MAINE FOREST TICK SURVEY

2020 RESULTS SUMMARY

116 VOLUNTEERS
1653 TICKS COLLECTED

TICK COLLECTION

806 blacklegged ticks
827 dog ticks
20 rabbit ticks

440 non-tick arthropods

445 blacklegged ticks tested for pathogens

THANK YOU

Thank you for participating in the 2020 Maine Forest Tick Survey. This is the first 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.

2020 QUICK FACTS

2020 was an unusally hot and dry summer which meant fewer ticks were collected than anticipated. Other research labs, including the Maine CDC, also collected fewer ticks compared to recent years.

Participants collected between 0 and 36 blacklegged tick nymphs, with an average of 3.74 blacklegged nymphs per property.

We tested 445 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 116 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 440 non-tick specimens. This data will not be wasted! We are identifying all specimens and will publish this data so that other researchers will know which insects are commonly mistaken for ticks.

PATHOGEN KEY RESULTS

25.2%

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

7.5%

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

5.5%

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.

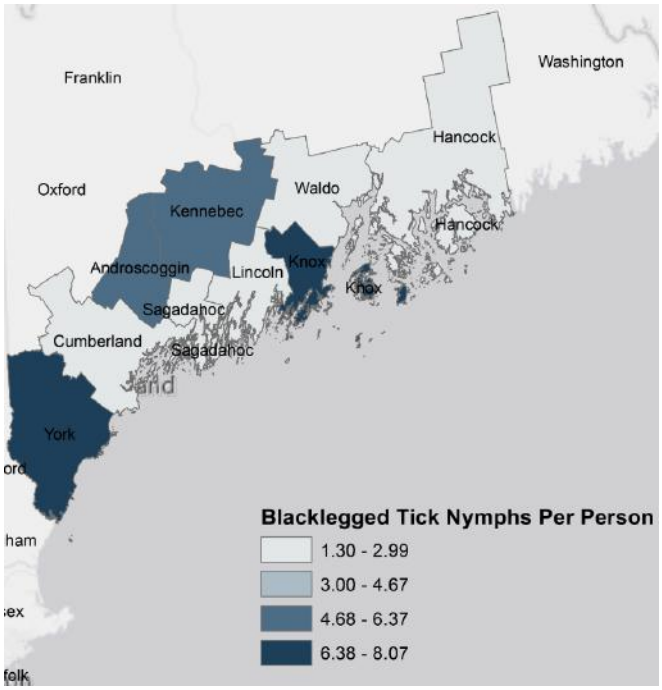
ANAPLASMA PHAGOCYTOPHILUM

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.



2020 was an unusually low tick year for this and other tick research across the state. Adult tick populations were robust in the early summer, but the nymph populations were greatly reduced compared to previous years. This was likely a result of the unusually hot and dry weather we experienced in mid-summer. 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.

Although a number of people did not collect any blacklegged tick nymphs in 2020, on average, people collected between 1 - 8 during the study, and some citizen scientists collected up to 36. Individuals in Knox and York Counties collected the most blacklegged tick nymphs on average.

County	Total Volunteers	Total Ticks Collected	Blacklegged Nymphs Collected
Androscoggin	11	194	51
Cumberland	16	336	37
Hancock	13	92	36
Kennebec	17	405	103
Knox	14	246	113
Lincoln	12	168	18
Sagadahoc	12	46	13
Waldo	15	86	21
York	9	80	63

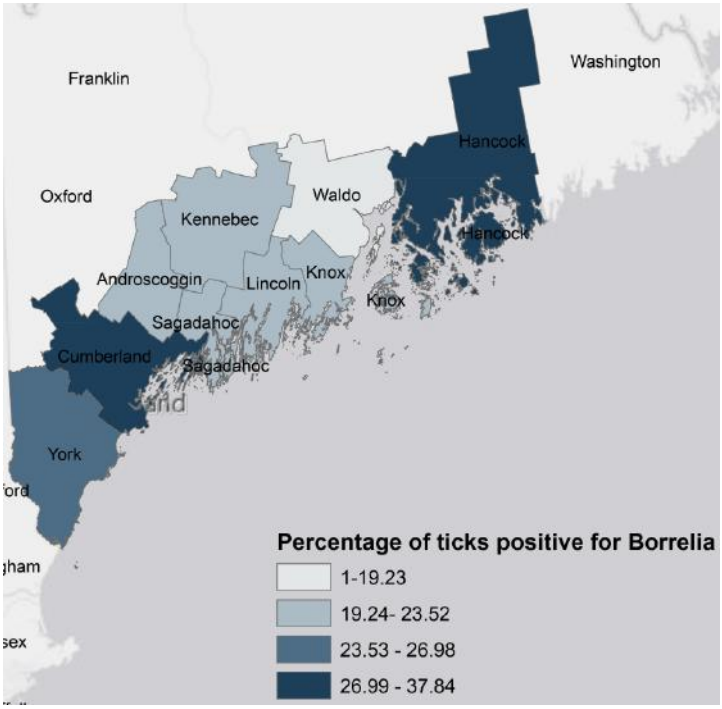
Tick-borne Pathogens Across Maine

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 Hancock and Cumberland county.

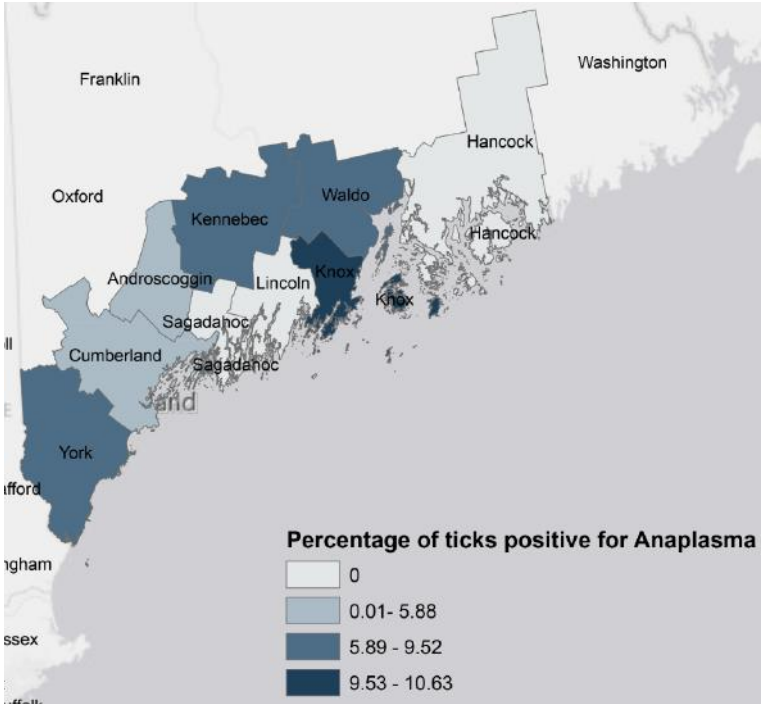
Anaplasma (causative agent of anaplasmosis) were detected in ticks in 6 counties with the highest prevalence rate in Knox county. Ticks in Hancock, Lincoln, and Sagadahoc counties were not carrying *Anaplasma*.

Babesia (causative agent of babesiosis) were found in all counties except Waldo, Lincoln, and Sagadahoc. Knox and Cumberland counties had the highest prevalence rates.

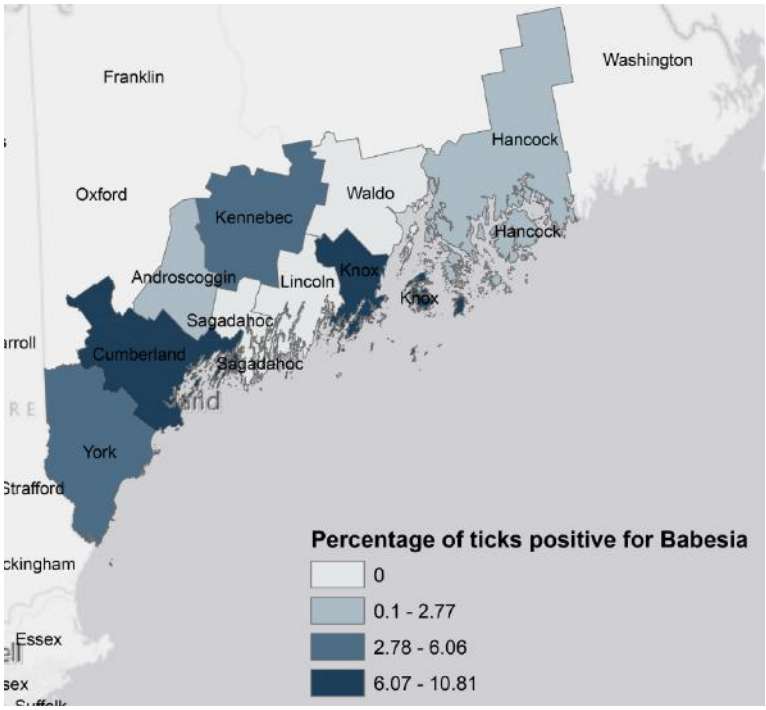
Borrelia prevelance rates per county



Anaplasma prevelance rates per county



Babesia prevelance rates per county



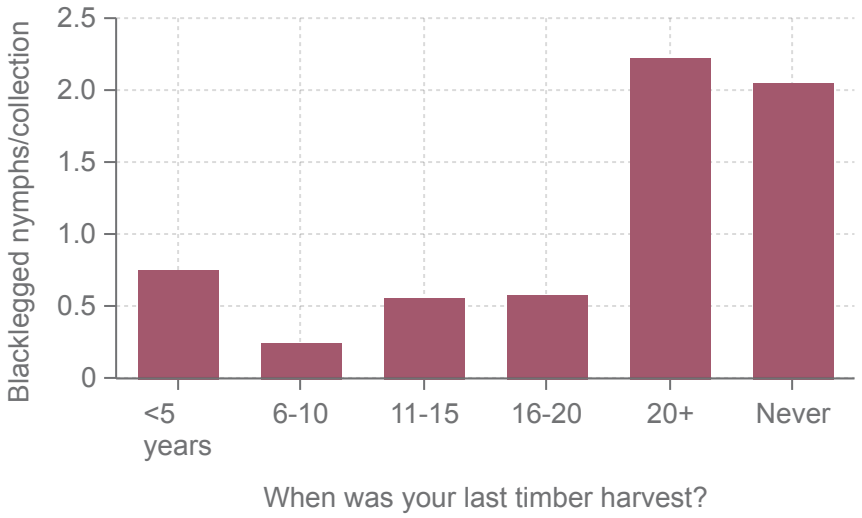
Pathogen testing was conducted by the UMaine Cooperative Extension's tick lab. They also offer affordable pathogen testing to members of the public. See their website for more information: extension.umaine.edu/ticks/

MAINE FOREST TICK SURVEY

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

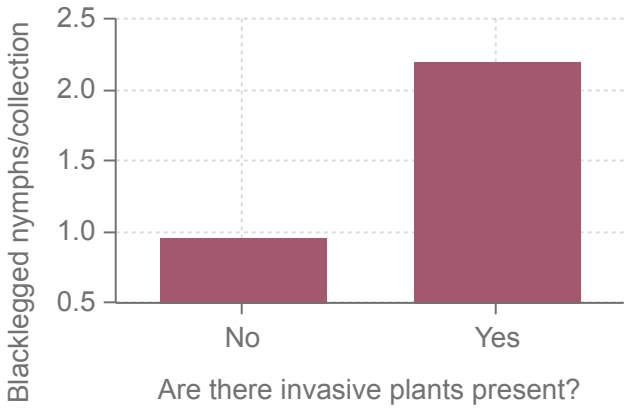
Recent timber harvests reduce ticks

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



Ticks love invasive plants

Properties that had invasive plants had significantly more blacklegged ticks than properties without. This was especially true for properties that had barberry and honeysuckle.

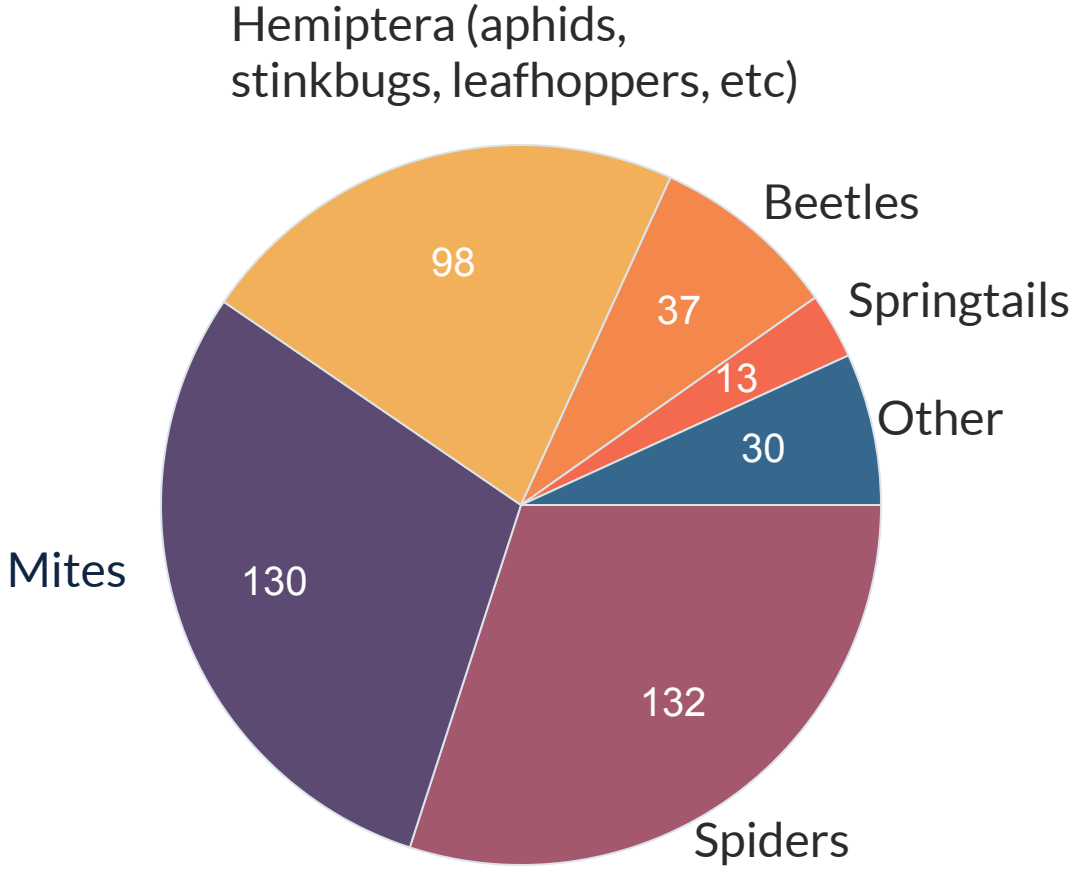


Non-target specimens

Tick look-a-likes

One unexpected result from our 2020 study was the number of non-tick specimens collected. Our volunteers collected 440 non-tick specimens over the course of the study. 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, and then springtails.

We are using this 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

2021 PLANS

THE FUTURE OF THE MAINE FOREST TICK SURVEY

We are planning to repeat our citizen science project at a larger scale for 2021. We plan to have 50 returning volunteers from 2020, as well as 150 new volunteers. This will allow us to educate more landowners on their personal tick-borne disease exposure risks, as well as collect additional data for our analyses.

We are also planning to launch a new, but related, tick research project called Tick Response. This project will work with land owners and land managers to measure the immediate impact of land management on ticks. For this study, members of our lab will sample an area of land before major land management takes places (timber harvesting or invasive plant removal). We will return the following year after the management is conducted to re-measure the tick population and report the results back to you. If you have land you plan to harvest, or manage invasive plants in the next few years, please contact us to participate.

Visit our website for project updates, or to sign up to be part of our new Tick Response study.
www.UMaine.edu/ForestTickSurvey

If you have any questions about these projects, or this report, please contact me at elissa.ballman@maine.edu or 207-581-2503