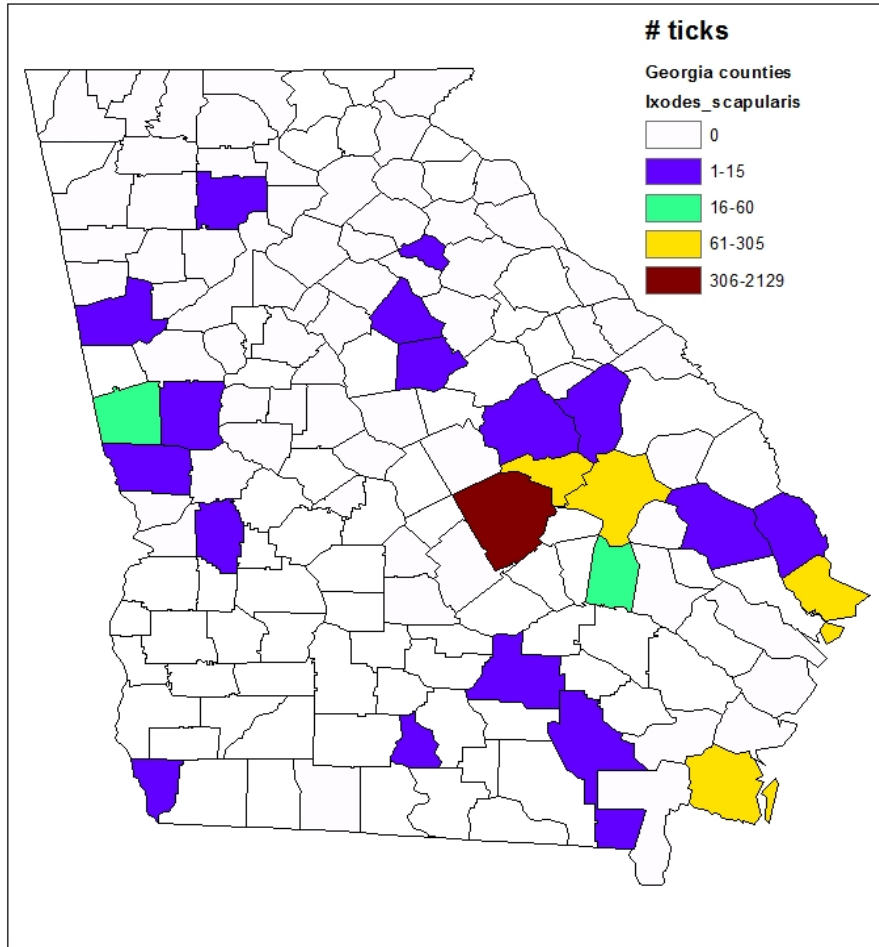
Female

Male

no festoons



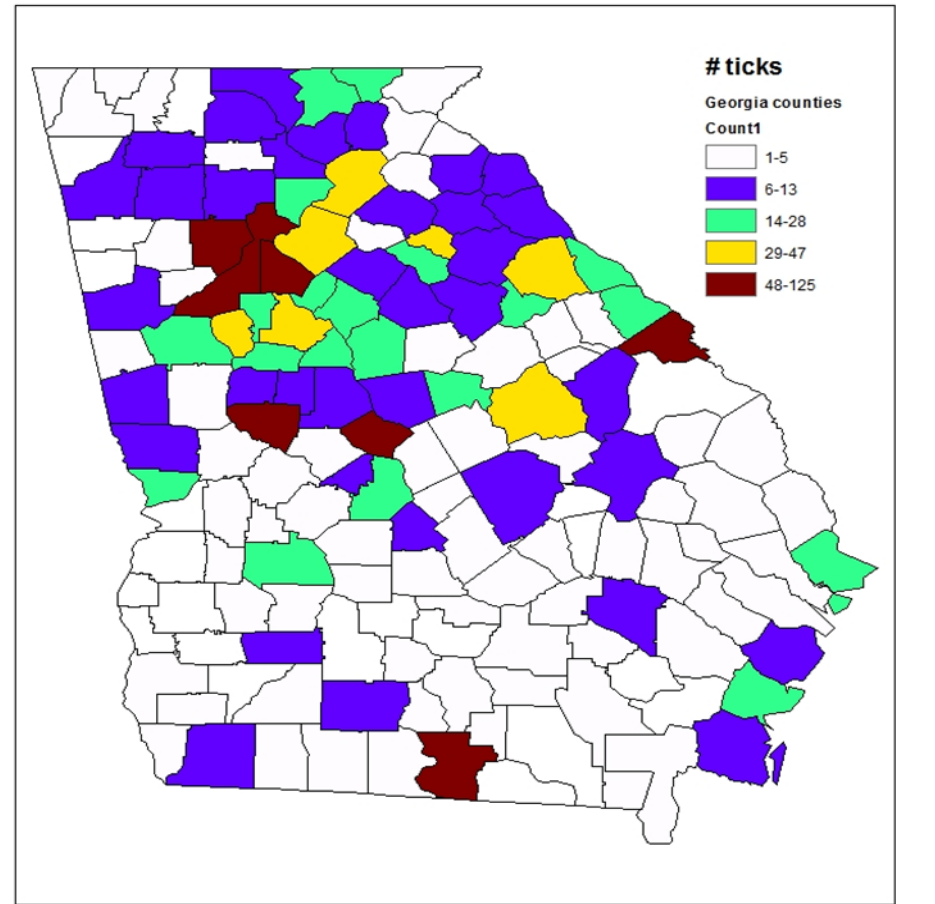
Tick Maps *Ixodes scapularis*



0 25 50 100 Miles



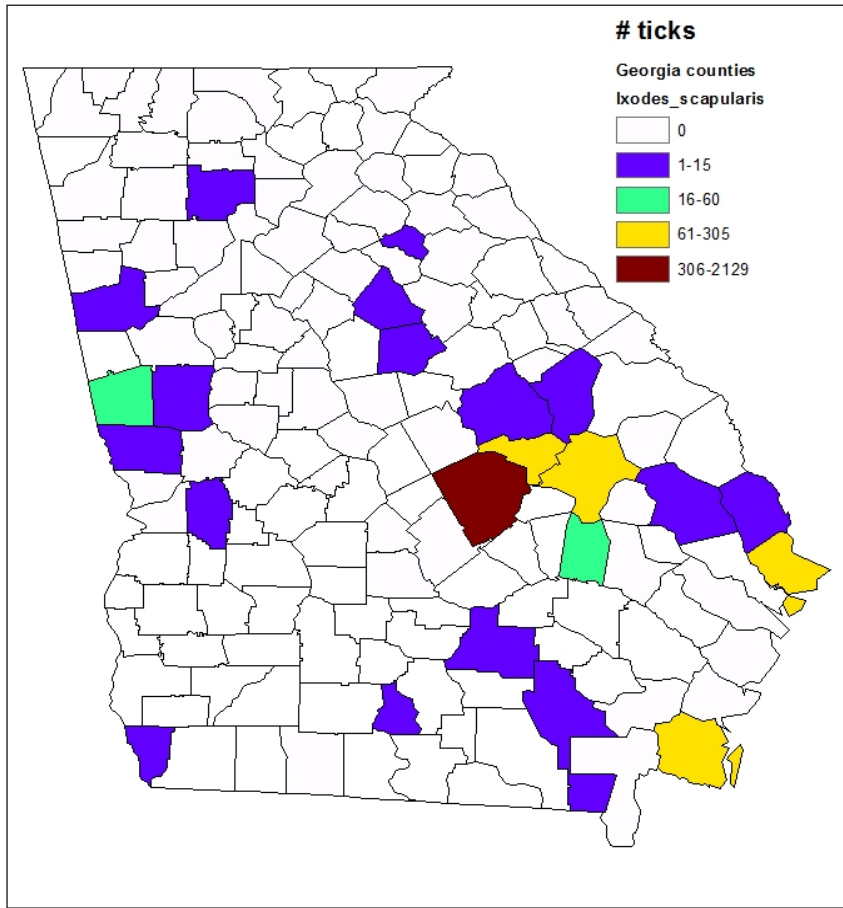
Tick-Borne Diseases Lyme Disease



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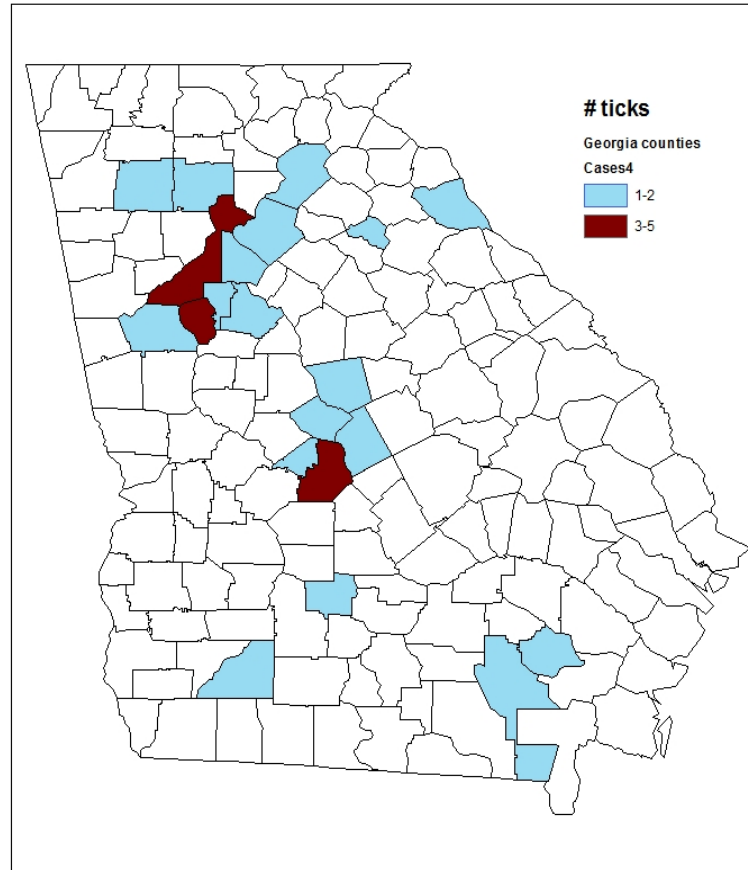
Tick Maps *Ixodes scapularis*



0 25 50 100 Miles



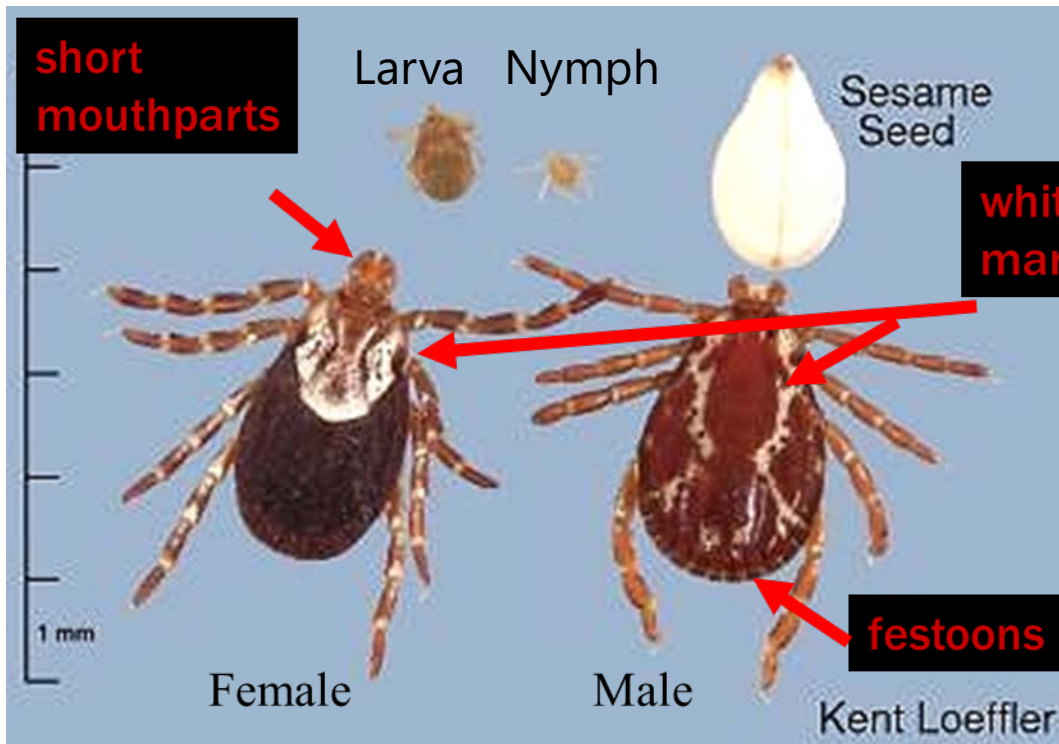
Tick-Borne Diseases Anaplasmosis



0 25 50 100 Miles

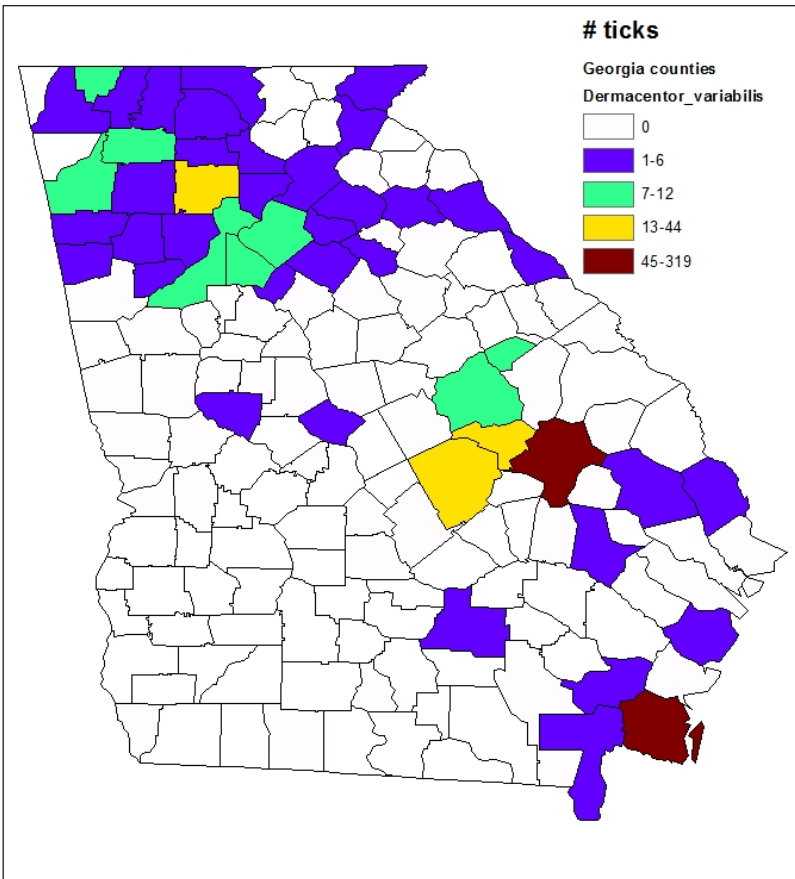


American Dog Tick (*Dermacentor variabilis*)



Identification:	Short mouthparts, festoons, white markings
Distribution:	Throughout North Carolina Most common tick submitted for ID
Vector of:	RMSF, Tularemia, Ehrlichiosis, tick paralysis

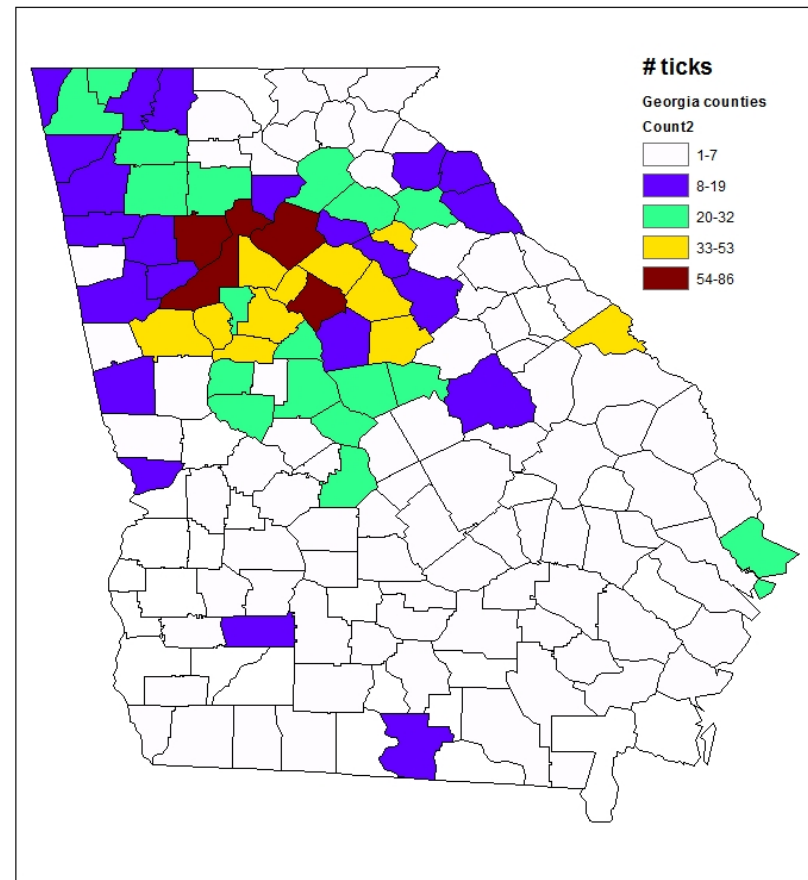
Tick Maps *Dermacentor variabilis*



0 25 50 100 Miles



Tick-Borne Diseases RMSF



0 25 50 100 Miles



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