

Tick-borne Diseases – Maine 2023

Presented by:

Maine Center for Disease Control and Prevention
& the MaineHealth Institute for Research



MaineHealth | Institute for Research
Vector-borne Disease Laboratory 

What are ticks?

- Ticks are arachnids, related to spiders and mites
 - >850 species worldwide
 - Approximately 90 species in the US
 - Only a handful of species bite and transmit disease to people
- Found worldwide
- Existed at least 99 million years ago (early Cretaceous period – biting dinosaurs?)



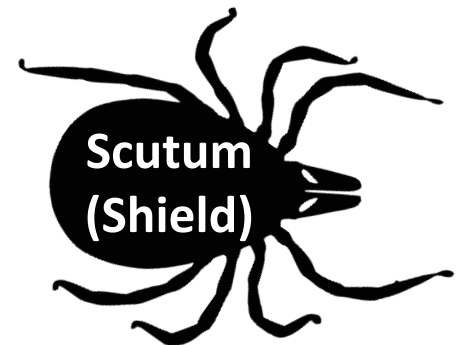
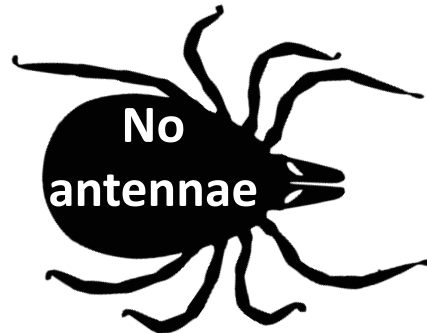
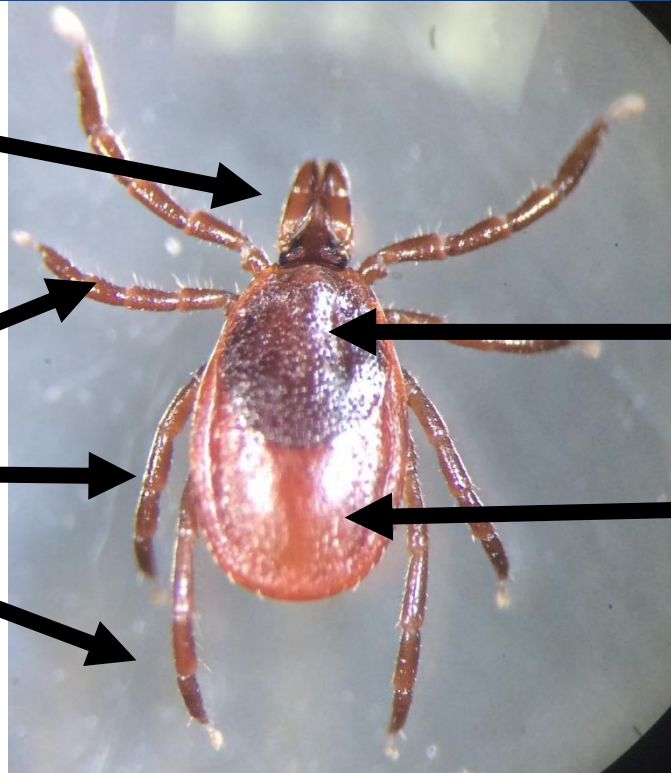
What do ticks look like?

Capitulum
(mouthparts)

Legs

Scutum
(Dorsal Shield)

Abdomen



Male vs. Female

DEERTICK

AMERICAN DOGTICK

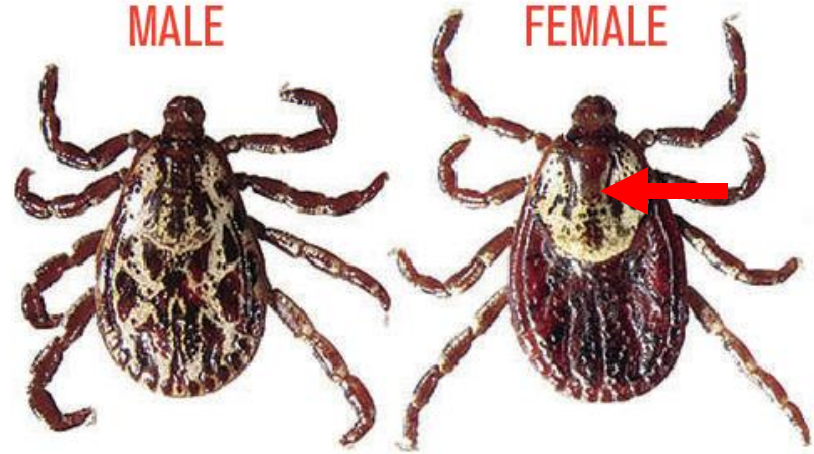
MALE

FEMALE



MALE

FEMALE



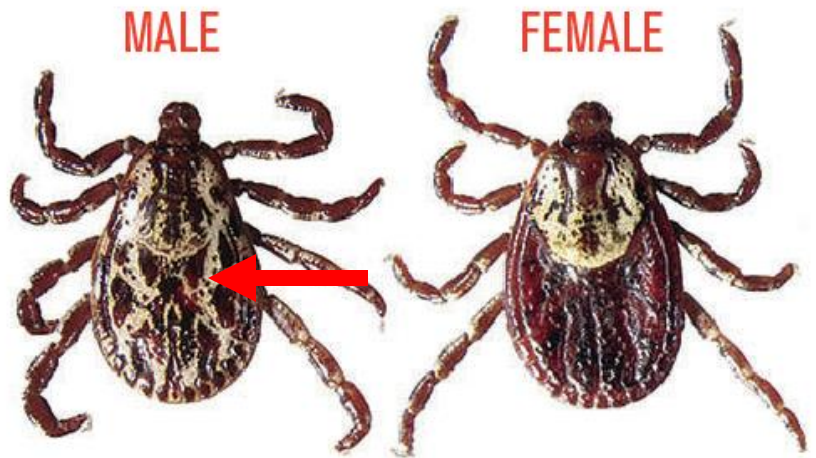
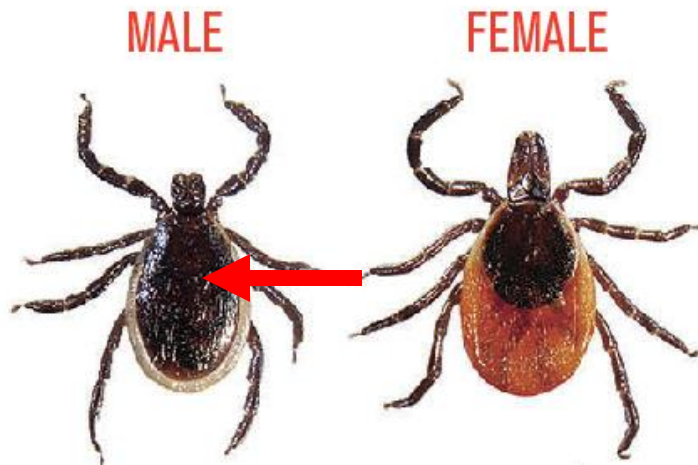
Female

- Short scutum (shield) behind head.
- The rest of the abdomen is left free to expand with blood.

Male vs. Female

DEERTICK

AMERICAN DOGTICK



Male

- Scutum (shield) covers entire back.
- Some ticks have lots of decoration here.

What about the “big” ticks?

As a tick feeds,
it can swell

UP
TO **10X**

its body size.

Check the color and pattern on the **shield** (scutum) behind the head to help identify your tick - this never changes in size.



How do ticks bite?

Long feeding time

- Up to 10 days

Barbed hypostome

- Has arrow-like teeth that help keep the tick in place under the skin
- Only part of the tick that is in the host body

Chemicals in saliva help with feeding

- Anesthesia: makes bite painless
- Anticoagulant: prevents blood from clotting



How do ticks move?

Ticks do not fly, jump, or climb trees!



Questing: Ticks use their front two legs to sense when a person or animal is nearby

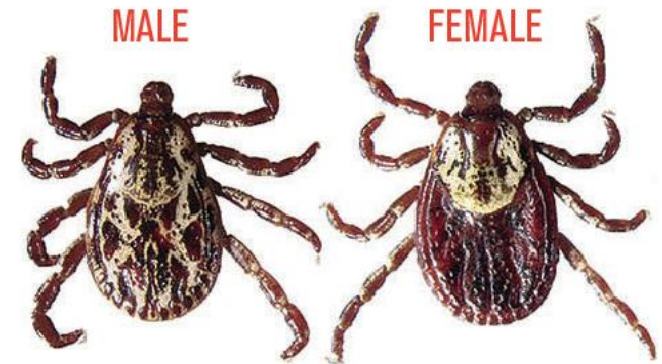
Ticks will **crawl** to a feeding spot on a person's skin

Ticks in Maine

**Most
Common:**

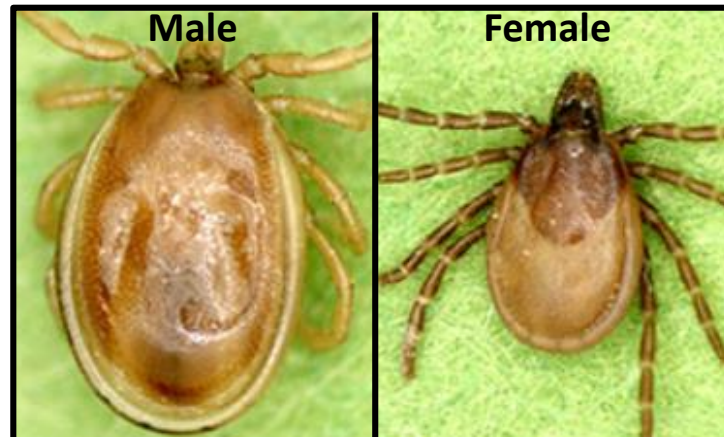


Deer or Blacklegged Tick
Ixodes scapularis



American Dog Tick
Dermacentor variabilis

**Less
Common:**



Woodchuck Tick
Ixodes cookei

Ticks of Concern



Lone Star Tick
Amblyomma americanum



Asian Longhorn Tick
Haemaphysalis longicornis

Four Life Stages

Egg

Larva

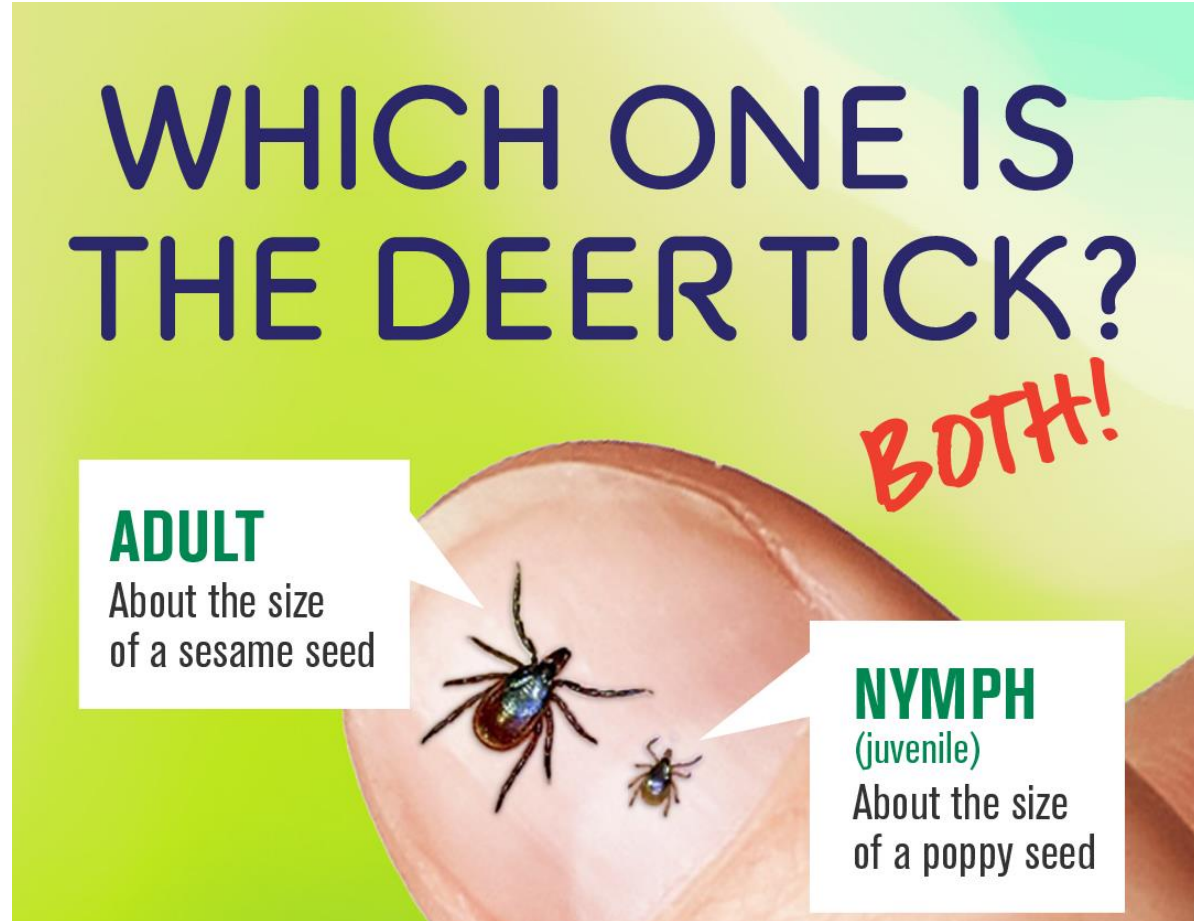
- Baby
- Six legs
- Size of period in 12 point font

Nymph

- Teenage/juvenile stage
- Eight legs
- Size of poppy seed

Adult

- Male and female
- Size of a sesame seed



Deer Tick Life Cycle

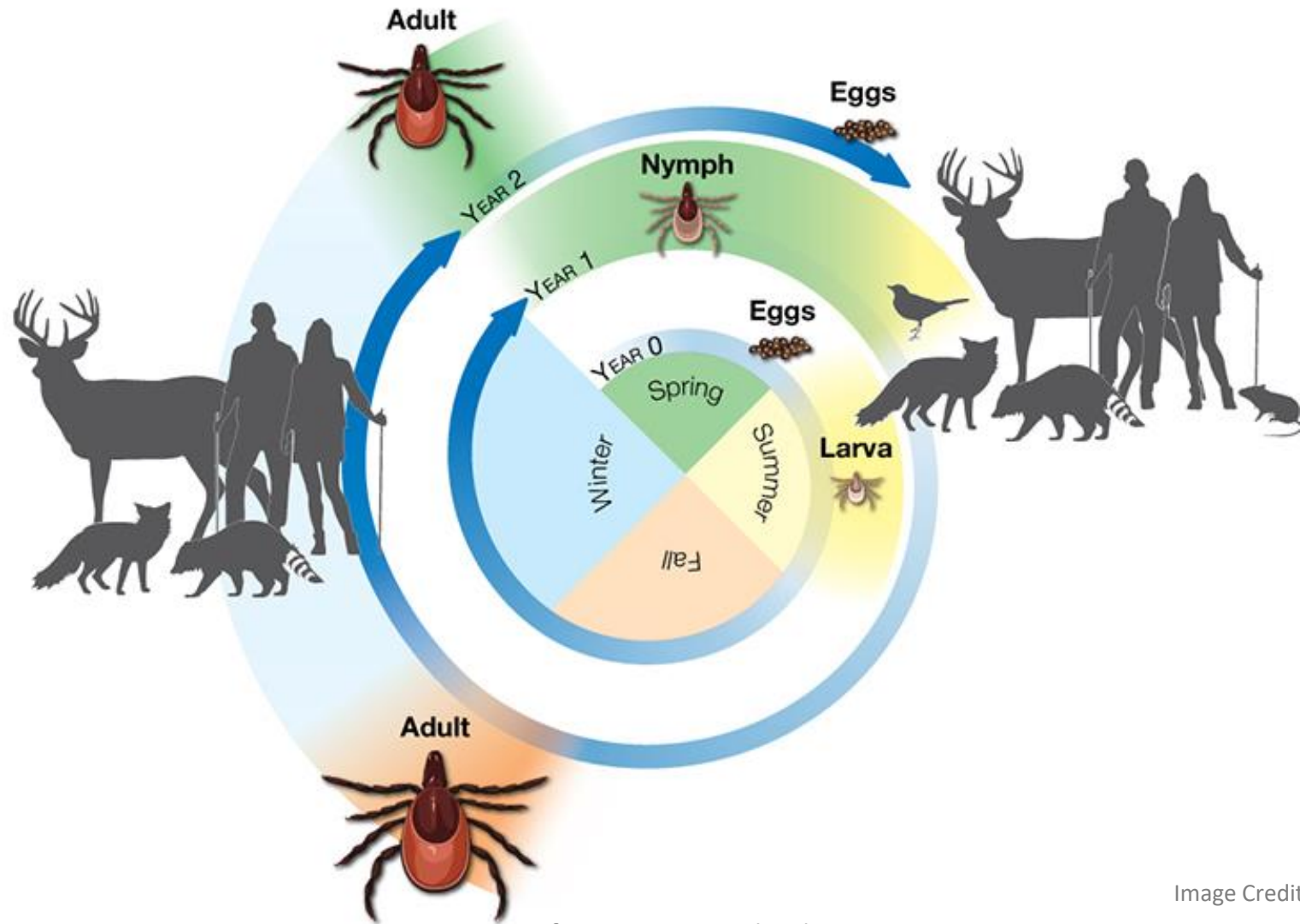


Image Credit: US CDC

Where do deer ticks live?



Deer ticks prefer:

Leafy canopy

Shrubs

Leaf litter

Where do deer ticks live?



Deer ticks prefer:

← Leafy canopy

← Shrubs
(Invasives)

← Leaf litter

Will I find a deer tick here?

Deer ticks do not like:

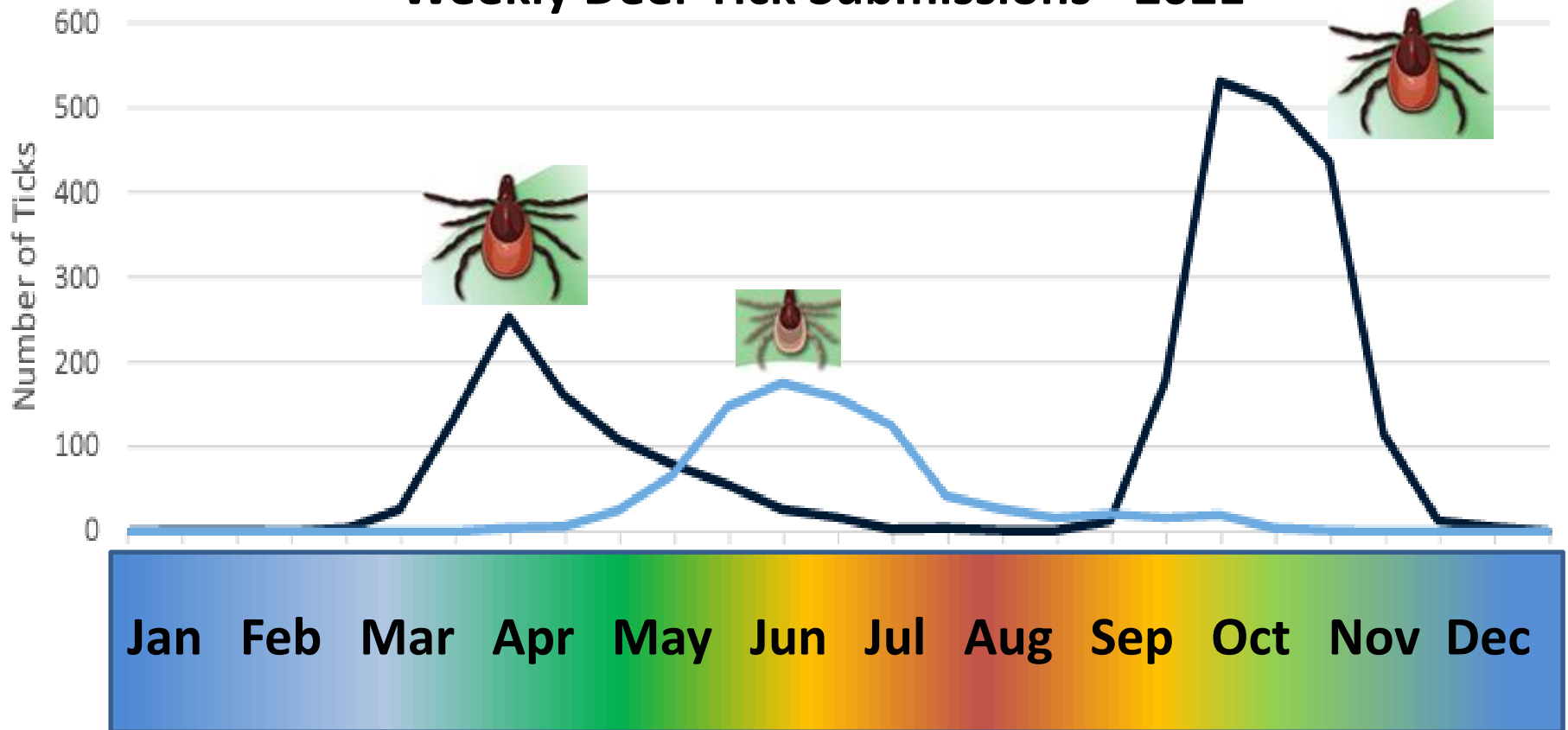
Open habitats

Dry habitats






Deer Tick Seasonality

Weekly Deer Tick Submissions - 2021



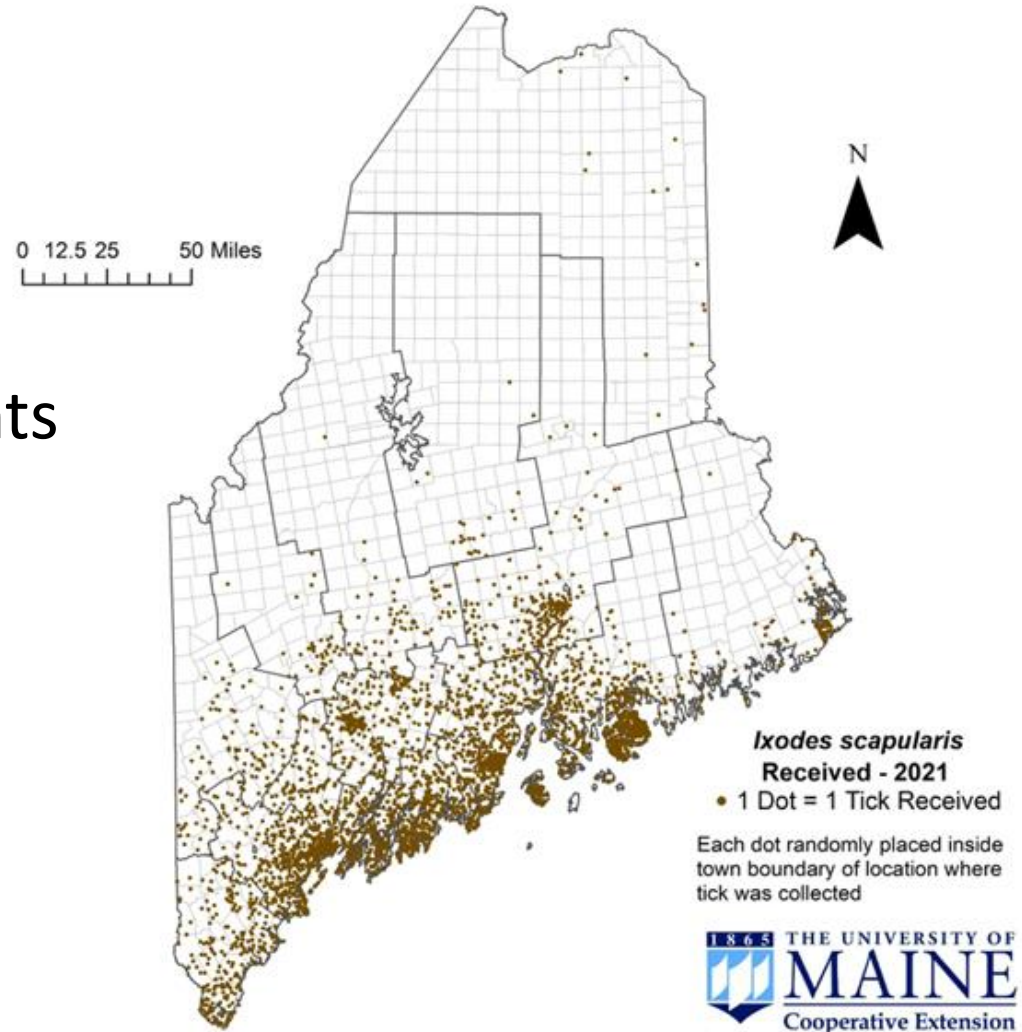
— Adults — Nymphs

Tick Ecology

	Deer Tick 	Dog Tick 	Woodchuck Tick 
Habitat	<ul style="list-style-type: none"> • Mixed forests • Woodland edges • Suburban landscapes 	<ul style="list-style-type: none"> • Open fields • Lawns • Forested areas 	<ul style="list-style-type: none"> • In and around the dens/nests of their hosts
Activity	Can be active any time temperature above freezing	April to August	Summer months
Peak	April or May with another in late October	May and June	July

Deer Tick Distribution in Maine

In 2021, Maine residents submitted deer ticks from every county.



Tickborne Diseases and Climate

Factors that influence tick populations:



Precipitation



Humidity



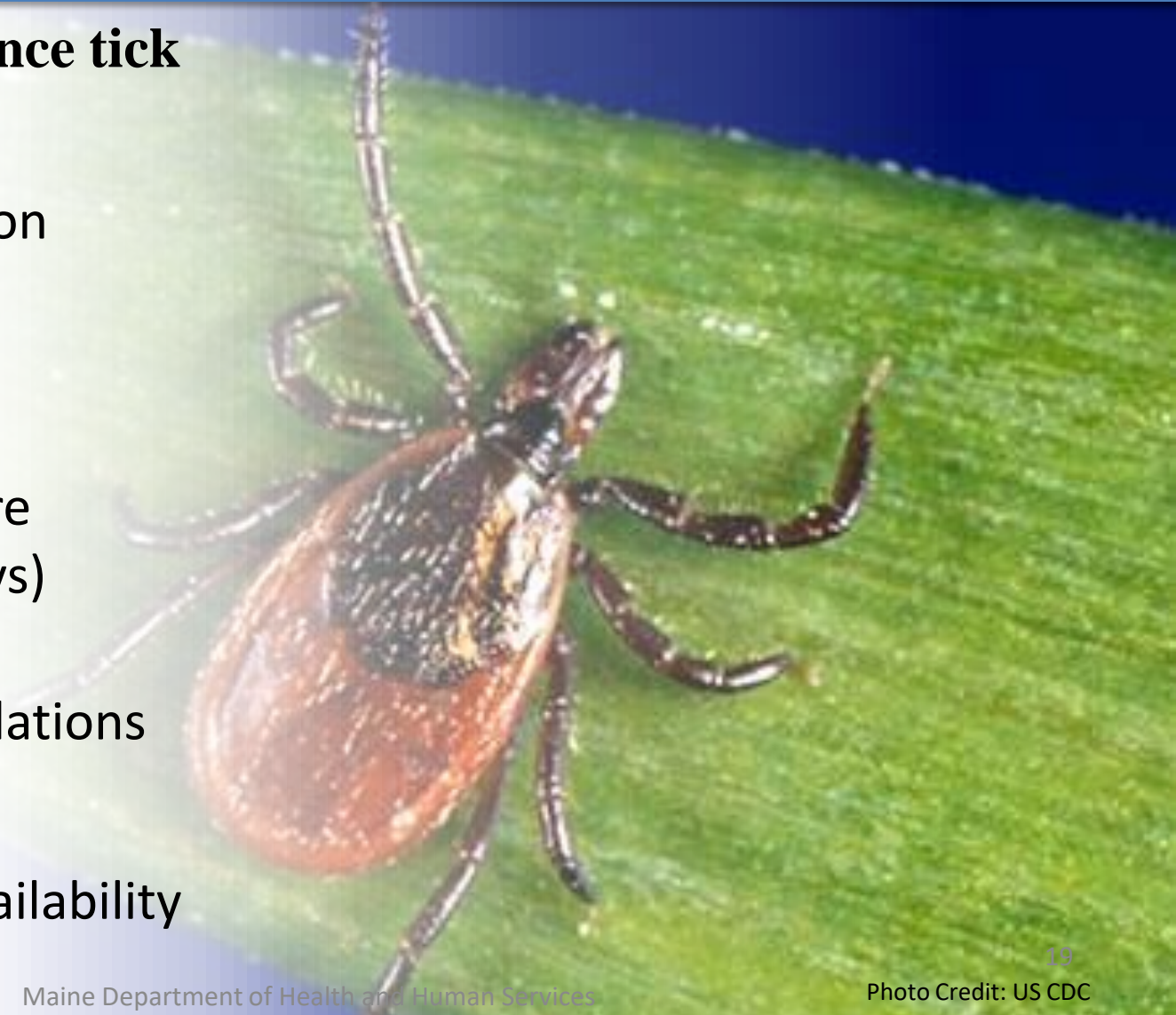
Temperature
(degree days)



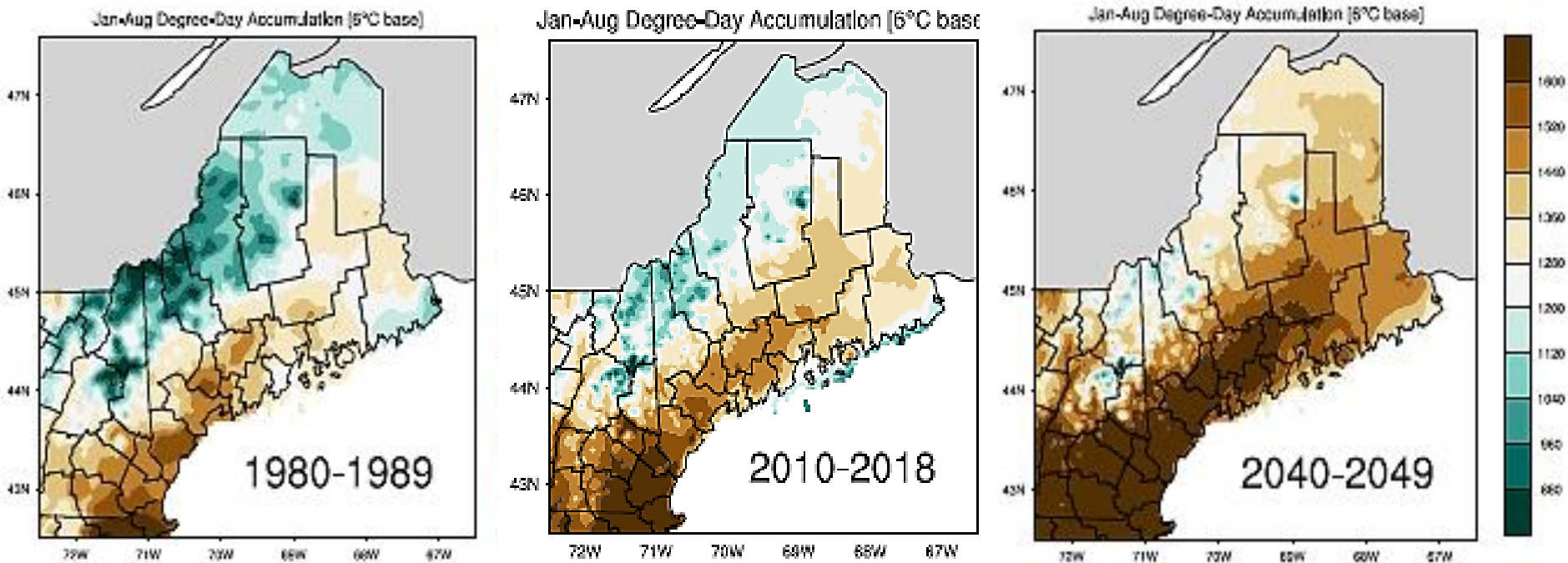
Host populations



Habitat availability



Degree Days in Maine



Scientific Assessment of Climate Change and Its Effects in Maine. A Report by the Scientific and Technical Subcommittee of the Maine Climate Council. 2020.

Who Can Get a Tickborne Disease?

Anyone!

Highest risk:

- People who spend time outdoors
- Children ages 5-14 years
- Adults over the age of 65 years

Tickborne Diseases in Maine

Common

- Lyme Disease
- Anaplasmosis
- Babesiosis

Rare

- Ehrlichiosis*
- Hard Tick Relapsing Fever (*Borrelia miyamotoi*)
- Powassan encephalitis

Potential Threat**

- Spotted Fever Rickettsiosis
- Tularemia
- Heartland Virus

* Disease is not normally found in Maine

** Possible for disease to emerge in Maine in the future (cases that do occur are often imported from travel)

Tickborne Diseases in Maine



Deer Tick

- Lyme disease
- Anaplasmosis
- Babesiosis
- Hard Tick Relapsing Fever
- Powassan



Dog Tick

- Spotted Fever
- Rickettsiosis*
- Tularemia*

*The pathogens that cause these diseases not found in ticks in Maine



Woodchuck Tick

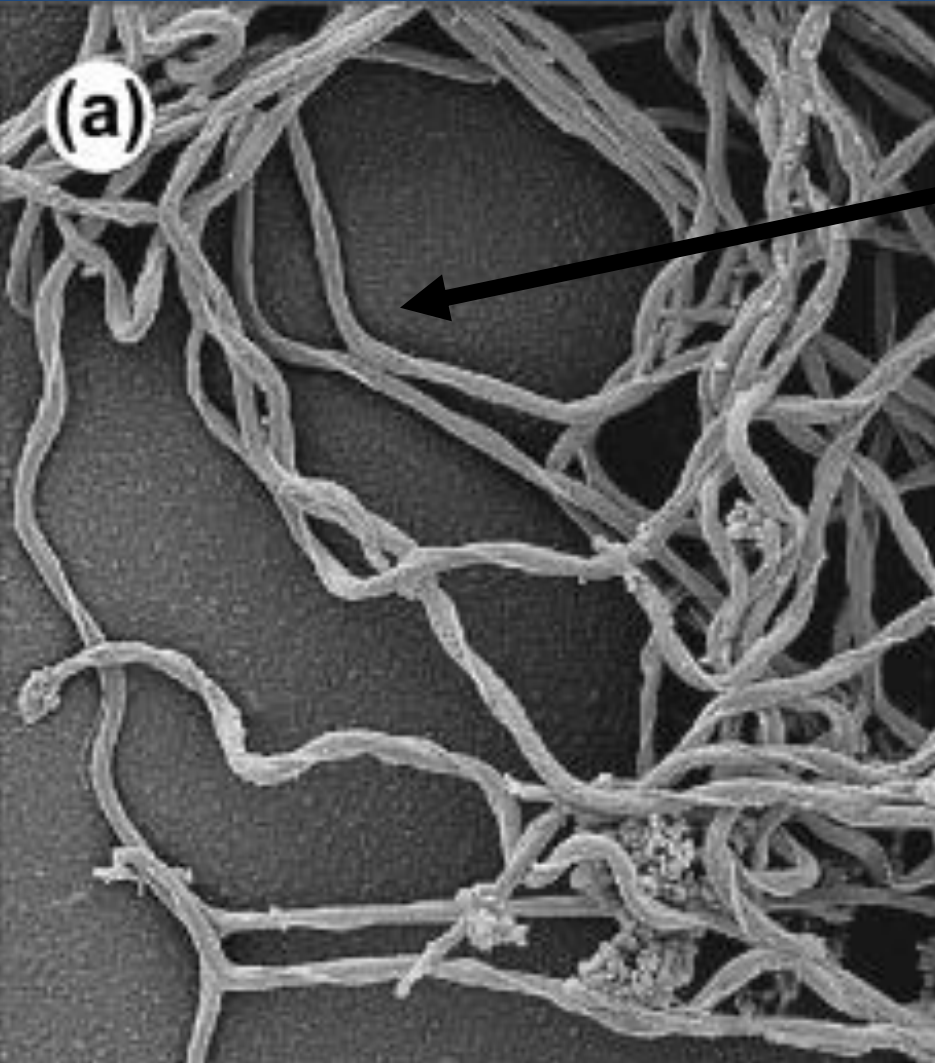
- Powassan



Lone Star Tick

- Ehrlichiosis*
- Tularemia*
- Heartland virus*

What is Lyme disease?



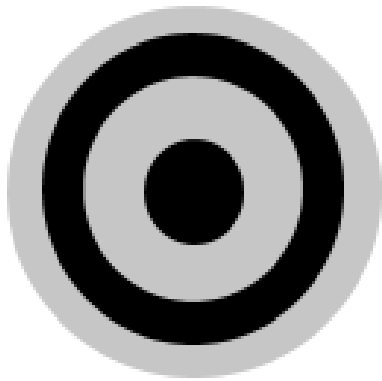
Caused by the corkscrew-shaped bacteria ***Borrelia burgdorferi***

Infected **deer tick** must bite for at least **24 hours** to transmit



Lyme Disease - Symptoms

Early symptoms: occur in first month after bite



Rash (Usually a
“Bull’s Eye”)



Fever and
Chills



Fatigue (Feeling
Very Tired)



Muscle or
Joint Soreness

Bull's-Eye Rash



The bull's-eye rash may appear anywhere on the body, so **make sure to check all over.**



The Lyme disease rash may **not** always look like a bull's-eye shape.



Look for a rash that **expands slowly in size.**



There may be a little redness at the site of a tick bite. **This is not the bull's-eye rash.**

Lyme Disease - Symptoms

Late Symptoms: may appear weeks to years after a bite if not treated early



Arthritis



Neurologic, Memory, and
Concentration Problems



Heart Problems

Identify symptoms early. Lyme disease treatment is more effective the earlier it is started.

Distribution of Lyme in United States - 2020



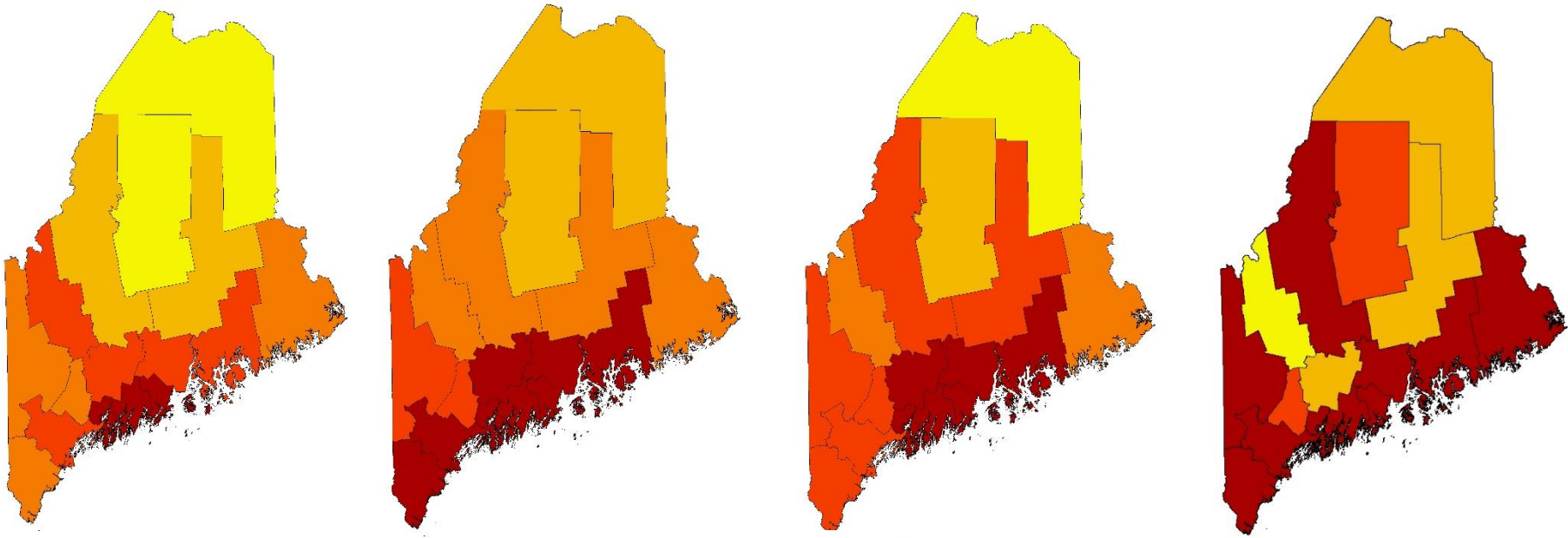
Rates of Lyme Disease in Maine by County

2010

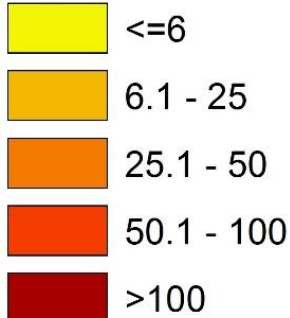
2014

2018

2022

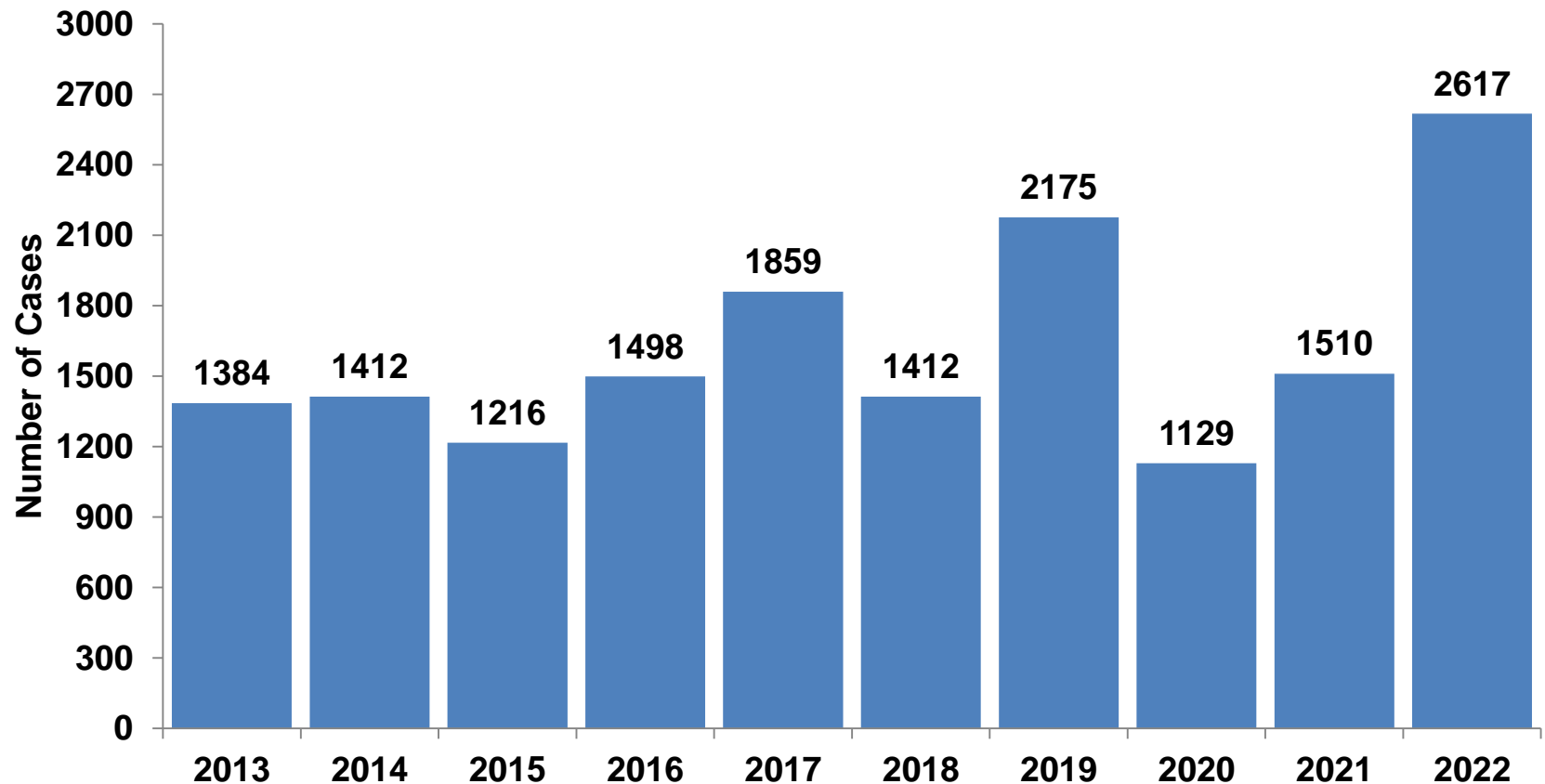


**Lyme disease
rate per 100,000**



Lyme Disease Cases – Maine, 2013-2022*

Lyme Disease Cases - Maine, 2013-2022*

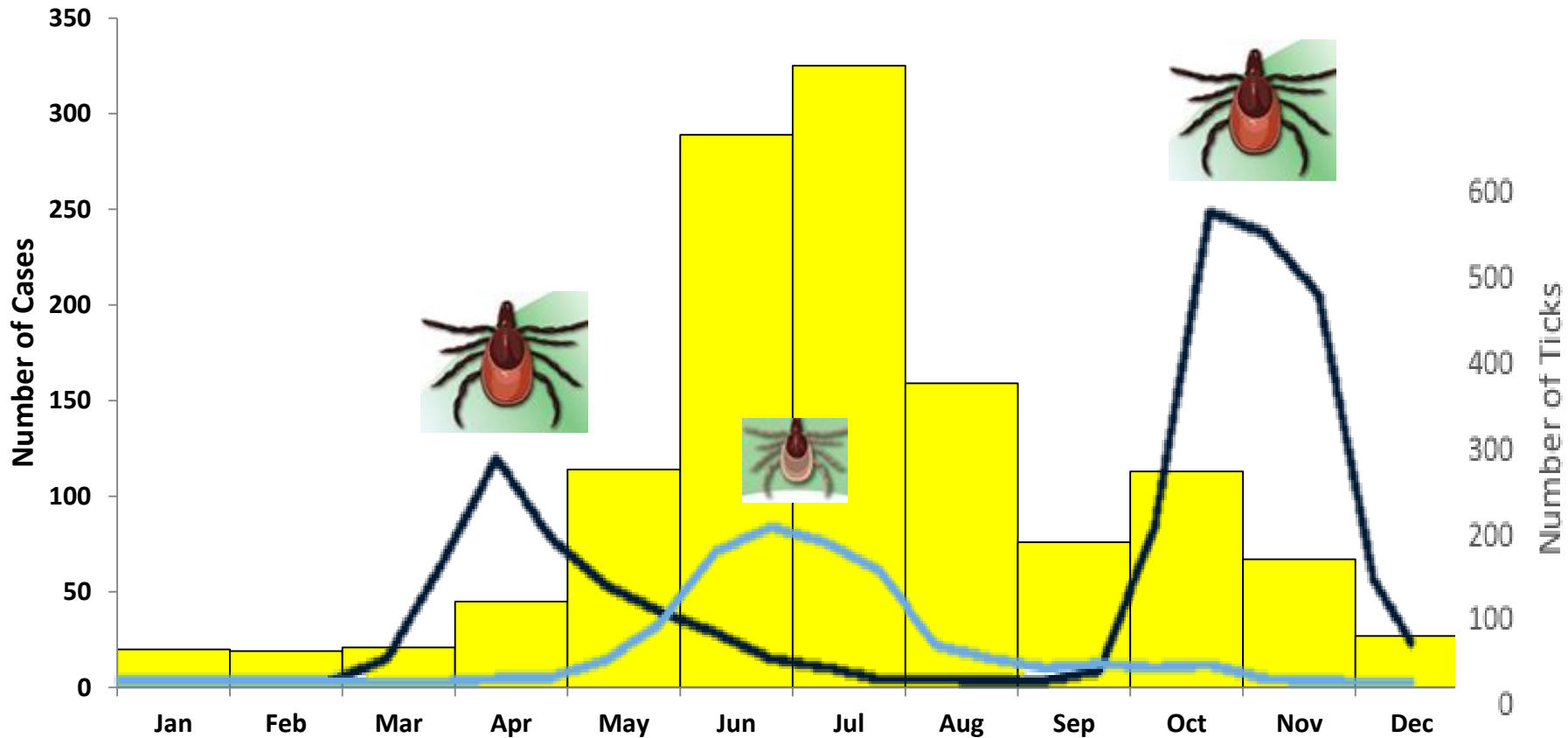


*data as of 3/7/2023

Maine Center for Disease Control and Prevention

Lyme Disease by Onset Month – Maine, 2021

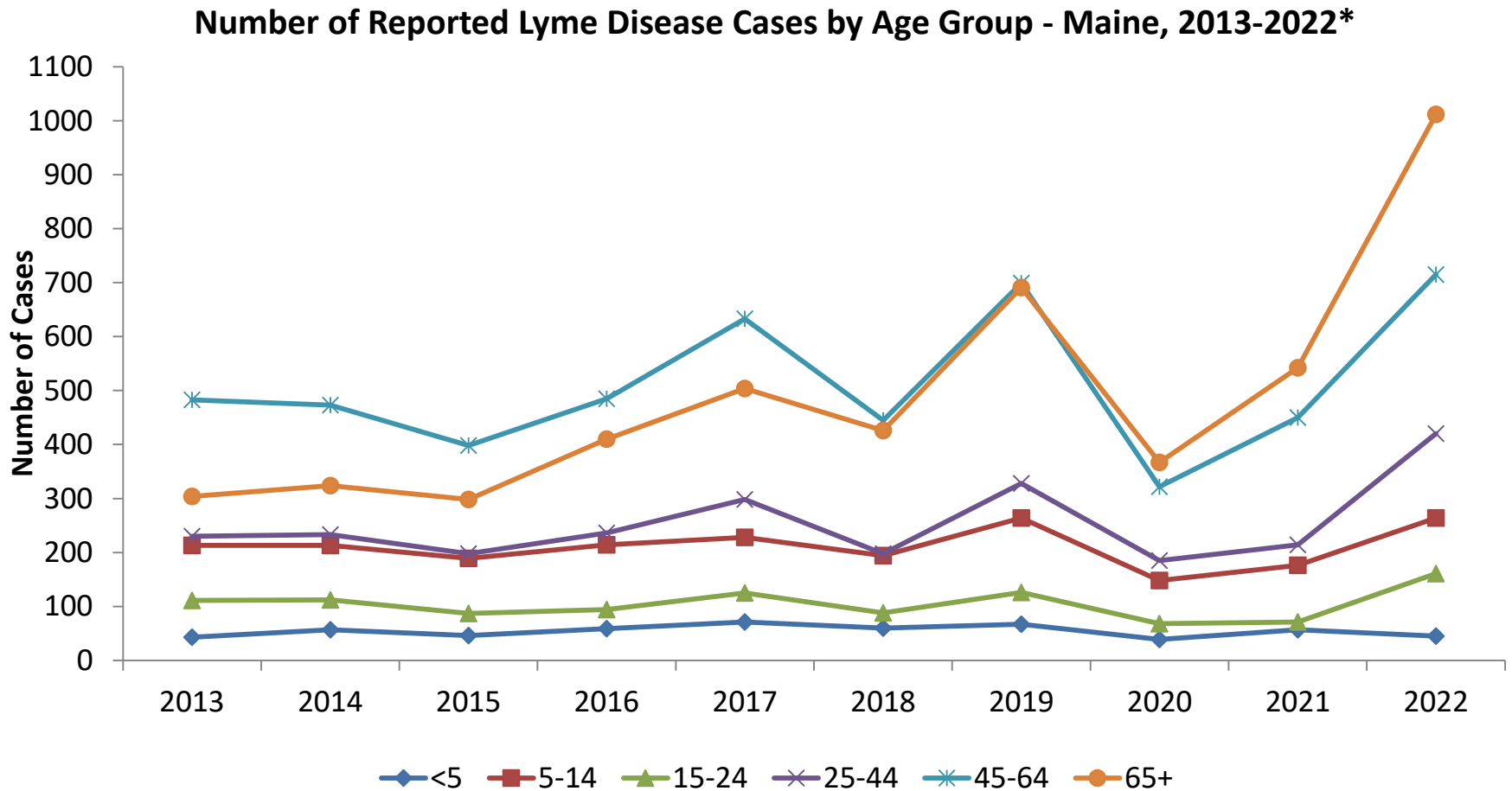
Lyme Disease by Month of Onset - Maine, 2021



Maine Center for Disease Control and Prevention

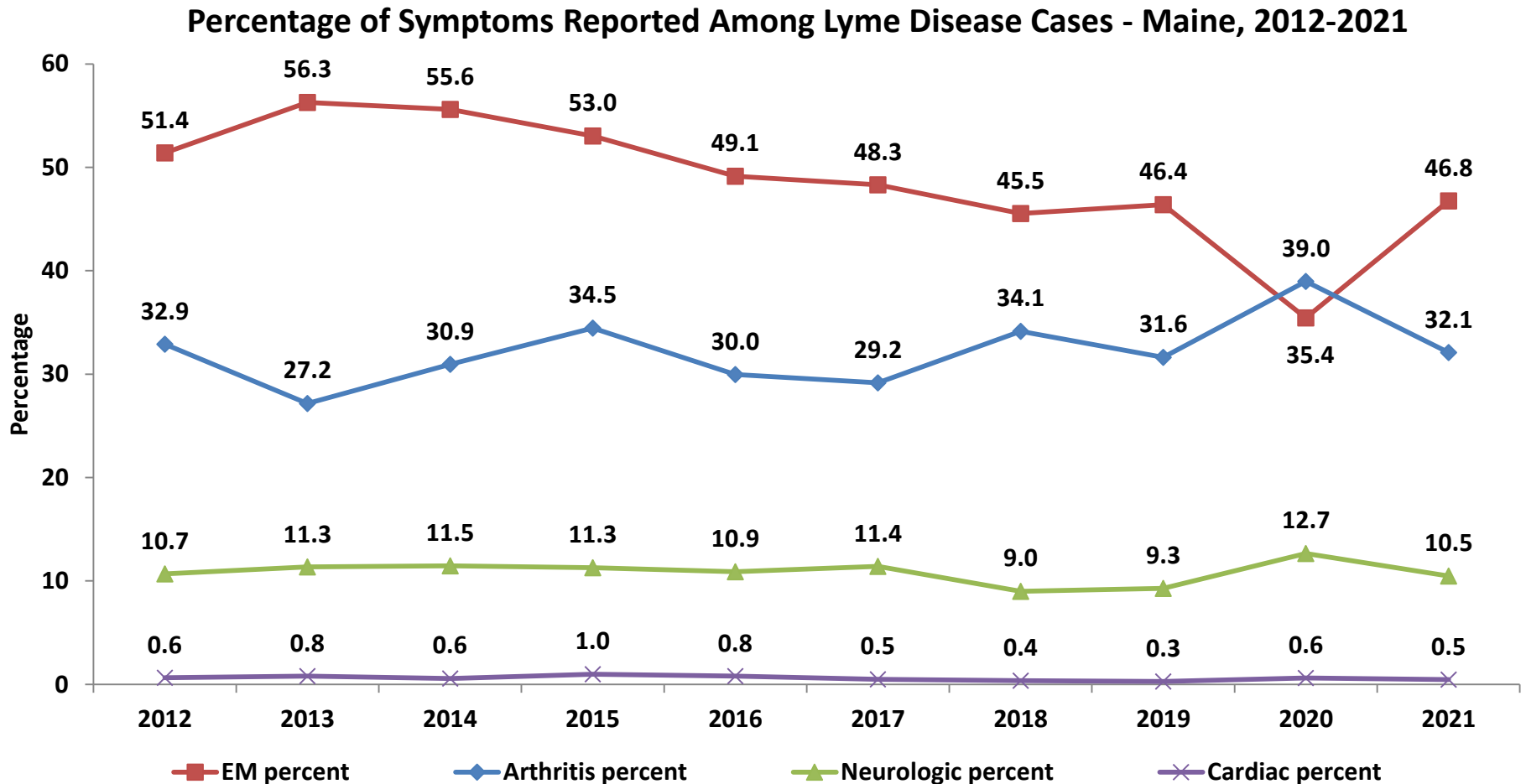
Tick data from University of Maine Cooperative Extension Tick Laboratory

Rates of Reported Lyme Disease Cases by Age Group – Maine, 2013-2022



*data as of 3/7/2023

Percentage of Symptoms Reported Among Lyme Disease Cases – Maine, 2012-2021



Anaplasmosis

Caused by the bacterium
Anaplasma phagocytophilum

Spreads from infected **deer tick**
within 24 hours during bite



Anaplasmosis Symptoms

Symptoms range from mild to severe.
Very few people experience **ALL** of these symptoms.

Common



Fever and Chills



Headache



Muscle Pain

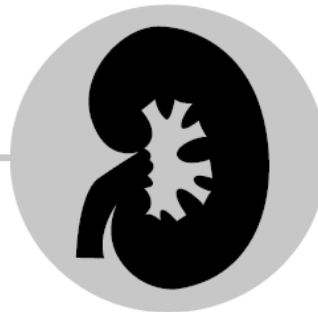


Nausea and
Abdominal Pain

Less
Common,
Severe



Difficulty Breathing



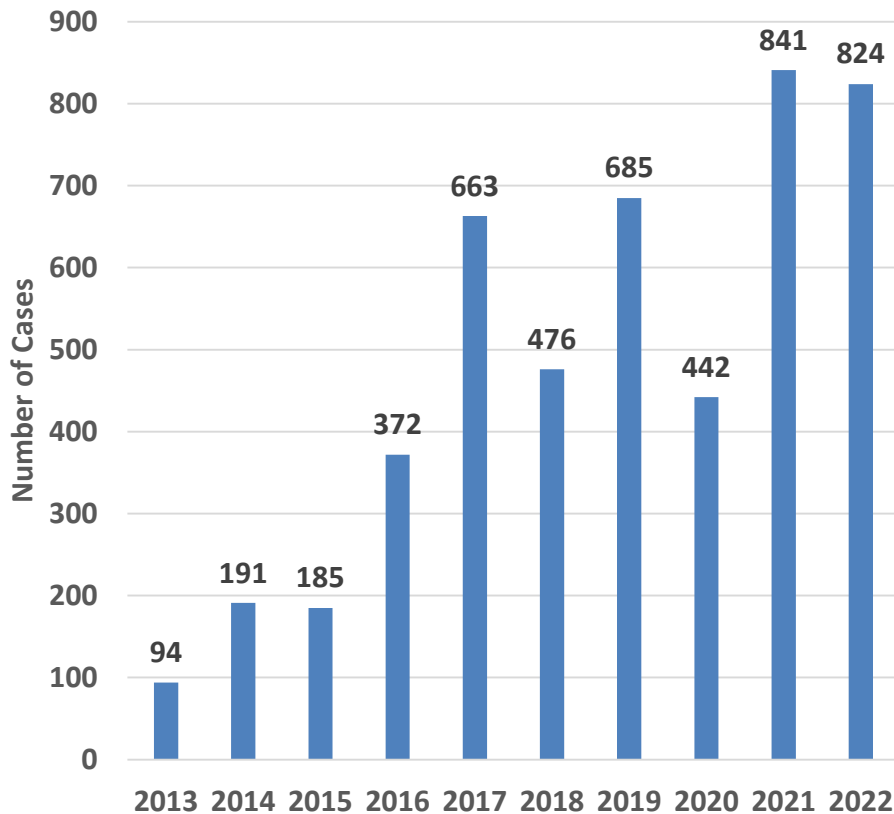
Kidney Failure



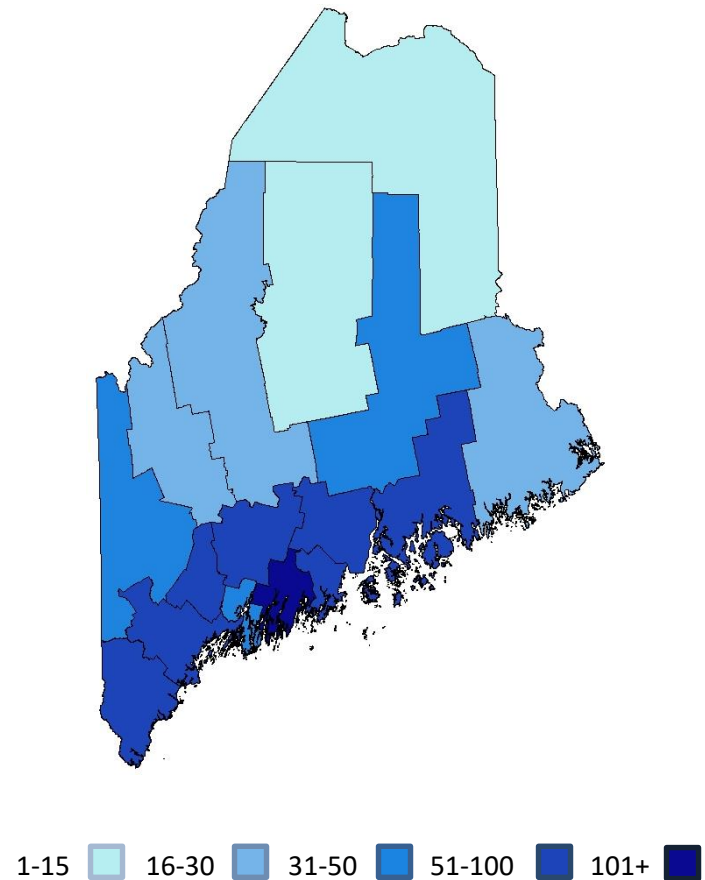
Neurologic Problems

Anaplasmosis in Maine

Anaplasmosis Cases by Year - Maine, 2013-2022*



Anaplasmosis Cases by County – Maine, 2022*



*data as of 3/8/2023

Babesiosis

Caused by *Babesia* species parasites that infect red blood cells

Infected **deer tick** must stay attached for **36-48 hours** to spread this parasite

Can also (rarely) spread through:

- **Contaminated blood transfusions**
- **From mother to child during pregnancy**



Babesiosis Symptoms

Symptoms start within a few weeks or months after a bite and can last days to months.



Fever and Chills



Anemia (Having a Lower Red Blood Cell Count Than Normal)



Headache



Feeling Very Tired

Highest risk:

- Elderly people
- People without a healthy spleen
- People with a weak immune system

Other Tickborne Diseases in Maine

Hard Tick Relapsing Fever (*Borrelia miyamotoi* disease)

- First identified in 1995, first case in Maine 2016
- Symptoms
 - Fever and chills
 - Headache
 - Muscle and joint pain
 - Fatigue (feeling very tired)

2018	2019	2020	2021	2022*
8 cases	12 cases	10 cases	9 cases	12 cases

Other Tickborne Diseases in Maine

Powassan Encephalitis

- Symptoms
 - Fever
 - Headache
 - Nausea/vomiting
 - Body aches
- Severe disease
 - Confusion
 - Swelling of brain (encephalitis)
 - Death
- For those with severe disease:
 - 1 in 10 cases die
 - Half of survivors have permanent brain damage
- At least one case in Maine every year since 2015
 - Record number of cases for a single year in Maine in 2022

2018	2019	2020	2021	2022*
0 cases	1 case	1 case	3 cases	4 cases

Photo Credit: US CDC

*data as of 3/8/2023

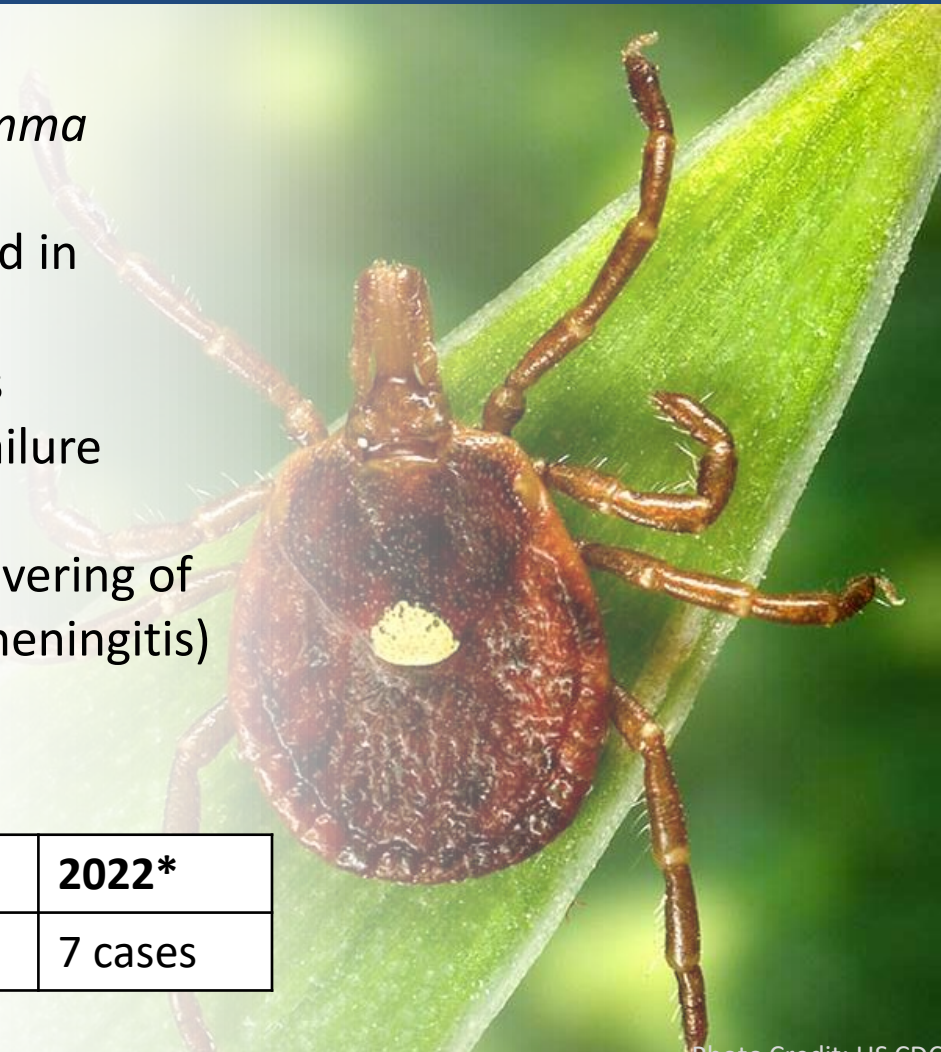
Other Tickborne Diseases

Ehrlichiosis

- Carried by the Lone Star tick (*Amblyomma americanum*)
 - The Lonestar tick is not established in Maine
- Symptoms
 - Fever
 - Headache
 - Nausea
 - Body aches
- Serious symptoms
 - Respiratory failure
 - Kidney failure
 - Swelling of covering of spinal cord (meningitis)
- Cases in Maine due to travel

2018	2019	2020	2021	2022*
19 cases	13 cases	2 cases	4 cases	7 cases

*data as of 3/8/2023



Other Tickborne Diseases

Spotted Fever Rickettsiosis (SFR)

- Most common is Rocky Mountain Spotted Fever (RMSF, spread by American Dog Tick)
- Symptoms
 - Fever
 - Headache
 - Rash
 - Dark-colored mark at the site of the tick bite
- In Maine
 - 0 confirmed cases to date
 - 1 probable case in 2022 from travel
 - No RMSF found in over 3000 American Dog Ticks tested by UMaine Tick Lab



Photo Credit: US CDC

*data as of 3/9/2023

Alpha-Gal Syndrome

Type of food allergy to **red meat, milk,** and other products from mammals.

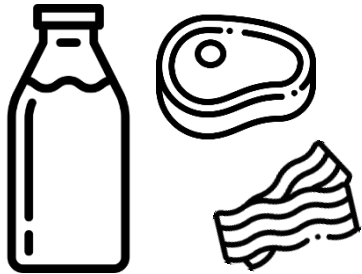
Allergy starts when a **lone star tick bites** a person.

In some people, this triggers an immune system reaction that leads to an allergic reaction.



Alpha-Gal Syndrome

Products that **may contain alpha-gal**:



Red meat, milk, and milk products

Other food products (gelatin, mammal fat products, meat broth/stock/gravy)



Additives, stabilizers, or coatings in some medicines or vaccines

Some medical products (heart valves from pigs or cows, monoclonal antibodies, heparin, some antivenins)

Foods that **do not contain alpha-gal**:

- Poultry, eggs, fish and seafood, fruits and vegetables

Alpha-Gal Syndrome Symptoms



Hives or itchy rash



Nausea or vomiting



Heartburn or indigestion



Diarrhea



Cough, shortness of breath, or difficulty breathing



Swollen lips, tongue, throat, face, or eyelids



Dizziness or faintness



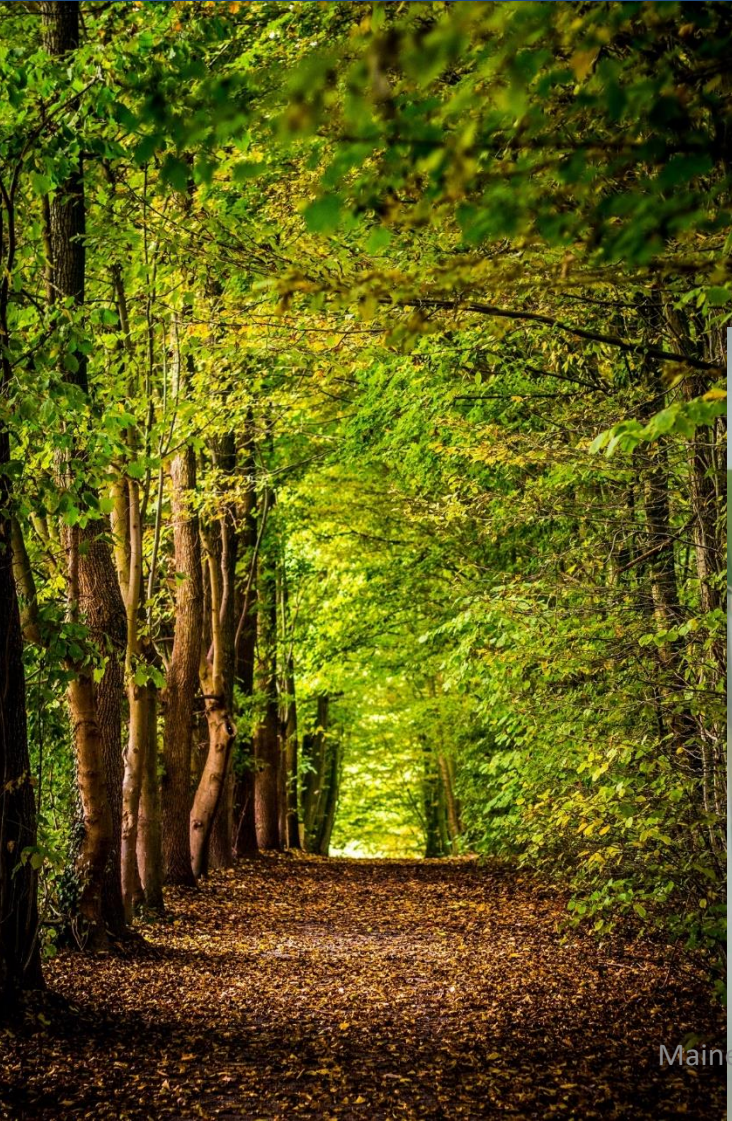
Severe stomach pain

Tick Bite Prevention - Before

- **Wear protective clothing**
 - Light colored (white/khaki)
 - Long sleeves and pants
 - Close-toed shoes
 - Tuck pants into socks
- **Treat clothes with permethrin**
 - Not for use on skin
- **Talk to a veterinarian about tick prevention for pets**
 - Pets can bring ticks inside too



Tick Bite Prevention - During



- Wear EPA-approved repellent
- Know when you are in tick habitat
- Stay on trails
- Check often for ticks



EPA-Approved Repellents

EPA-approved repellents:

- DEET
- Picaridin
- IR3535 (ethyl butylacetylaminopropionate)
- Oil of Lemon Eucalyptus
- Permethrin (not for skin)

What does EPA-approved mean?

- The active ingredient works against ticks
- The active ingredient is safe when used correctly



Tick Bite Prevention - After

Check for ticks

- When you come home
- Before going to bed
- Check pets too!

Take a shower

- May wash off unattached ticks
- Helps with tick check

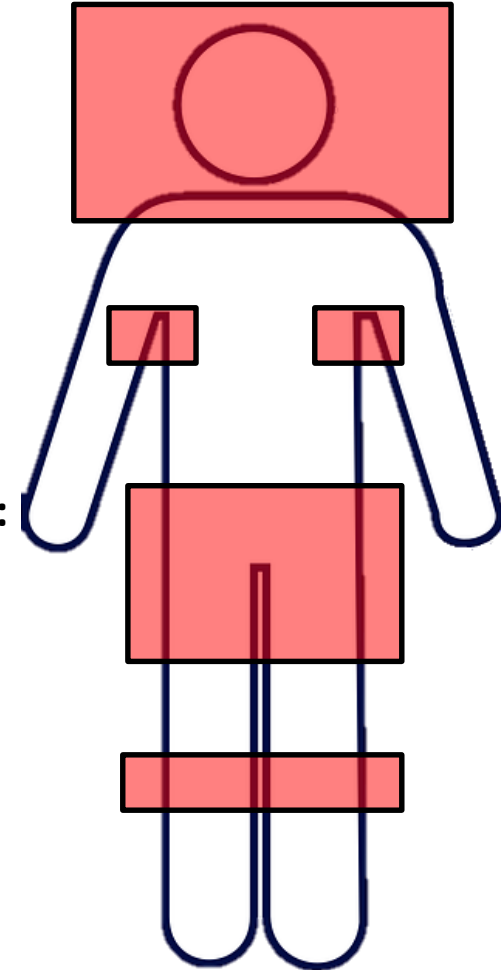
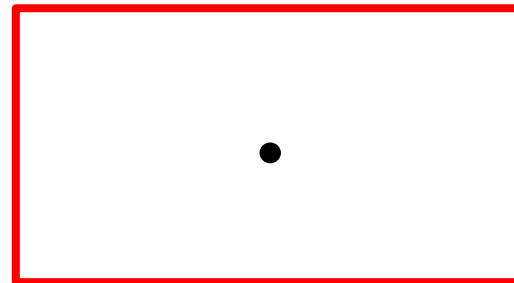
Put clothes in dryer before washing

- On high heat for 10-15 minutes
- Heat kills ticks that are hiding in clothes
- Wash clothes normally after

Ticks look like this:



But their size is more like this:



What if you find a tick attached?

Do:

- Stay calm
- Use a tick spoon or fine-tipped tweezers to remove the tick
- Monitor for fever, chills, and other symptoms for 30 days

Do Not:

- Wait to remove the tick
- Use nail polish, matches, petroleum jelly, etc. to remove the tick



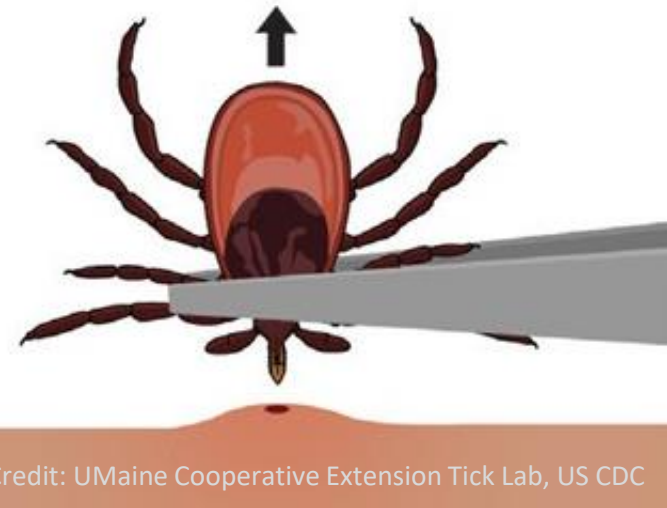
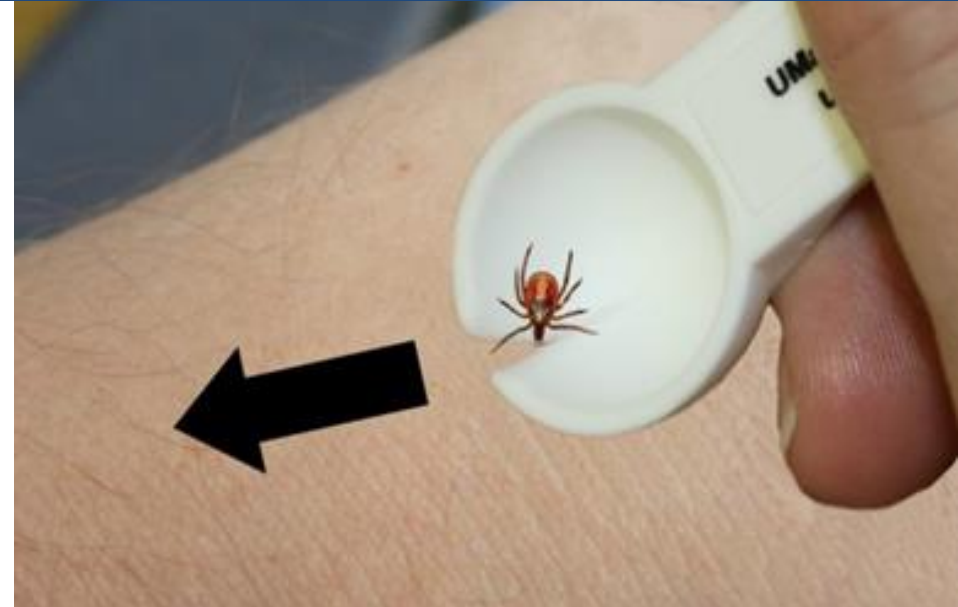
Tick Removal

Tick Spoon:

- Fit notch of spoon around head of tick
- Gently scoop forward with steady pressure

Fine-Tipped Tweezers:

- Grab the tick as close to the skin as possible
- Use firm, steady pressure and pull straight out



What to do with my tick?

Kill and preserve your tick:

- Put tick in a container with rubbing alcohol
- Tick will die and is preserved if you would like to submit for testing

Tick testing:

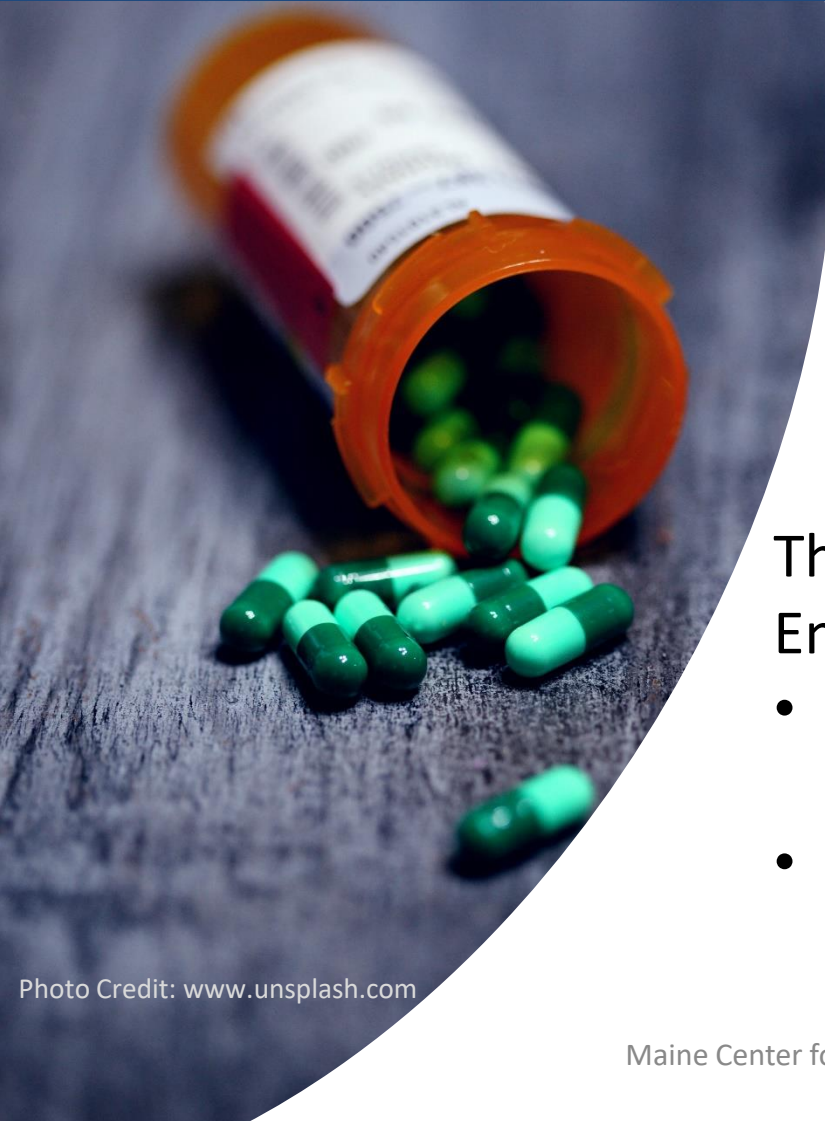
- University of Maine Cooperative Extension Tick Laboratory
 - Tick identification free of charge
 - Tick testing for \$15 fee (only Maine residents)

www.ticks.umaine.edu



Remember: clinical decisions should **NOT** be made based on tick testing services

What if I start to feel sick?



Talk to a healthcare provider if you start to feel unwell after a tick bite

Most tickborne diseases can be treated with antibiotics.

There is no treatment for Powassan Encephalitis

- Some symptoms may be treated with over-the-counter drugs
- Severe illness may require supportive treatment in hospital

Photo Credit: www.unsplash.com

Make Your Yard Safer

1 Keep the lawn mowed.

2 Keep leaves raked and get rid of leaf piles.

3 Move wood piles away from the house.

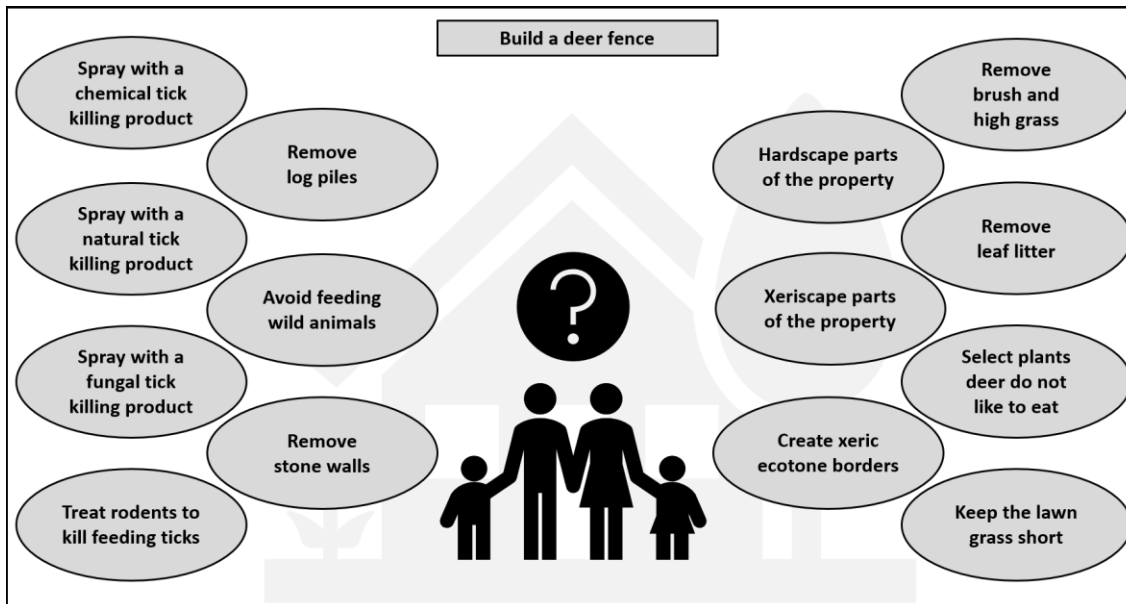
4 Move birdfeeders away from house, garden, and yard toys.

5 Create border with crushed stone or woodchips.



This is how tick control currently is done in the U.S.

Single residential property

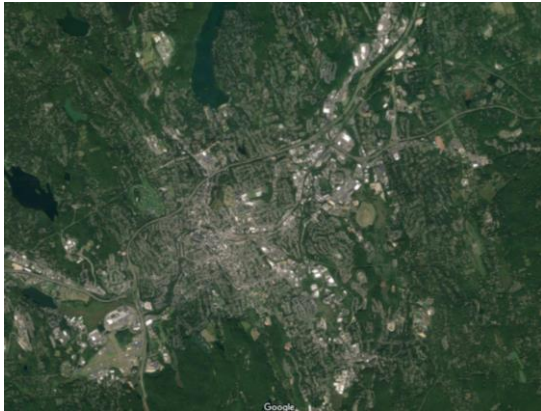


Confused homeowners & Pest Control Firms

Public land



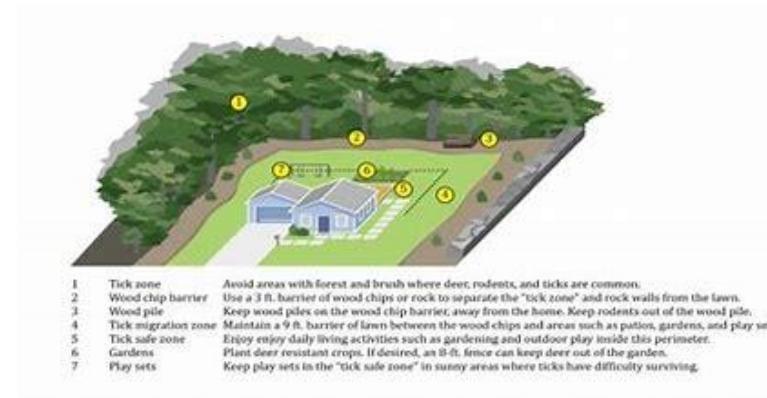
Spatial scales relevant to tick control



Community

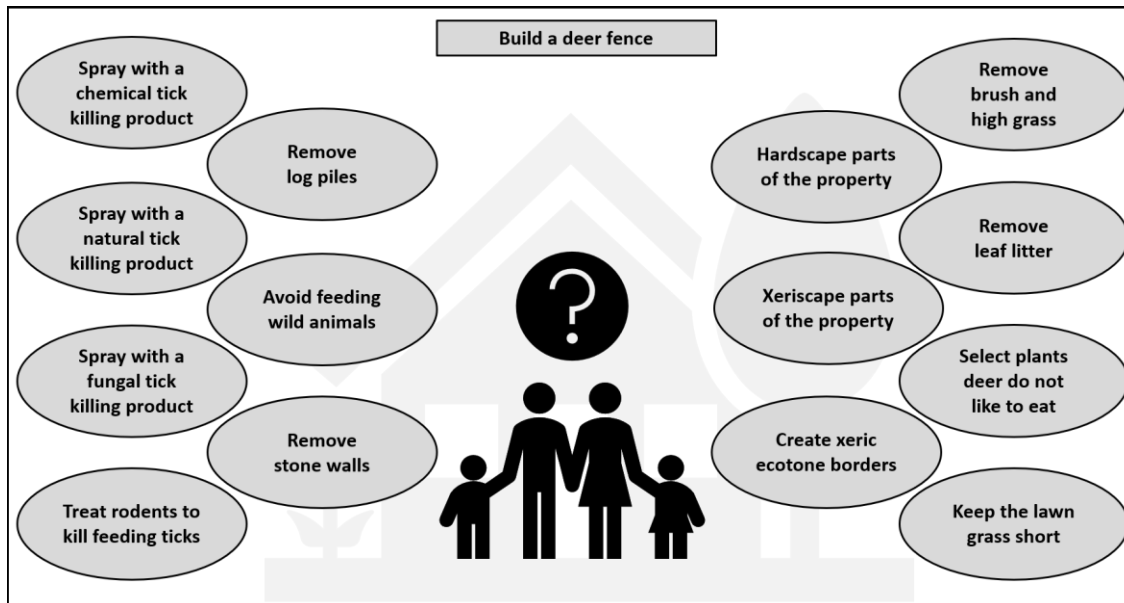


Neighborhood



Individual property

Single residential property solution



The knowledge base for impact of these tactics even on host-seeking ticks on residential properties has more holes than a



Eisen, L. 2021. Control of ixodid ticks and prevention of tick-borne diseases in the United States: The prospect of a new Lyme disease vaccine and the continuing problem with tick exposure on residential properties. *Ticks and Tick-borne Diseases* 12: 101649.

What should a local public health tick management program achieve?

- **Tick surveillance** (define local high-risk environments for tick exposure, incl. high use portions of public lands such as trails, picnic areas, wooded edges of sports fields/playgrounds, etc.) & **Posting of warning signs**
- **Tick control for high use portions of public lands, incl. assessment of the control interventions on host-seeking ticks**
- **Assistance to homeowners regarding options for locally appropriate tick control on their properties** (objective information to complement what can be found via internet searches and/or by contacting pest control firms)
- **Working with homeowners and pest control firms on operational quality control projects to assess the impact of tick control implemented by residents or pest control operators on residential properties on host-seeking ticks**
- **Outreach to local community of where and when during the year they are at risk for bites by different tick species and their associated pathogens & Advice on personal protective measures to prevent tick bites**

For More Information

Maine CDC

- Vectorborne Disease Information: www.maine.gov/dhhs/vectorborne
- Information for Schools: <https://www.maine.gov/dhhs/shm>
- Disease Reporting Consultation Line: 1-800-821-5821
- Disease Reporting Consultation Email: disease.reporting@maine.gov

MaineHealth Institute for Research Vectorborne Disease Lab

- www.mhir.org

University of Maine Cooperative Extension

- www.ticks.umaine.edu

