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UMaine Tick Surveillance Program Annual Report - 2022

INTRODUCTION

The University of Maine Cooperative Extension Tick Lab conducts surveillance of ticks and tick-borne pathogens to track their distribution, detect trends or changes in tick activity, and to identify areas of risk for tick-borne disease in Maine. In 2019, the UMaine Extension Tick Lab began testing tick samples for the causative agents of Lyme disease, anaplasmosis, and babesiosis; the three most common tick-borne diseases. Additional testing panels were added to screen applicable tick species for the causative agents of Rocky Mountain spotted fever, ehrlichiosis, tularemia, and hard tick relapsing fever (*Borrelia miyamotoi* disease). A free tick identification program also continues to be offered.

This report summarizes the information gathered through the passive surveillance associated with the 2022 UMaine Extension Tick Surveillance Program. Passive surveillance refers to tick specimens found and submitted by members of the public and can potentially result in a bias toward certain geographic locations or uncertainty about where a specific sample was collected. All samples were submitted to the Tick Lab within the UMaine Cooperative Extension Diagnostic & Research Laboratory. For more information on ticks in Maine or on submitting a tick to the Tick Lab, please visit us online at:

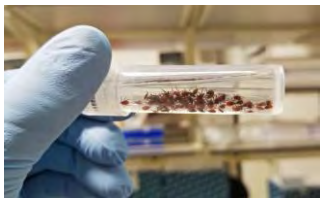
ticks.umaine.edu

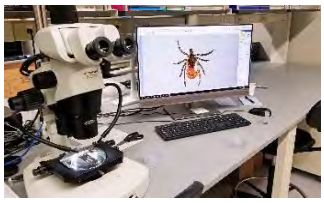
BACKGROUND

Ticks and tick-borne diseases have become a significant public health issue in Maine and throughout the United States. Lyme disease is the most commonly reported vector-borne disease in the US, and reported cases have been steadily increasing throughout much of the state. In addition to Lyme disease, cases of anaplasmosis and babesiosis are also on the rise. Other tick-borne diseases known to occur in Maine include *Borrelia miyamotoi* disease and the serious but relatively rare Powassan virus. The primary vector of these diseases, the blacklegged tick has greatly increased in both population size and geographic range within the state.

There are 15 different tick species that have been found in Maine, though not all are permanent residents. Some may arrive on wildlife hosts and do not establish viable populations. Other species have thrived and are now widespread throughout much of the state. The most commonly encountered tick species in Maine are the blacklegged tick (*Ixodes scapularis*), the American dog tick (*Dermacentor variabilis*), and, to a lesser extent, the woodchuck tick (*Ixodes cookei*). Maine also faces threats related to invasive tick species including the lone star tick and Asian longhorned tick, both of which can have impacts on the health of humans, wildlife, and domestic animals.

A note on common names: the blacklegged tick is commonly referred to as the deer tick, though blacklegged tick is the recognized common name. We will generally refer to this species as the blacklegged tick in this report.



PURPOSE

Combatting the threats associated with ticks is an immense challenge that relies heavily on an integrated approach that includes monitoring tick populations, reducing tick and host habitat, managing ticks and their wildlife hosts, and widespread educational outreach on personal protection. The tick surveillance associated with the UMaine Extension Tick Lab is an attempt to gain information on the geographic spread of ticks and tick-borne disease in Maine and to provide information on the risk of encountering ticks.

The Tick Lab is not a medical lab and does not provide medical information. The testing of tick samples is intended to provide information on ticks and their associated pathogens in Maine and is not intended to be used in human health assessment or to be interpreted as a medical diagnosis. If you have been bitten by a tick, do not wait until tick testing results are available to consult with your doctor.

This report was prepared by Griffin Dill, Tom Rounsville, and Ann Bryant, University of Maine Cooperative Extension. Questions regarding the report can be directed to tickID@maine.edu. Additional data are updated daily and are available online at ticks.umaine.edu.

TICK SPECIES IDENTIFICATION

A total of 5,274 ticks were submitted to the UMaine Extension Tick Surveillance Program in 2022, with samples submitted from each of the state's 16 counties and from 380 towns. The majority of the ticks submitted were identified as blacklegged ticks (also known as deer ticks) (*Ixodes scapularis*), while American dog ticks (*Dermacentor variabilis*) also made up a significant portion of the submissions. Lone star ticks (*Amblyomma americanum*) are not known to have established permanent populations in Maine, but are established in other New England states. Of the 28 lone star ticks that were submitted to the program, 17 were related to Maine residents travelling to other states, while the other 11 samples were acquired in Maine, originating from Androscoggin, Aroostook, Cumberland, Knox, Lincoln, Penobscot, Somerset, and York Counties.

Tick Species Submitted to the UMaine Extension Tick Lab in 2022 (Table 1)

Tick Species	Common Name	Total
Ixodes scapularis	Blacklegged tick (also known as deer tick)	3513
Dermacentor variabilis	American dog tick	1683
Amblyomma americanum	Lone star tick	28
Ixodes cookei	Woodchuck tick	36
Dermacentor albipictus	Winter Tick	6*
Ixodes marxi	Squirrel tick	3
Amblyomma maculatum	Gulf Coast tick	1
Unknown	Specimens damaged during removal/delivery	4

* Three winter tick samples arrived as lint roller sheets with several hundred larval winter ticks on each sheet. These ticks were not counted individually and instead each sheet was treated as one individual sample.

Blacklegged Tick (*Ixodes scapularis*) Submissions by Life Stage and Feeding Status (Table 2)

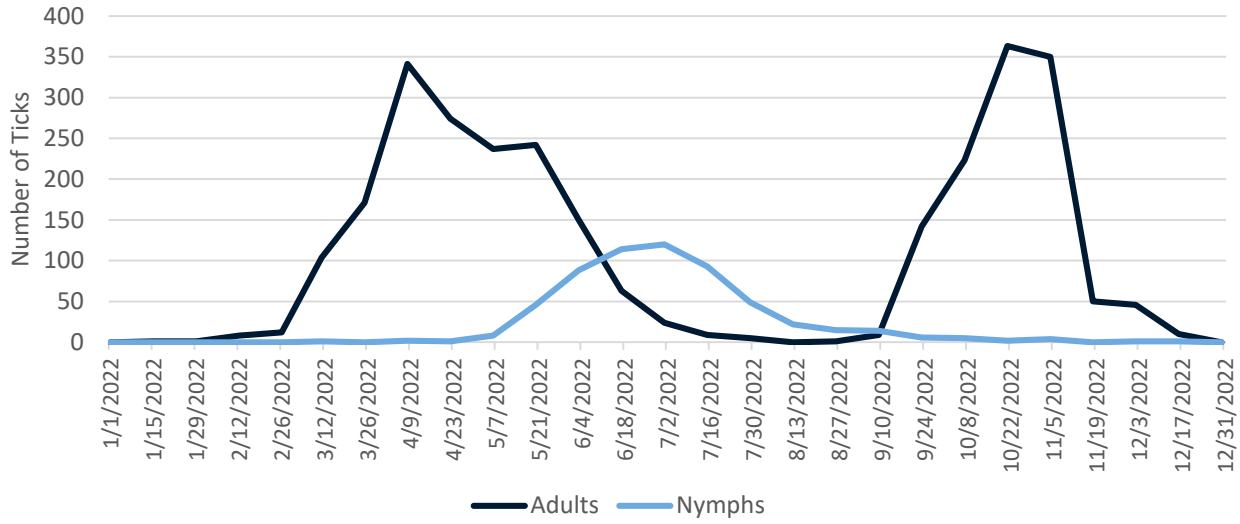
Life Stage	Not Engorged	Partially Engorged	Fully Engorged	Engorgement Undetermined*	Total
Adult Females	593	1948	48	149	2738
Adult Males	-	-	-	-	98
Nymphs	24	539	5	23	592
Larvae	9	69	2	5	85

* Some specimens arrived at the lab too damaged to determine feeding status, sex and/or life stage. Though male ticks may feed for brief periods, they do not become engorged.

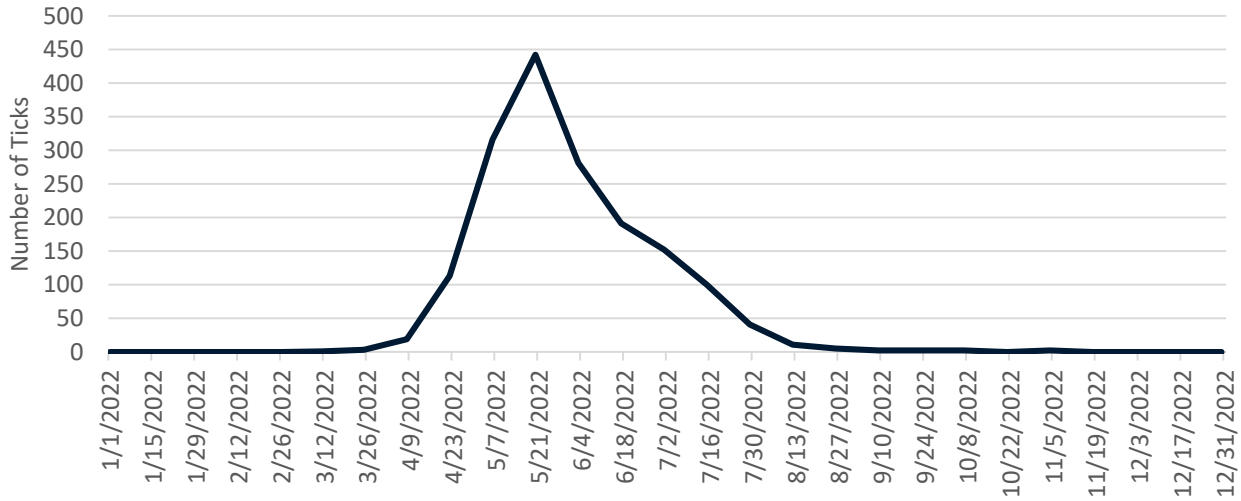
SEASONALITY OF TICK SUBMISSIONS

Tick activity can vary by season, based upon multiple factors including the tick's life cycle, weather, and host availability. While both blacklegged tick adults and nymphs can transmit pathogens, the nymphs play an important role in the disease transmission cycle due to their small size and ability to go unnoticed while feeding. Adult blacklegged ticks are most active from spring to late fall with two peaks, one in April or May and another peak in late October or early November. Nymph numbers usually peak in June and early July. When temperatures permit, blacklegged ticks can be active year round. In 2022, blacklegged tick samples began arriving to the lab for testing in mid-January and the final sample arrived near the end of December.

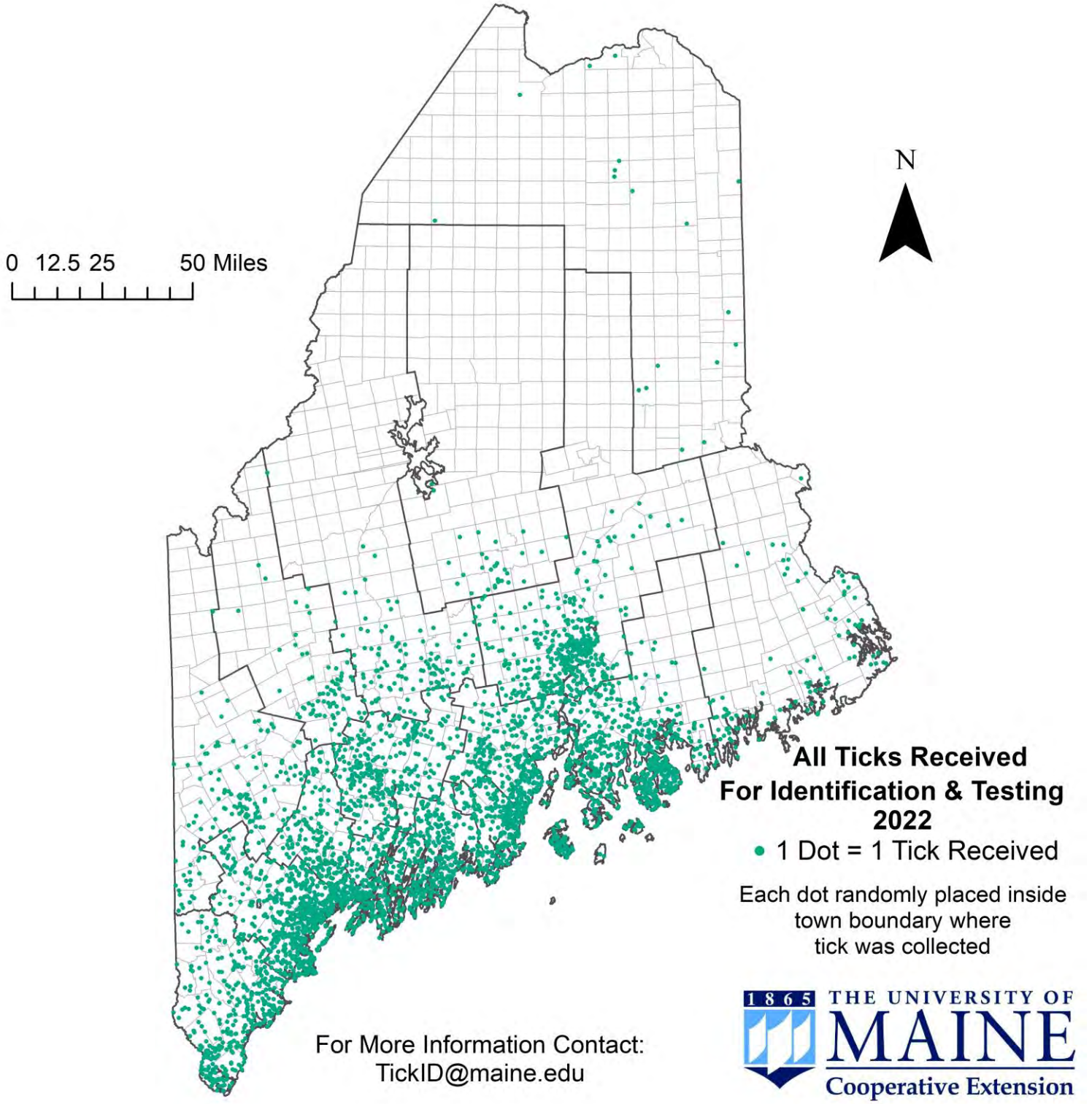
Blacklegged Ticks (*Ixodes scapularis*) Collected by Week - 2022 (Fig. 1)



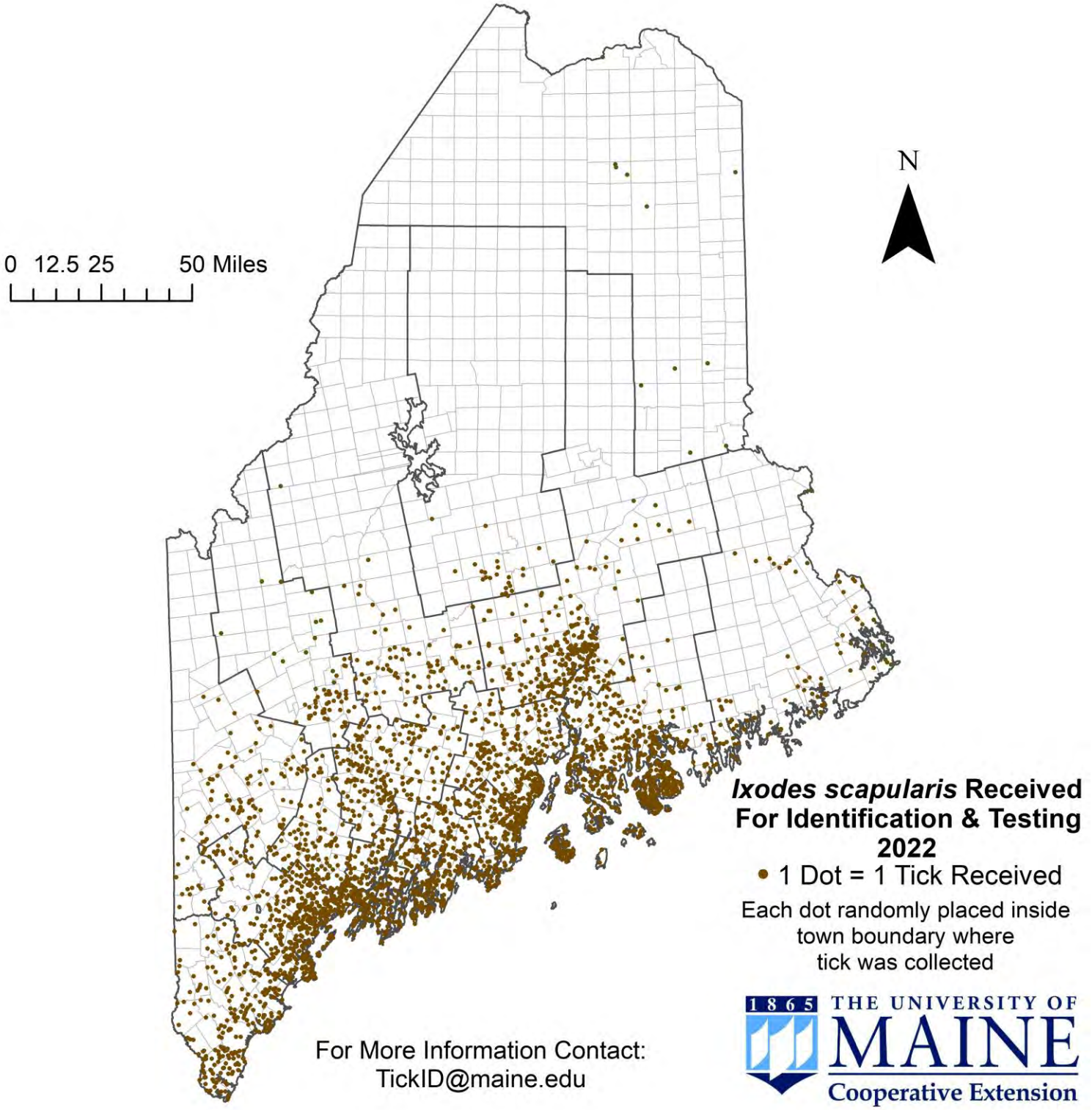
American Dog Ticks (*Dermacentor variabilis*) Collected by Week – 2022 (Fig. 2)



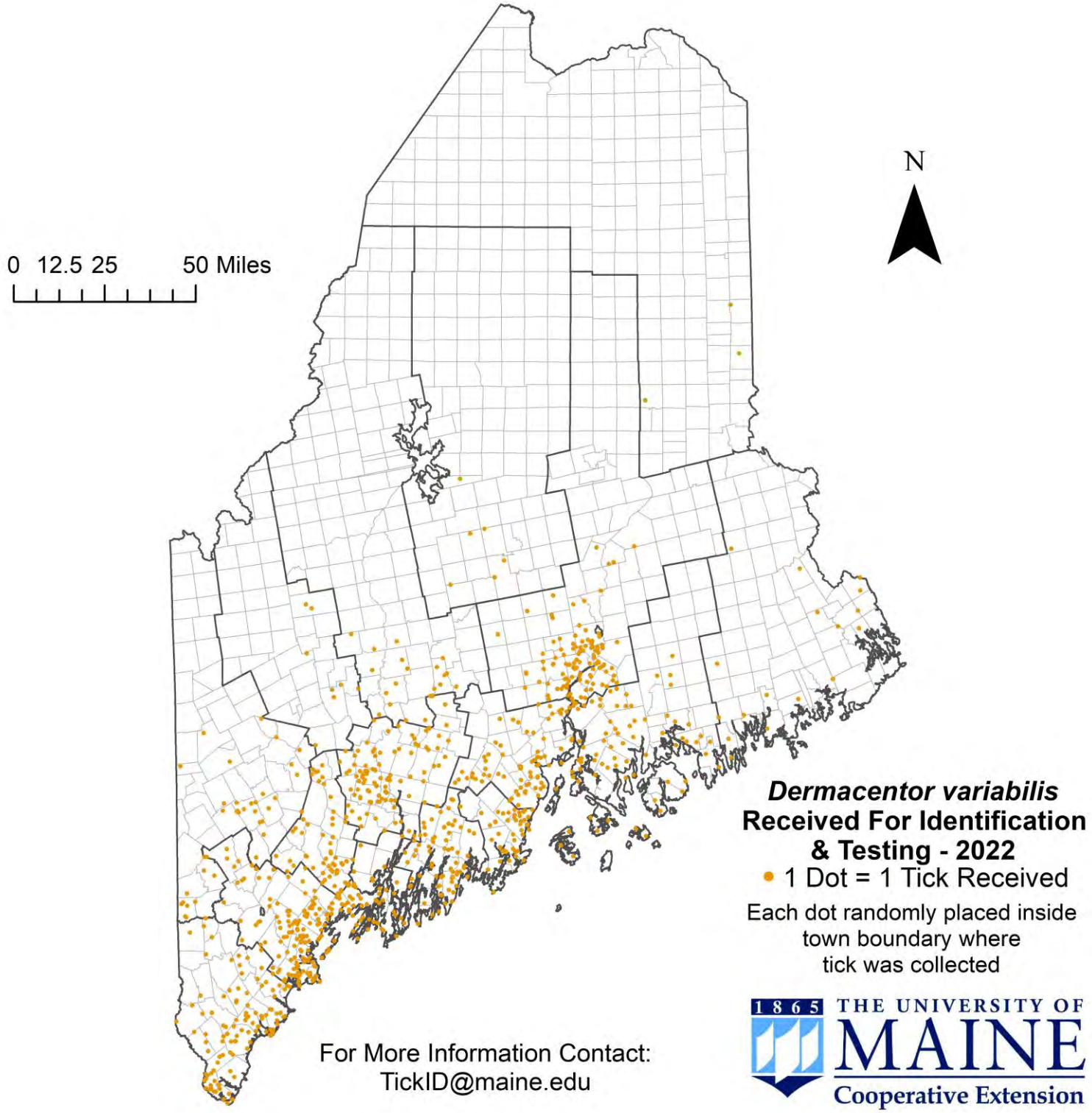
All Ticks Received for Identification and/or Testing (Map 1)



Ixodes scapularis (Blacklegged Ticks) Received for Identification and/or Testing (Map 2)



Dermacentor variabilis (Dog Ticks) Received for Identification and/or Testing (Map 3)



TICK PATHOGEN TESTING

Pathogen testing was conducted on blacklegged ticks and related species for the causative agents of Lyme disease (*Borrelia burgdorferi*), anaplasmosis (*Anaplasma phagocytophilum*), babesiosis (*Babesia microti*), and hard tick relapsing fever (*Borrelia miyamotoi*). The following tables include testing data from all samples, including those that may have been acquired outside of the state of Maine.

Infection Prevalence in Submitted Blacklegged Ticks (*Ixodes scapularis*) - 2022 (Table 3)

Pathogen	% of nymphs infected	% of adults infected	% of ticks infected
Positive for at least 1 pathogen	33.2%	56.5%	51.2%
Borrelia burgdorferi	28.0%	48.1%	43.5%
Anaplasma phagocytophilum	5.6%	12.1%	10.7%
Babesia microti	6.4%	11.7%	10.5%
Borrelia miyamotoi	0.7%	1.6%	1.4%
Borrelia + Anaplasma	3.0%	4.9%	4.5%
Borrelia + Babesia	3.0%	6.4%	5.6%
Anaplasma + Babesia	0.2%	0.5%	0.4%
Borrelia + Anaplasma + Babesia	0.3%	1.8%	1.5%

Non-*Ixodes* tick species, including the American dog tick and lone star tick were tested for the causative agents of Rocky Mountain spotted fever (*Rickettsia ricketsii*), ehrlichiosis (*Ehrlichia spp.),* and tularemia (*Francisella tularensis*). An adult male Gulf Coast tick (*Amblyomma maculatum*) that was acquired in Lincoln County, tested positive through additional screening for *Rickettsia parkeri*, a causative agent of spotted fever rickettsiosis

Infection Prevalence in American Dog Ticks and Lone Star Ticks – 2022 (Table 4)

Pathogen	American Dog Ticks (*Dermacentor variabilis*)	Lone Star Ticks (*Amblyomma americanum*)
Rickettsia rickettsii	0/888 (0%)	0/25 (0%)
Ehrlichia spp.	0/888 (0%)	0/25 (0%)
Francisella tularensis	0/888 (0%)	0/25 (0%)

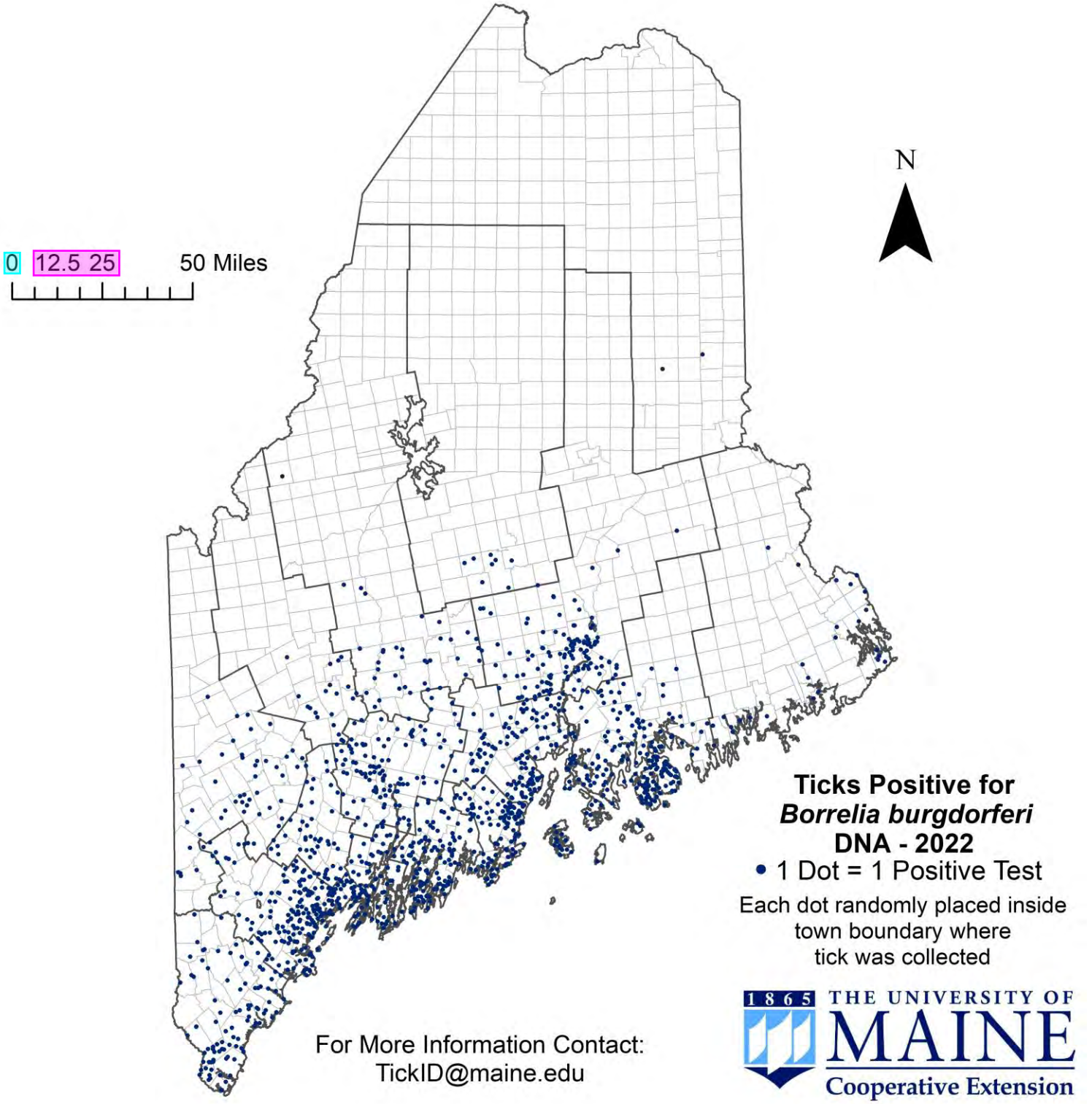
TICK PATHOGEN TESTING

Tick populations and infection rates can vary over both large and small geographic distances. The numbers in the following table represent the number of blacklegged ticks that tested positive from each county. The percentage indicates the number of ticks that tested positive divided by the total number of deer ticks that were tested from that county. Submissions testing positive for each pathogen are mapped on the following three pages. In addition to the information listed below, another 72 samples were submitted from locations outside of Maine.

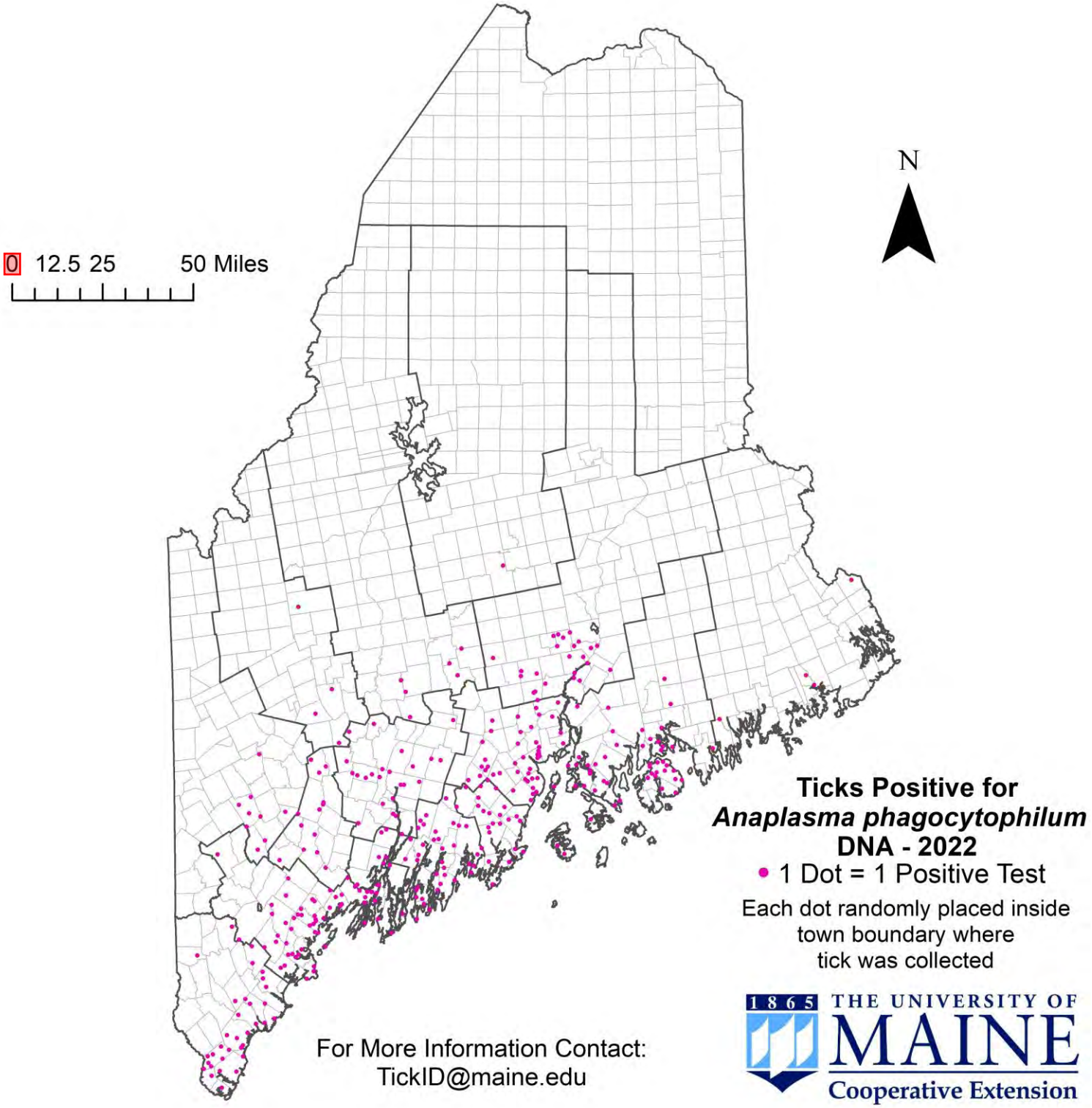
Infection Prevalence in Submitted Blacklegged Ticks (*Ixodes scapularis*) (All Life Stages) by County - 2022 (Table 5)

County	Ticks Submitted	Ticks Tested	*Borrelia* (Lyme)	*Anaplasma*	*Babesia*
Androscoggin	114	110	47 (42.7%)	13 (11.8%)	15 (13.6%)
Aroostook	12	11	2 (18.2%)	0 (0.0%)	0 (0.0%)
Cumberland	530	523	236 (45.1%)	56 (10.7%)	65 (12.4%)
Franklin	64	56	20 (35.7%)	4 (7.1%)	3 (5.4%)
Hancock	653	514	203 (39.5%)	46 (8.9%)	27 (5.3%)
Kennebec	272	265	137 (51.7%)	31 (11.7%)	38 (14.3%)
Knox	291	282	119 (42.2%)	27 (9.6%)	40 (14.2%)
Lincoln	253	252	117 (46.4%)	36 (14.3%)	37 (14.7%)
Oxford	106	100	51 (51.0%)	9 (9.0%)	10 (10.0%)
Penobscot	333	309	130 (42.1%)	29 (9.4%)	19 (6.1%)
Piscataquis	23	23	9 (39.1%)	1 (4.3%)	0 (0.0%)
Sagadahoc	131	126	48 (38.1%)	12 (9.5%)	17 (13.5%)
Somerset	84	78	38 (48.7%)	6 (7.7%)	8 (10.3%)
Waldo	245	245	115 (46.9%)	41 (16.7%)	24 (9.8%)
Washington	82	81	26 (32.1%)	4 (4.9%)	4 (4.9%)
York	248	232	97 (41.8%)	34 (14.7%)	33 (14.2%)
TOTAL	**3441**	**3207**	**1405 (42.1%)**	**349 (10.9%)**	**340 (10.6%)**

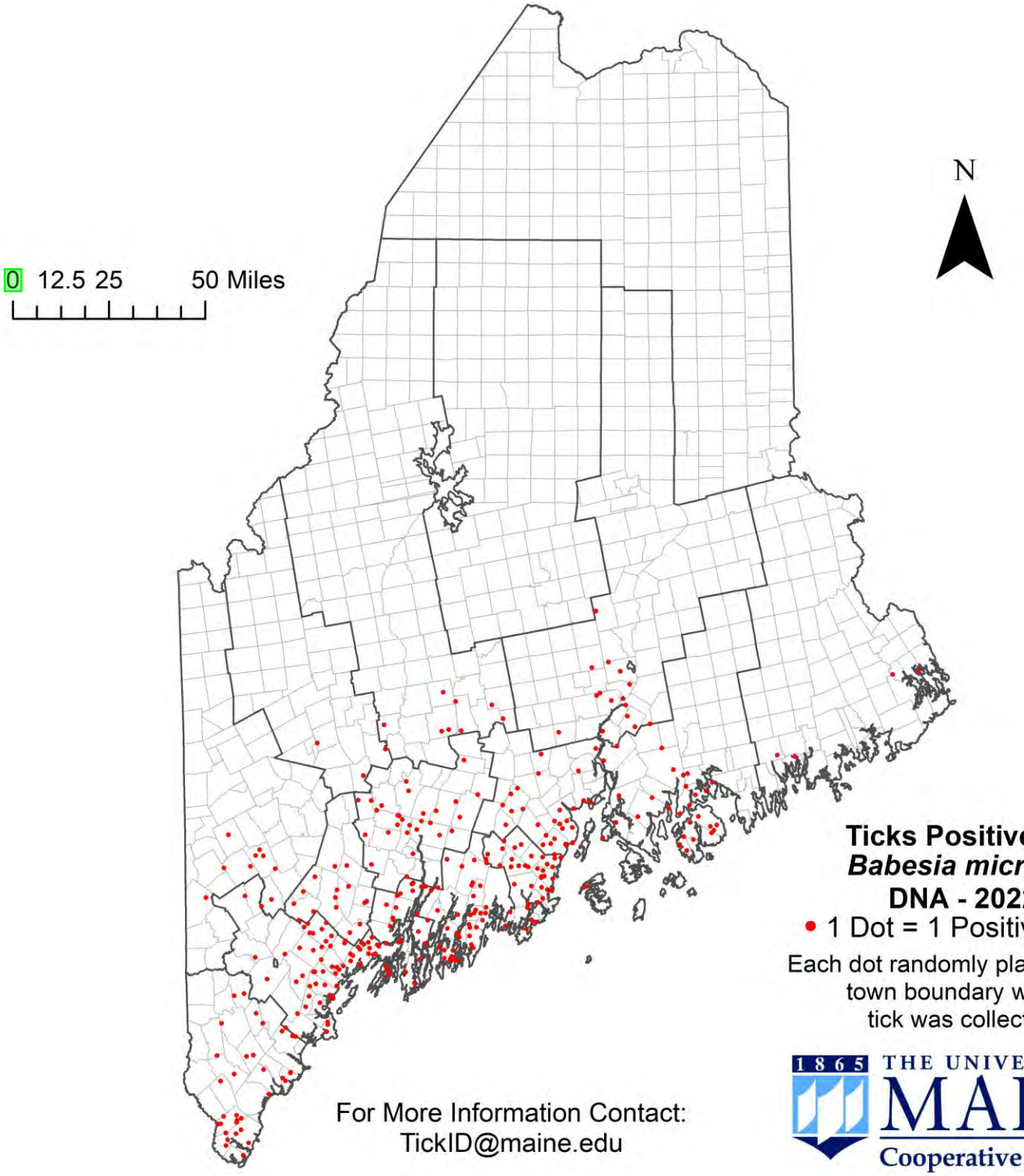
Ixodes scapularis (Blacklegged Ticks) Positive for *Borrelia burgdorferi* sensu lato (Causative Agent of Lyme Disease) (Map 4)



Ixodes scapularis (Blacklegged Ticks) Positive for *Anaplasma phagocytophilum* (Causative Agent of Anaplasmosis) (Map 5)



Ixodes scapularis (Blacklegged Ticks) Positive for *Babesia microti* (Causative Agent of Babesiosis) (Map 6)

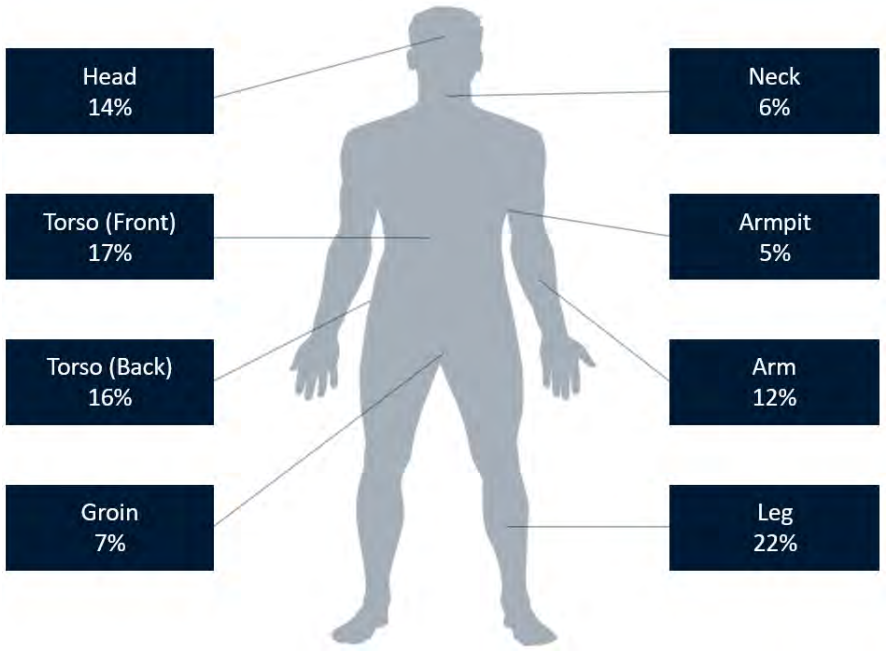


HUMAN TICK ENCOUNTERS

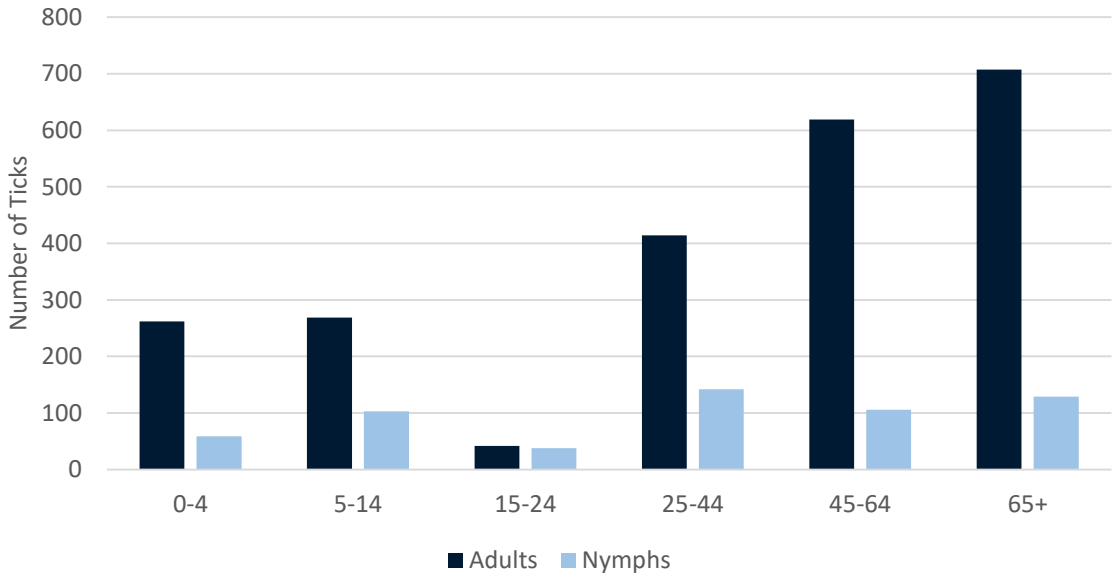
The tick species most commonly encountered by humans, the blacklegged tick and American dog tick, are generalist feeders that will attach and feed upon humans as well as a wide variety of different animal species. The ticks submitted to the UMaine Tick Lab were overwhelmingly found on human hosts (77%), with pets and other hosts making up the remaining submissions.

Once the tick is on a host it may immediately attach and start feeding or it may wander around before settling on a spot. The majority of ticks submitted from human hosts (92%) were discovered while attached and feeding. Feeding sites were fairly evenly distributed across the body on average (Fig. 3). Tick submissions can vary based upon age, with ticks frequently submitted from those over the age of 45 and under the age of 15. During 2022, blacklegged tick nymph submissions were relatively evenly distributed by age group, while adult blacklegged ticks were most commonly submitted by those over the age of 45.

Ixodes scapularis Attachment Sites – All Ages (Fig. 3)



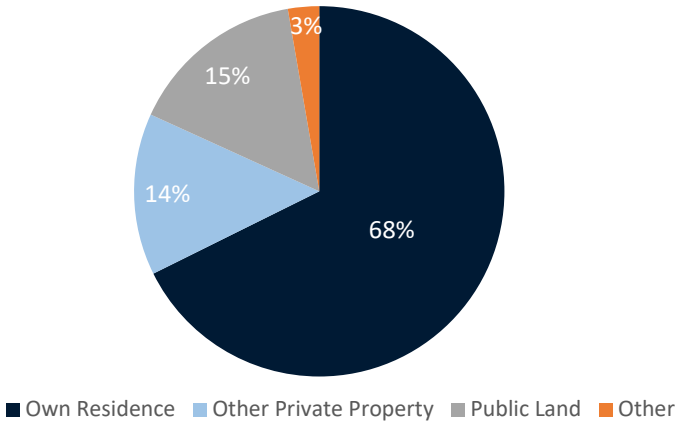
Blacklegged Tick (*Ixodes scapularis*) Submissions by Age Group - 2022 (Fig. 4)



HUMAN ACTIVITY

One of the goals of UMaine Extension's Tick Surveillance Program is to identify potential risk factors for contacting ticks. Certain habitats and human activities may increase this potential for contact and subsequently lead to increased risk of contracting a tick-borne illness. Approximately, 68% of those who submitted blacklegged ticks encountered them on their own property. Table 6 summarizes the human activities associated with the blacklegged ticks that were submitted to the UMaine Tick Lab in 2022. The listed activities represent just some of the ways in which contact with ticks can be made.

Property Type Where Ticks Were Encountered (Figure 5)



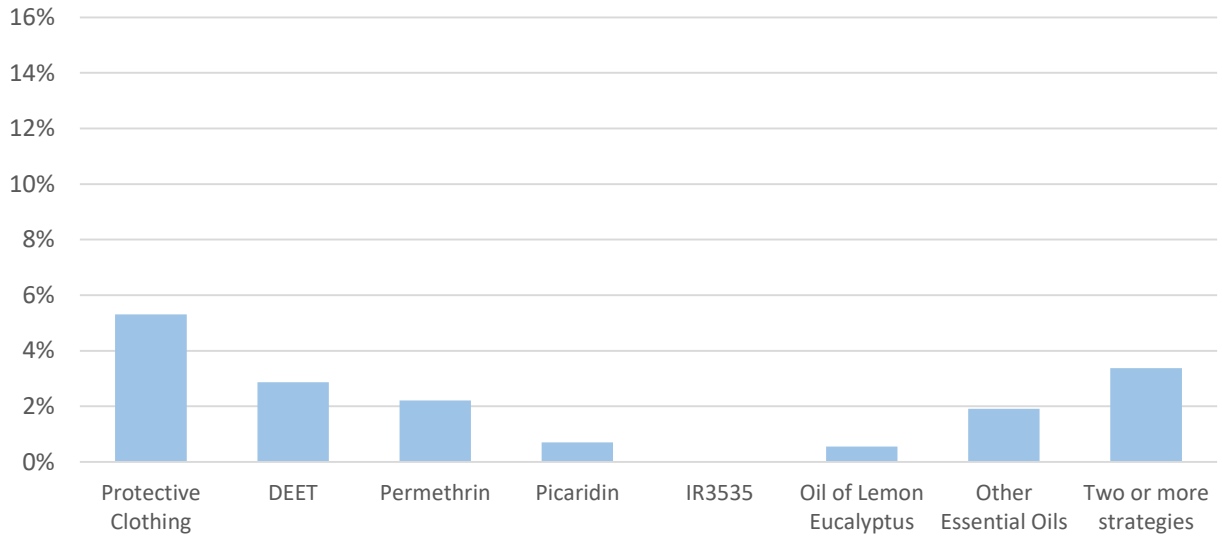
Human Activity at the Time of Blacklegged Tick (*Ixodes scapularis*) Encounter (Table 6)

Activity	Adults	Nymphs	Total
Yardwork/Gardening	765	205	970 (33.0%)
Playing Outside	461	142	603 (20.5%)
Walking	300	59	359 (12.2%)
Hiking	260	60	320 (10.9%)
Pet Related	221	29	250 (8.5%)
Other	142	31	173 (5.9%)
Hunting / Trapping	63	3	66 (2.2%)
Occupational - Other	41	11	52 (1.8%)
Camping	15	19	34 (1.2%)
Occupational - Agriculture	17	12	29 (1.0%)
Occupational - Forestry/Logging	20	4	24 (0.8%)
Playing Sports	20	4	24 (0.8%)
Fishing	8	4	12 (0.4%)
Bicycling	10	2	12 (0.4%)
Running	9	2	11 (0.4%)

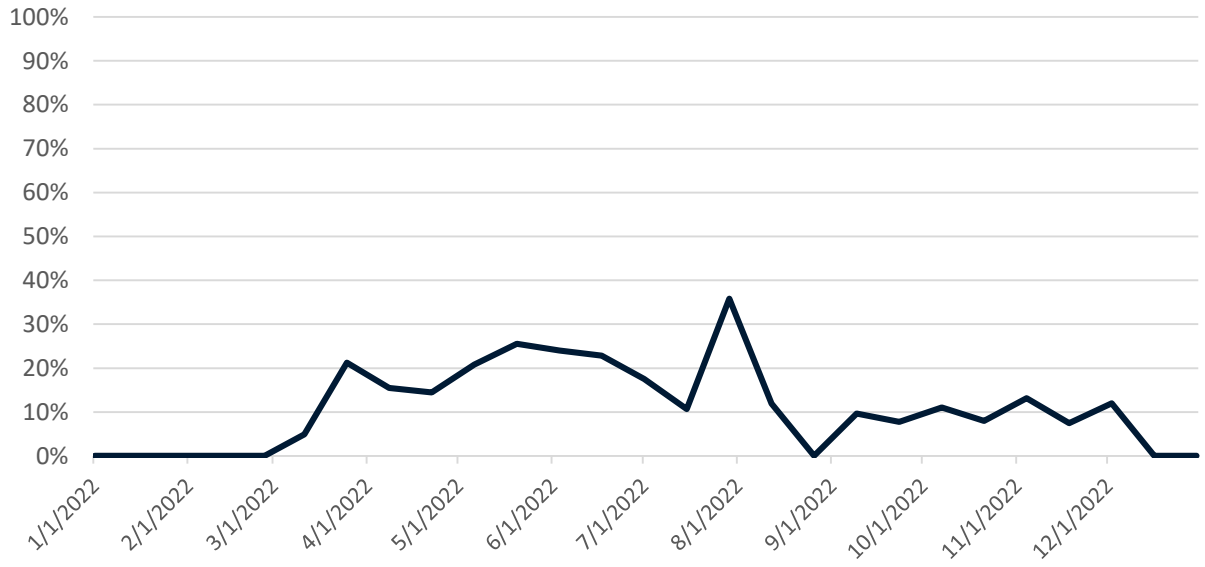
PERSONAL PROTECTION

Managing tick populations can be a challenge, thus the use of personal protection strategies is important in reducing tick encounters. Avoiding tick habitat, wearing appropriate clothing, and using tick repellents can significantly reduce exposure to ticks. Of those who submitted ticks to the Tick Lab in 2022, approximately 17% reported using some type of personal protection measure at the time of their tick encounter, with protective clothing being the most commonly used (5%). The use of personal protection peaked at 36% in late July and remained low (10 - 20%) during the spring and fall peaks in adult blacklegged tick activity.

Percentage of Tick Submitters Using Different Personal Protection Measures Against Ticks – 2022 (Figure 6)



Percentage of Tick Submitters Using Personal Protection Measures (Calculated Bi-Weekly) – 2022 (Figure 7)



LIMITATIONS OF THE DATA

The information in this report is preliminary as of December 31, 2022. Tick samples collected in 2022 that are submitted after this date will be added to the data set and included in future reports. As this is an annual report, it represents only a snapshot in time and cannot be used to examine long-term trends. This report provides a general summary of the data collected and does not attempt to draw specific conclusions. Each tick is counted individually, but multiple ticks may be submitted from a single host or person, which can thus impact the interpretation of geographic data. Towns without tick submissions or positive test results should not be interpreted as not having tick populations or tick-borne disease. The data in this report is generated from passive surveillance (tick specimens found and submitted by members of the public) and can potentially result in a bias toward certain geographic locations or uncertainty about where a specific sample was collected.

ACKNOWLEDGEMENTS

Special thanks to the Tick Lab's research assistants John Nugent, Dev Scott, Olivia Choi, Alyssa Marini, and Emma Nickerson, as well as all those who submitted ticks to the program, the Maine state government, and the people of Maine for supporting this program.

The Tick Lab is part of the Pest Management Unit within the University of Maine Cooperative Extension Diagnostic and Research Laboratory. The Diagnostic and Research Lab is coordinated by Jim Dill and combines veterinary diagnostics, pest management, and aquatic animal health research under one roof.

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