# MAINE FOREST TICK SURVEY

## 2021 RESULTS SUMMARY

## 150 VOLUNTEERS
## 5283TICKS COLLECTED

### TICK COLLECTION

2341 blacklegged ticks
2872 dog ticks
70 rabbit ticks

455 non-tick arthropods

2107 blacklegged ticks tested for pathogens

### THANK YOU

Thank you for participating in the 2021 Maine Forest Tick Survey. This is the second year of a multi-year, multi-disciplinary study that examines the link between land management and ticks. We greatly appreciate the time you devoted to helping us understand the risk of ticks and tick-borne pathogens in Maine. Please reach out if you have any questions about this report.

# 2021 QUICK FACTS

2021 was a much wetter, cooler summer compared to 2020, which may be why more ticks were collected in the second year. 2020 was an unusually hot and dry summer which meant fewer ticks were collected than anticipated.

Participants collected between 0 and 123 blacklegged tick nymphs, with an average of 14.2 blacklegged tick nymphs per property. This is up from 2020 where participants collected 3.7 blacklegged nymphs per property.

We tested 2107 blacklegged tick nymphs for pathogens. Although both nymphs and adults can transmit pathogens, nymphs are more likely to go unnoticed due to their small size and thus are more likely to infect humans. Nymphs are typically the life stage that is studied to understand tick-borne disease risks.

We had 150 volunteers spread across 9 southern and coastal Maine counties. We had a variety of harvest histories, as well as properties with a number of different invasive plants.

Participants collected a total of 455 non-tick specimens. These data will not be wasted! We are identifying all specimens and will publish these data so that other researchers will know which insects are commonly mistaken for ticks.

# PATHOGEN KEY RESULTS

## 24.3%

of blacklegged tick nymphs were carrying *Borrelia burgdorferi* (the bacterium responsible for Lyme disease)

## 5.8%

of blacklegged tick nymphs were carrying *Anaplasma phagocytophilum* (the bacterium responsible for anaplasmosis)

## 5.8%

of blacklegged tick nymphs were carrying *Babesia microti* (the organism responsible for babesiosis)

# COLLECTED TICKS

## BLACKLEGGED TICKS (*IXODES SCAPULARIS*)

Blacklegged ticks (often incorrectly called deer ticks) are the tick species most responsible for tick-borne diseases in Maine. It was first detected in Maine in the 1980s and has since continued to increase its geographic range and abundance. It can harbor a number of pathogens including those responsible for Lyme disease, babesiosis, and anaplasmosis. This tick is most often found in forests and forest edges. This is the tick species of highest health concern in Maine.

## DOG TICKS (*DERMACENTOR VARIABILIS*)

Dog ticks are a generalist tick species, meaning they will feed on a large number of hosts, including humans. Although they are capable of carrying the bacteria that causes Rocky Mountain spotted fever, there have not been any known cases that have originated in Maine. They are not capable of transmitting the pathogen that causes Lyme disease.

## RABBIT TICKS (*HAEMAPHYSALIS LEPORISPALUSTRIS*)

Rabbit ticks are rarely encountered as they do not typically feed on humans. They primarily feed on birds and small mammals including rabbits. Although they are capable of transmitting Rocky Mountain spotted fever and tularemia to rodents, they are not considered a human health risk.

# PATHOGENS IN MAINE

## *BORRELIA BURGDORFERI*

*Borrelia burgdorferi* is the bacteria responsible for Lyme disease and is transmitted by the blacklegged tick in New England. It can survive in a wide range of hosts including humans, rodents, livestock, and birds, though the most important reservoir host is the white-footed mouse. While deer are important for tick survival, they do not transmit *Borrelia* to ticks. Ticks are never born with this bacteria as females cannot pass it to their off-spring. Instead, ticks must feed on an infected host to acquire the bacteria. Once a tick acquires the bacteria, they are capable of transmiting it to new hosts while feeding. Between 1,000 - 2,000 human cases are reported in Maine each year.

## *BABESIA MICROTI*

*Babesia microti* is a microscopic parasite that infects red blood cells and causes babesiosis. The white-footed mouse is again considered the primary reservoir host. This parasite is transmitted through the bite of an infected blacklegged tick. This parasite was first detected in Maine in 1995 and about 100 people in Maine are diagnosed with babesiosis each year.

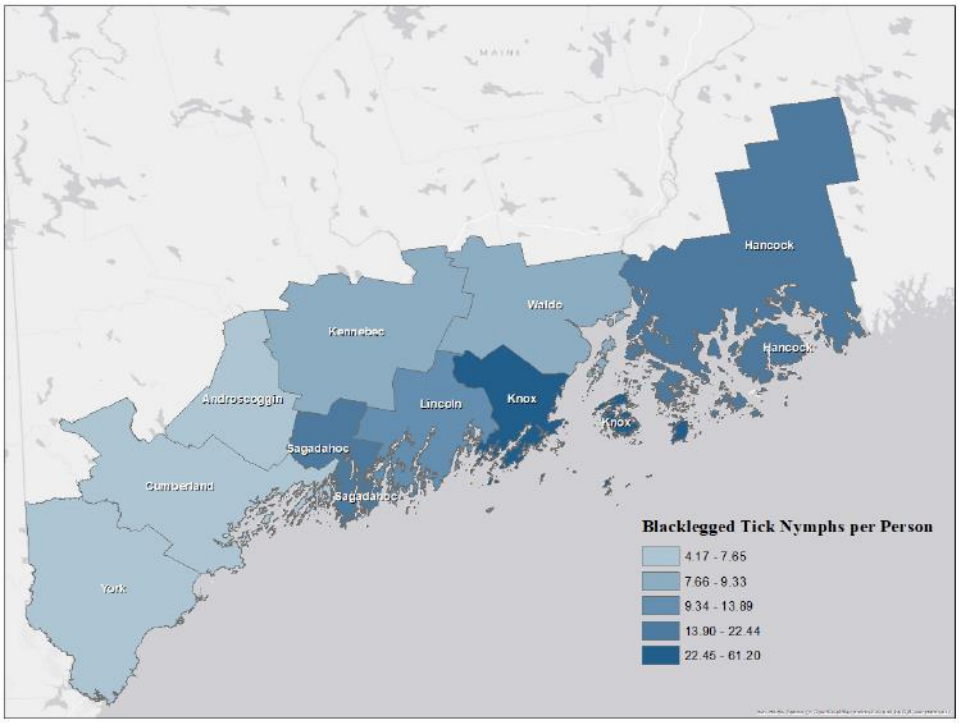
## *ANAPLASMA PHAGOCYTOPHILUM*

Anaplasmosis is caused by an infection of the bacterium *Anaplasma phagocytophilum*. This bacteria can be transmitted through the bite of an infected blacklegged tick. Cases have been steadily rising across the United States since it was first measured in 2000. On average, several hundred people in Maine are diagnosed with anaplasmosis each year.

# Geographic Tick Collections

## Average blacklegged ticks collected per volunteer

For our study, we choose to focus on the counties that were known to have the highest populations of blacklegged ticks, and tick-borne pathogens. Based on data collected in previous years through the Maine CDC, UMaine cooperative extension, and our own lab, those counties were determined to be: Androscoggin, Hancock, Cumberland, Kennebec, Knox, Lincoln, Sagadahoc, Waldo and York.




Although 2020 was an unusually low tick year for this and other tick research across the state, 2021 was a much more active tick year. This is likely a result of cooler and wetter weather in July that we experienced in 2021. Numerous studies have determined blacklegged tick nymphs are the highest risk to human health, which is why we chose to focus during when this life stage is most active (July). Conducting sampling in the early summer or early fall would result in more overall tick collections, but not of the life stage that is most important to human health.

Volunteers collected between 0 - 125 blacklegged tick nymphs in 2021. Individuals in Knox and Sagadahoc Counties collected the most blacklegged tick nymphs on average.

| County | Total Volunteers | Total Ticks Collected | Blacklegged Nymphs Collected |
|---|---|---|---|
| Androscoggin | 11 | 428 | 80 |
| Cumberland | 20 | 526 | 153 |
| Hancock | 14 | 398 | 233 |
| Kennebec | 20 | 517 | 196 |
| Knox | 10 | 716 | 612 |
| Lincoln | 9 | 328 | 125 |
| Sagadahoc | 16 | 675 | 359 |
| Waldo | 22 | 617 | 190 |
| York | 24 | 954 | 100 |

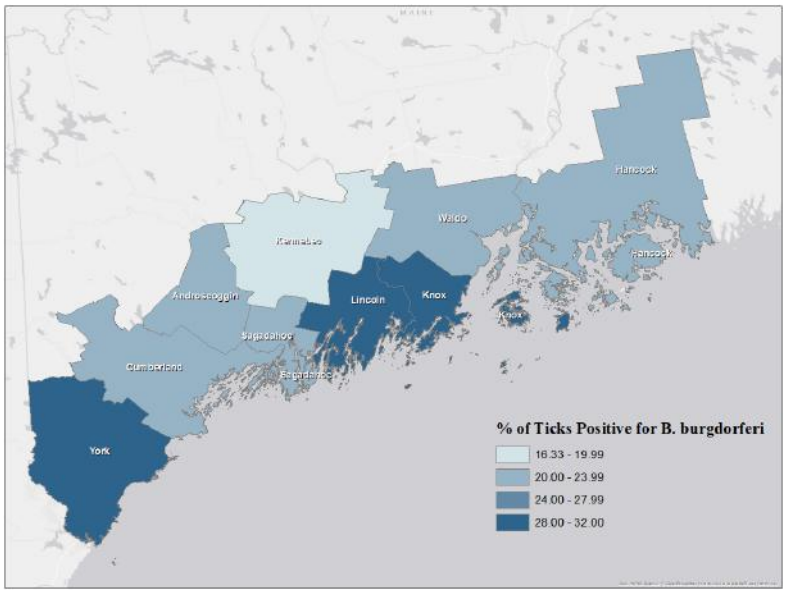
# Tick-borne Pathogens Across Maine

*Borrelia burgdorferi* (causative agent of Lyme disease) was the most common pathogen detected. Every county in the study had ticks positive for this pathogen. The highest rates of *Borrelia* infected ticks were in Knox, Lincoln, and York County.

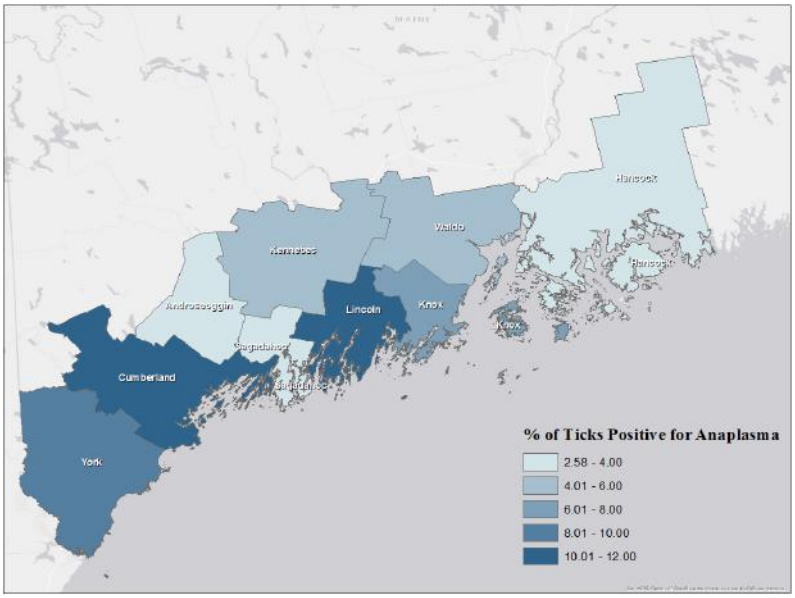
*Anaplasma* (causative agent of anaplasmosis) were detected in ticks in all counties with the highest prevalence rate in Cumberland and Lincoln County.

*Babesia* (causative agent of babesiosis) were found in all counties. Lincoln County had the highest prevalence rate.

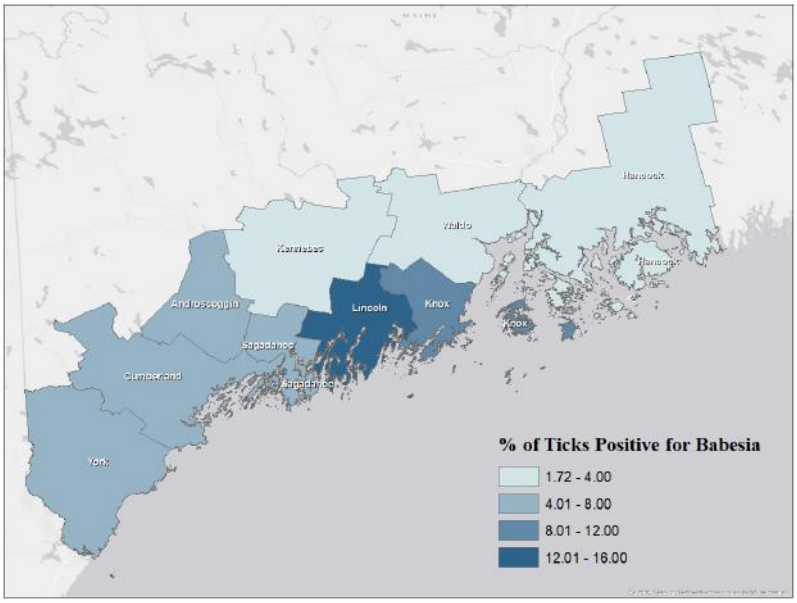
## *B. burgdorferi* prevalence rates per county




## Anaplasma prevalence rates per county




## Babesia prevalence rates per county



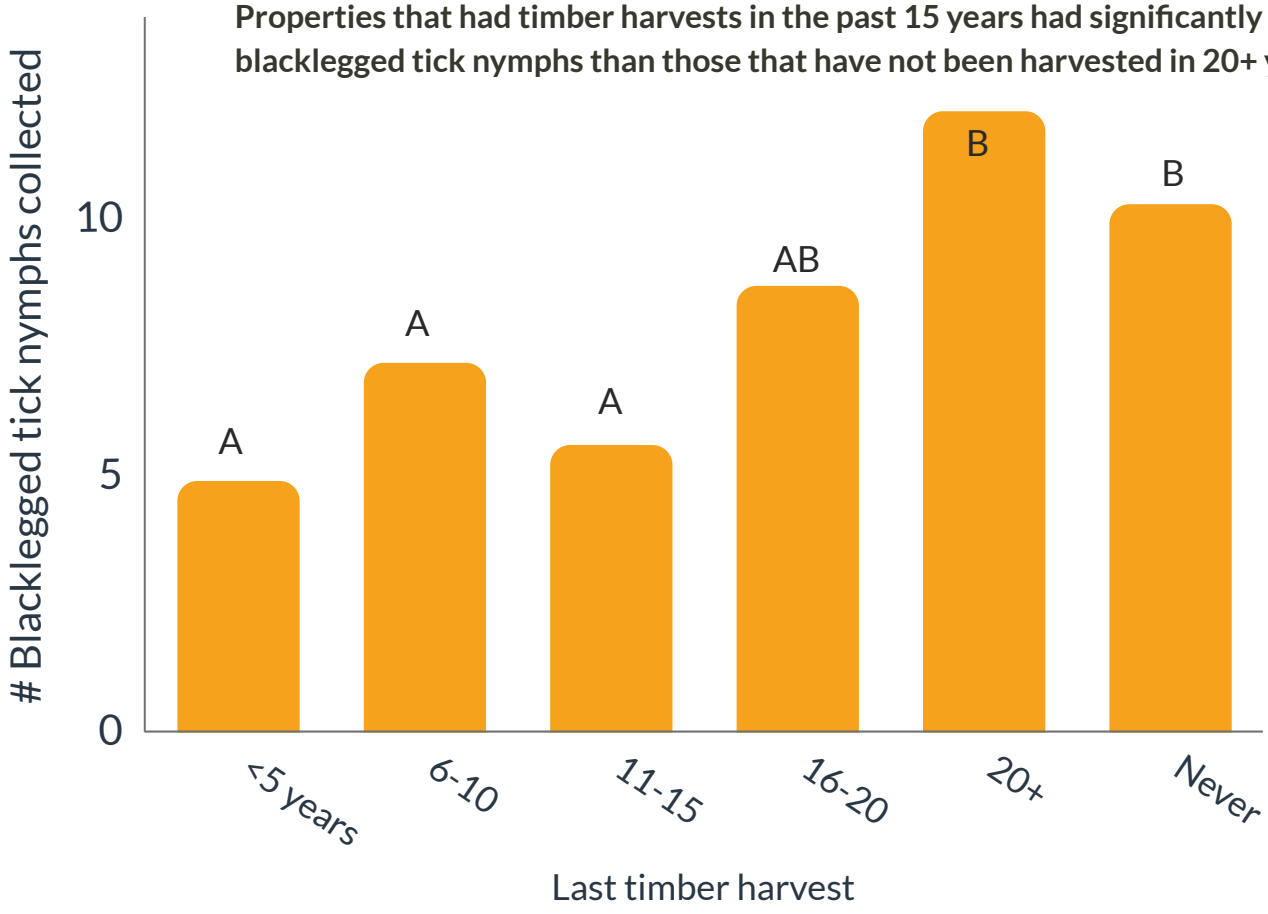

*Pathogen testing was conducted by the UMaine Cooperative Extension's tick lab. They also offer affordable pathogen testing to members of the public. See their website for more information: extension.umaine.edu/ticks*

MAINE FOREST TICK SURVEY

# How does land management impact ticks and tick-borne pathogens?

## Recent timber harvests reduce ticks

**Properties that had timber harvests in the past 15 years had significantly fewer blacklegged tick nymphs than those that have not been harvested in 20+ years.**

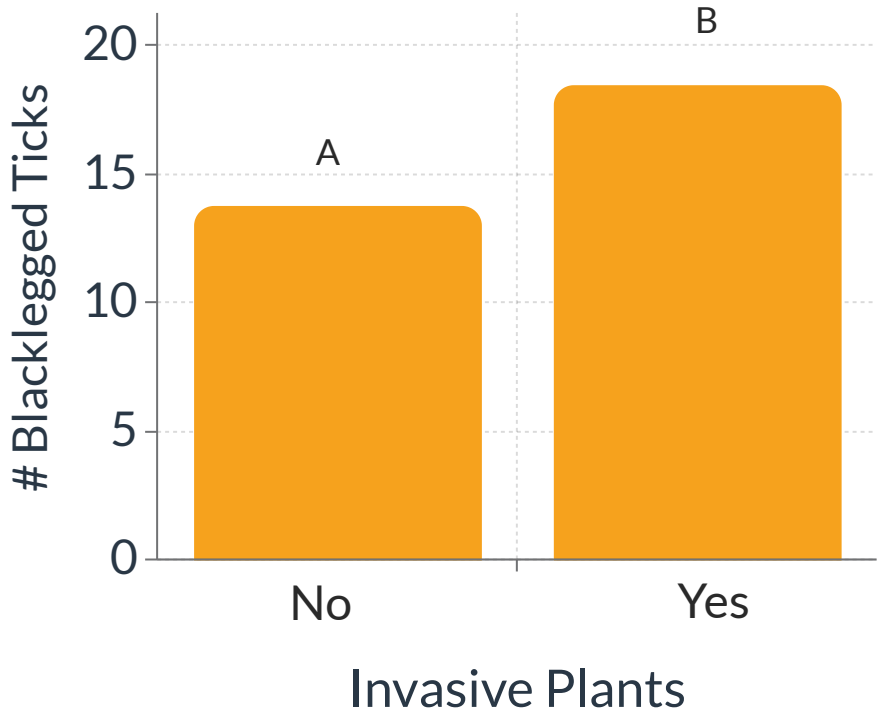



Data combined between 2020 and 2021. Different letters indicate a statistical difference. Same letters indicate harvest histories are not statistically different from one another.

MAINE FOREST TICK SURVEY

# How does land management impact ticks and tick-borne pathogens?

## Ticks love invasive plants



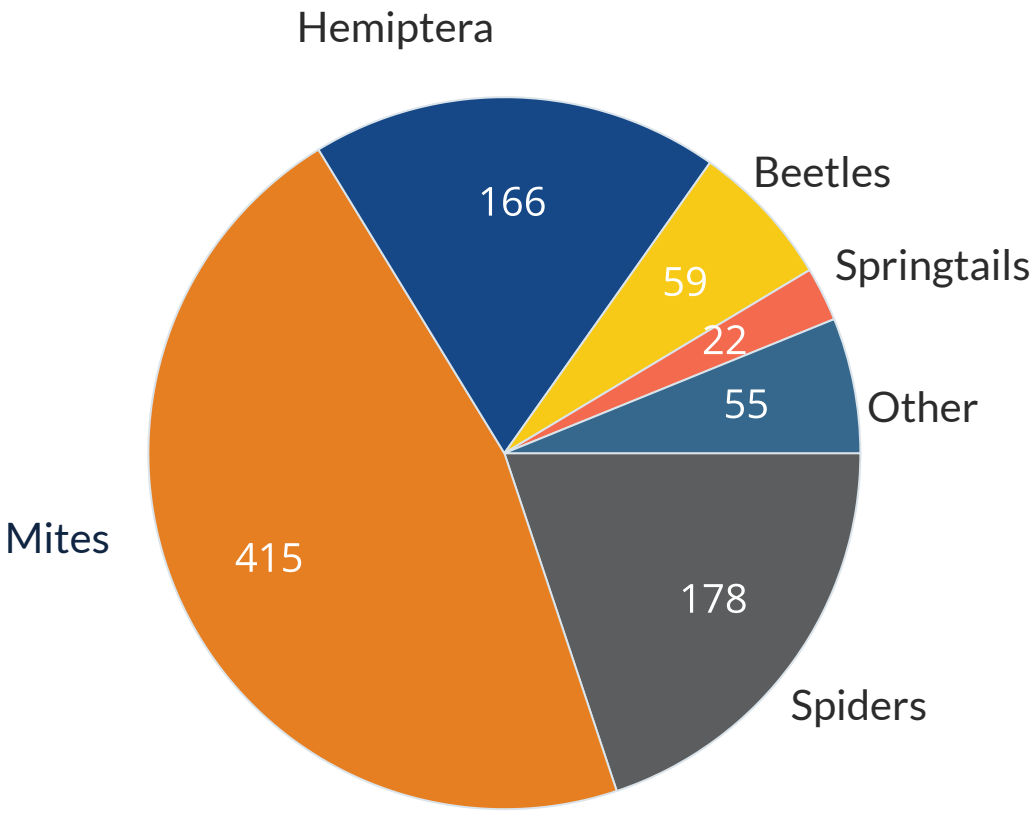

**Data are combined between 2020 and 2021. Properties that had invasive plants had significantly more blacklegged tick nymphs than properties without. This was especially true for properties that had barberry and honeysuckle.**

# Non-target Specimens

## Tick look-a-likes

One unexpected result from our study was the number of non-tick specimens collected. Our volunteers collected 455 non-tick specimens in 2021. The most commonly collected non-ticks were spiders, mites, and insects in the order Hemiptera (mostly aphids and immature stink bugs), followed by beetles commonly known as weevils.

We are using these data to better understand which arthropods are commonly mistaken for ticks.



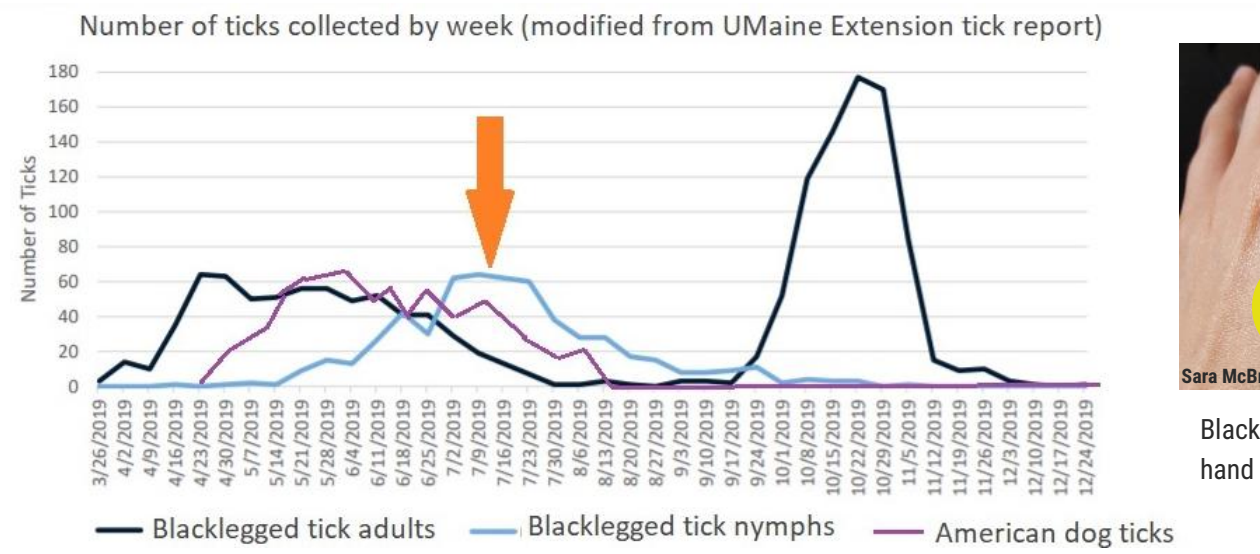

## How to distinguish commonly mistaken non-targets from ticks

| |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| **Name** | Tick | Immature stinkbug | Aphid | Spider | Weevil | Springtail | Mite |
| **Distinguishing characteristic** | 8 legs, flat and hard-bodied | 6 legs, has antennae | 6 legs, soft-bodied, body more rounded than ticks | Often moves faster than ticks or jumps, body often more rounded than ticks | 6 legs, snout on front of head | Can jump, often light purple, soft-bodied | Soft-bodied |

# Frequently Asked Questions

## Why did you have us collect ticks in July?

July corresponds to the peak population of blacklegged tick nymphs in Maine. This is the life-stage regarded as the most hazardous to human health because of their very small size and because they have already had one blood meal where they potentially picked up a pathogen. We realize there are more ticks overall in the spring when both the blacklegged tick adults and dog ticks are active, but these are not as medically important. See graph below to see what the tick populations look like in a typical year.





Blacklegged tick nymph circled on hand

## Why did we collect in forests instead of fields?

The majority of Maine's landscape is forested and is an important place where people work and recreate. The blacklegged tick is also heavily associated with forest landscapes which it relies on for the appropriate microclimate and hosts to feed on. Blacklegged ticks are commonly found in forests while dog ticks are more often encountered in open fields.

## Are you repeating this study again?

We are not repeating this study in the summer of 2022. However, we do hope to repeat this study again in the future.