

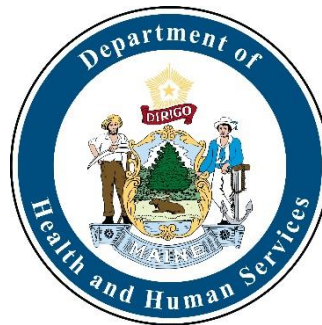
# Vectorborne Diseases – Maine, 2019

*Presented by:*

**Maine Center for Disease Control and Prevention**

*In cooperation with*

**The Maine Medical Center Research Institute**



# Agenda

## **Ticks**

- Tick Biology & Ecology
- Tickborne Diseases
- Tick Bite Prevention

## **Mosquitoes**

- Mosquito Biology & Ecology
- Mosquito-borne Diseases
- Mosquito Bite Prevention

TICKBORNE

# Ticks

There are 14 different species of ticks potentially found in Maine.



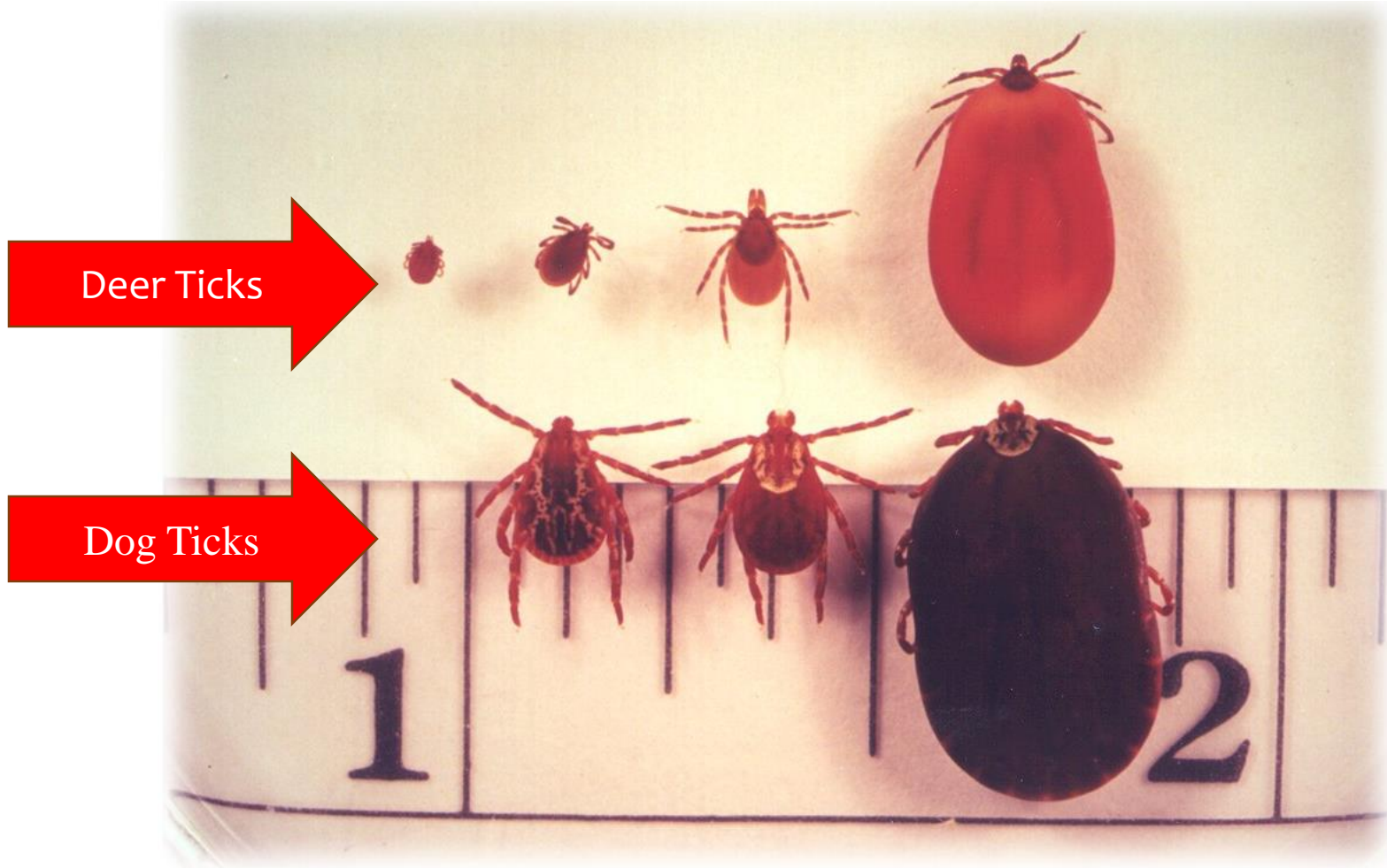
**Deer or Blacklegged Tick** (*Ixodes scapularis*)  
female (left) and male (right).

**Woodchuck Tick** (*Ixodes cookei*)  
female (left) and male (right).



**American Dog Tick** (*Dermacentor variabilis*)  
female (left) and male (right).

# Deer Ticks vs. Dog Ticks



# Deer Tick Nymph



# Tick Ecology

These are the most common ticks in Maine. They are found statewide.

	<b>Deer Tick</b>	<b>Dog Tick*</b>	<b>Woodchuck Tick</b>
<b>Habitat</b>	Mixed forests, woodland edges of fields, and suburban landscapes	Open fields, lawns, and forested areas	In and around the dens/nests of their hosts
<b>Activity</b>	Early spring to late fall	April to August	Summer months
<b>Peak</b>	April or May w/ another in late October	May and June	July
<b>Medical Importance</b>	Lyme disease, Anaplasmosis, Babesiosis, <i>Borrelia miyamotoi</i> , and Powassan Encephalitis <sup>1</sup>	Rocky Mountain Spotted Fever and Tularemia	Powassan Encephalitis <sup>2</sup>

\* ticks in Maine not known to be infected with these diseases

<sup>1</sup> disease caused by Deer Tick Virus

<sup>2</sup> disease caused by Powassan Virus

# Deer Tick Habitat

- Deer ticks are found everywhere in Maine, but they are concentrated in southern and mid-coastal regions
- Areas where deer ticks live include:
  - Wooded or forested areas
  - Wild, unmaintained landscapes with high grass
  - Brush or leaf piles
- Deer ticks are active at any temperature above freezing





# Deer Tick Habitat

## Favorable

- Deciduous (broadleaf) forest such as oaks
- Shrubby areas



## Unfavorable

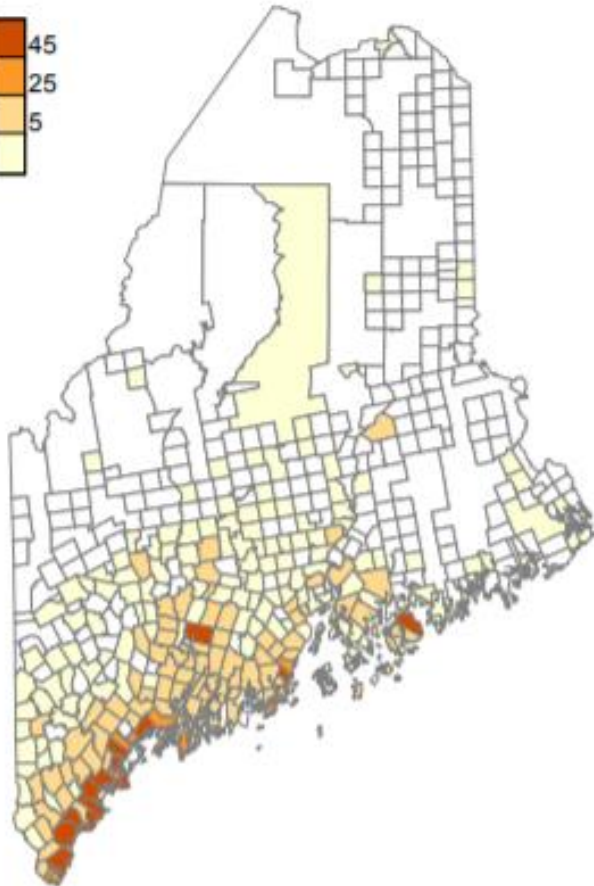
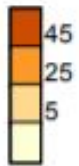
- Open, dry habitats



# Deer Tick Distribution

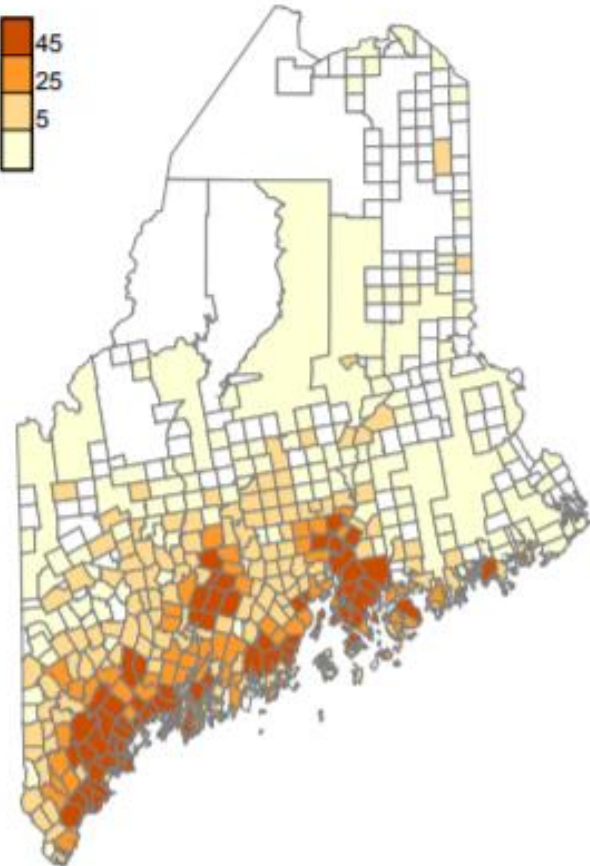
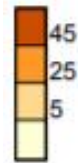
Number of Deer Tick Submissions  
by Town, Maine 1989-2000

Number

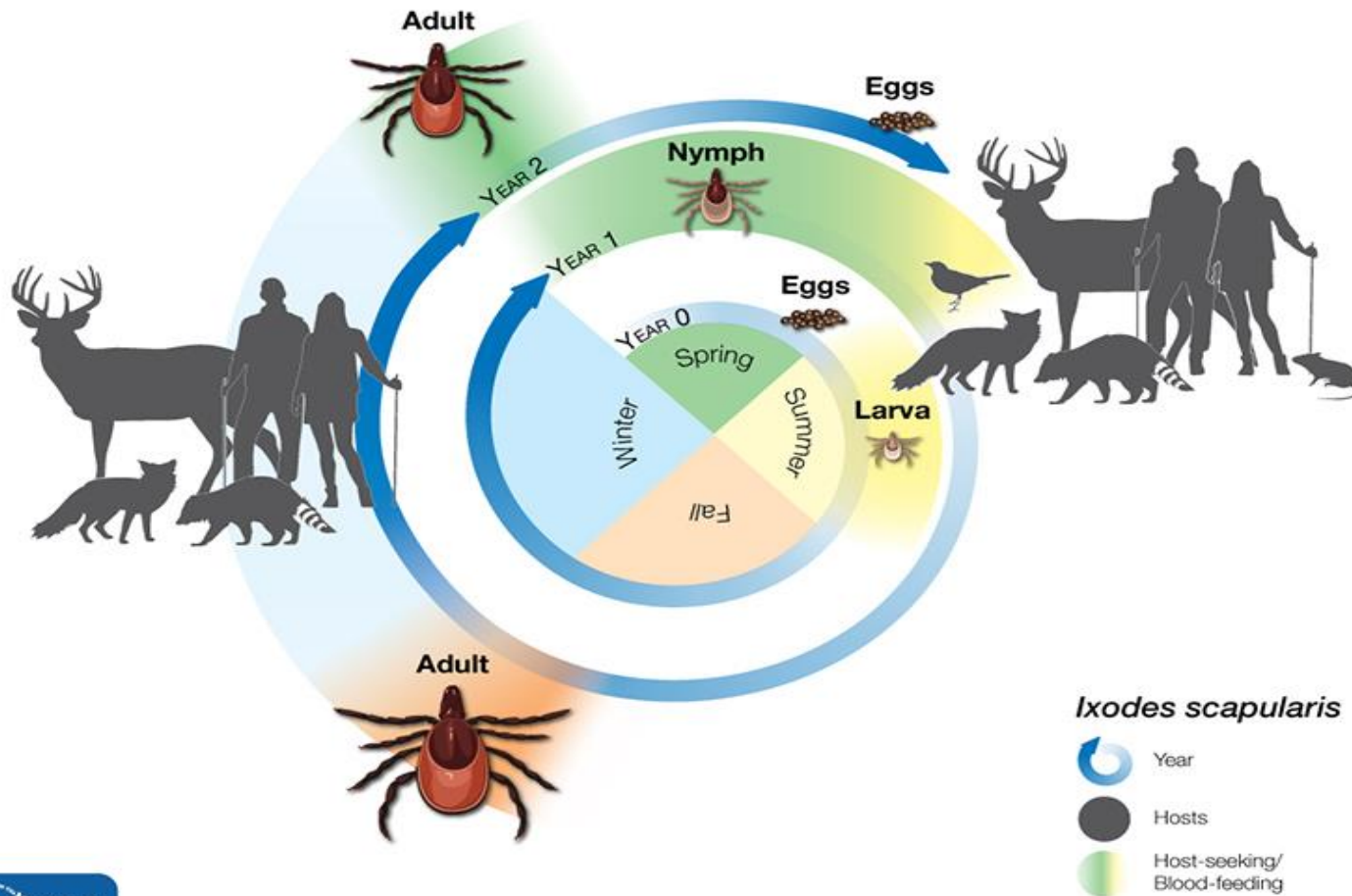


Number of Deer Tick Submissions  
by Town, Maine 2001-2013

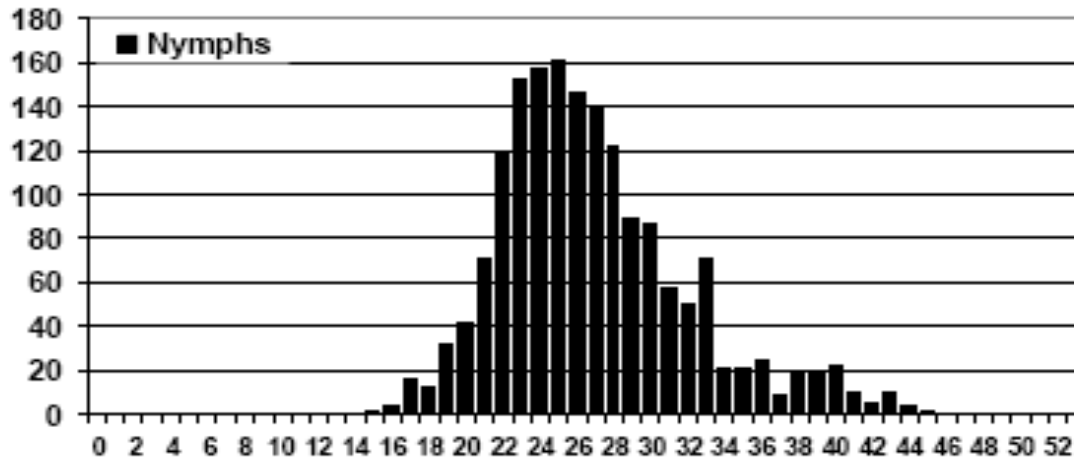
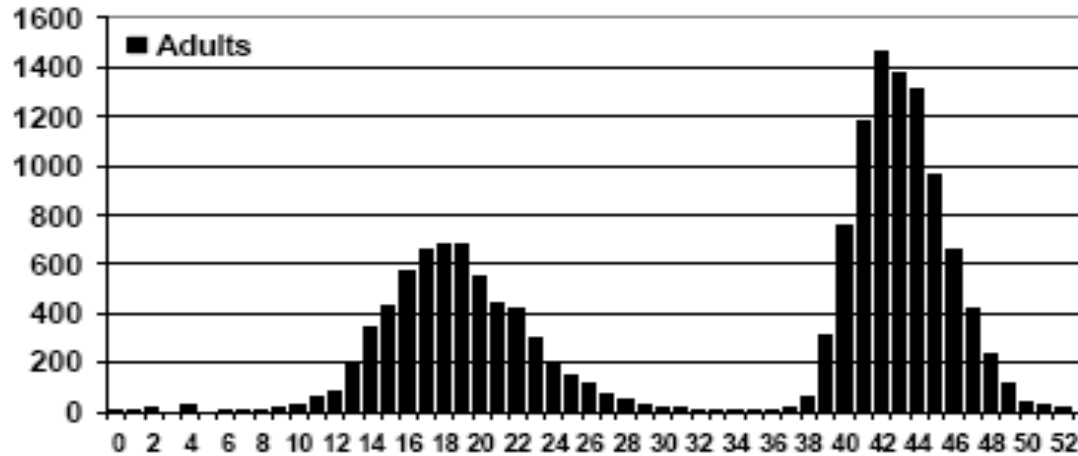
Number



# Tick Lifecycle

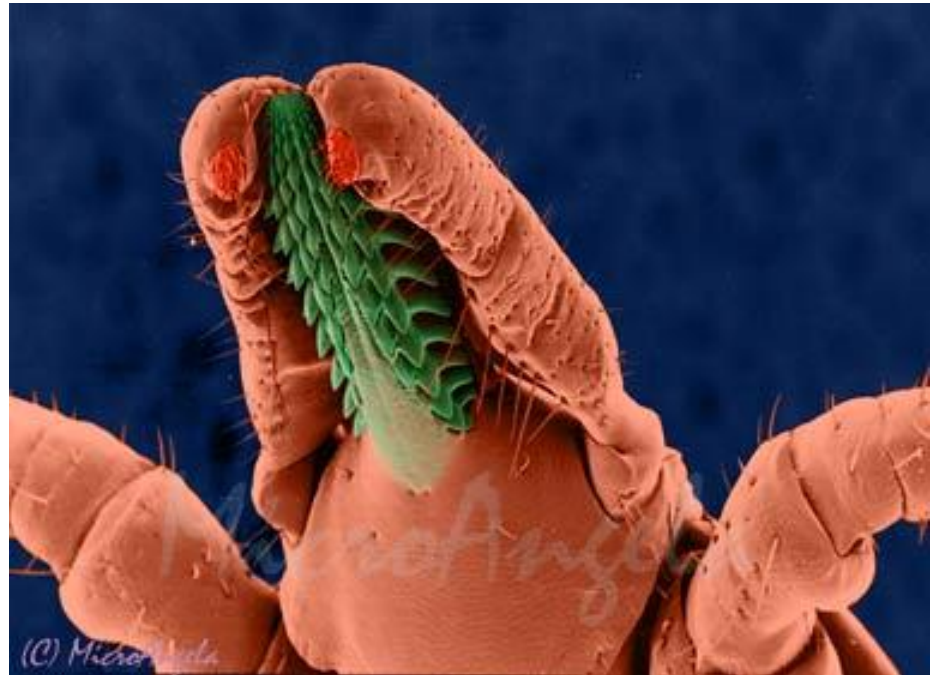


# Weekly Deer Tick Submissions: 1989-2010



# Tick Bite

- Barbed hypostome
  - Harpoon-like structure allows tick to anchor in place
- Ticks secrete an anesthesia and anticoagulant when biting
  - Anesthesia makes the bite painless
  - Anticoagulant prevents blood from clotting



Scanning Electron Microscope (SEM) image of a deer tick. Barbed hypostome shown in green. Courtesy of MicroAngela.

# Tickborne Diseases in Maine

Anyone can get a tickborne disease, but people who spend time outdoors, children ages 5-14 years, and adults over the age of 65 years are at the highest risk.

## Common

Lyme Disease

Anaplasmosis

Babesiosis

## Rare

Ehrlichiosis\*

Powassan  
Encephalitis

*Borrelia  
miyamotoi*

## Potential Threat\*\*

Rocky  
Mountain  
Spotted Fever

Tularemia

Heartland  
Virus

\* Disease is not endemic in Maine

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

# Lyme Disease

**Lyme disease** is caused by the bacteria *Borrelia burgdorferi*. To transmit the bacterium, ticks must feed for at least 24 hours! Identify symptoms early. Lyme disease treatment is more effective the earlier it is started.

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

These symptoms may appear weeks to years after a bite if not treated early:



Arthritis



Neurologic, Memory, and Concentration Problems



Heart Problems

# EM Rashes

**“Classic” Lyme disease rash**



**Expanding rash with central crust**



**Multiple rashes, disseminated infection**



**Red, oval plaque on trunk**



**Expanding rash with central clearing**



**Bluish rash, no central clearing**



**Red-blue lesion with central clearing**





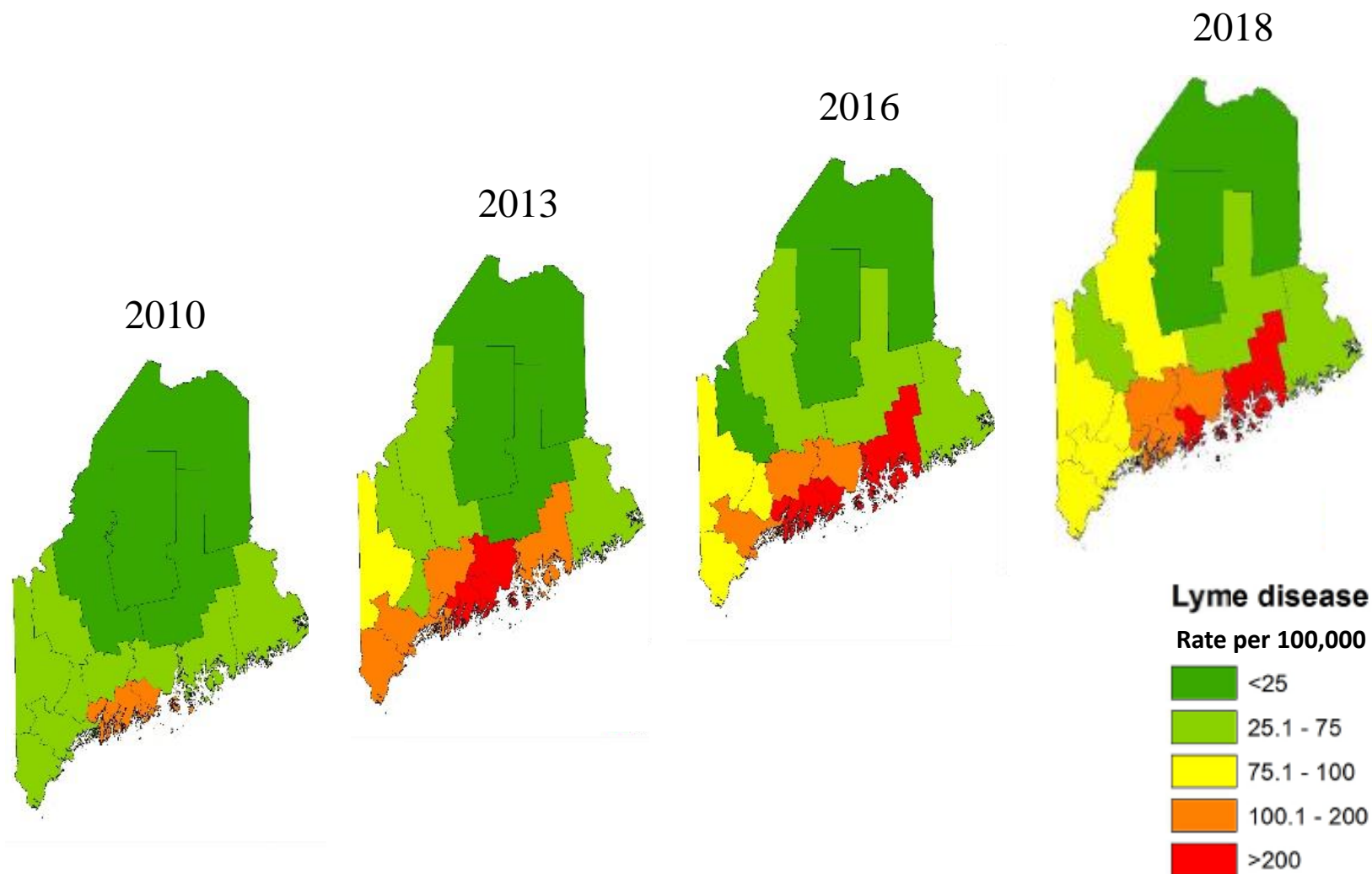
# Distribution of Lyme in United States – 2017

Reported Cases of Lyme Disease -- United States, 2017

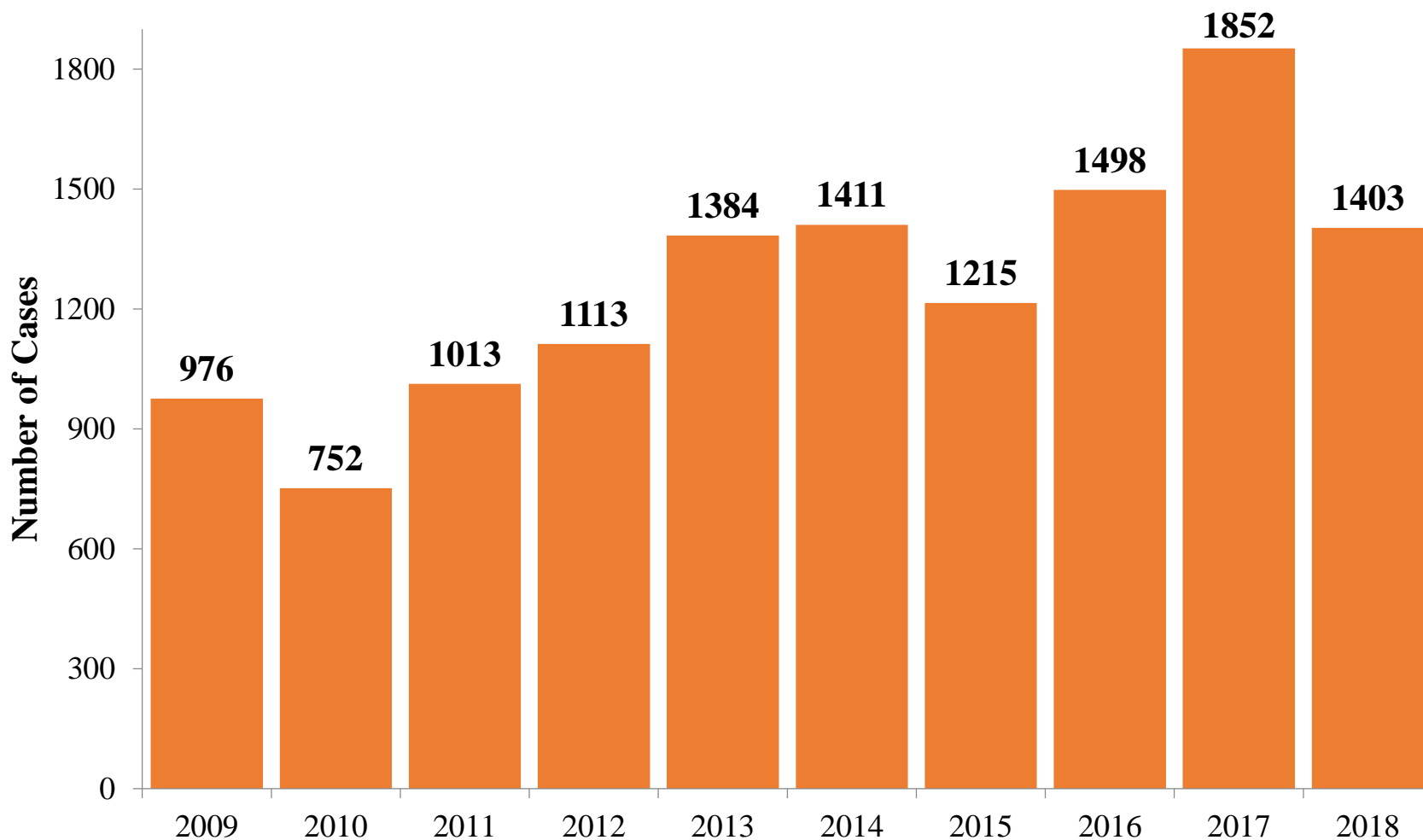


1 dot placed randomly within county of residence for each confirmed case

# Rates of Lyme Disease in Maine by County

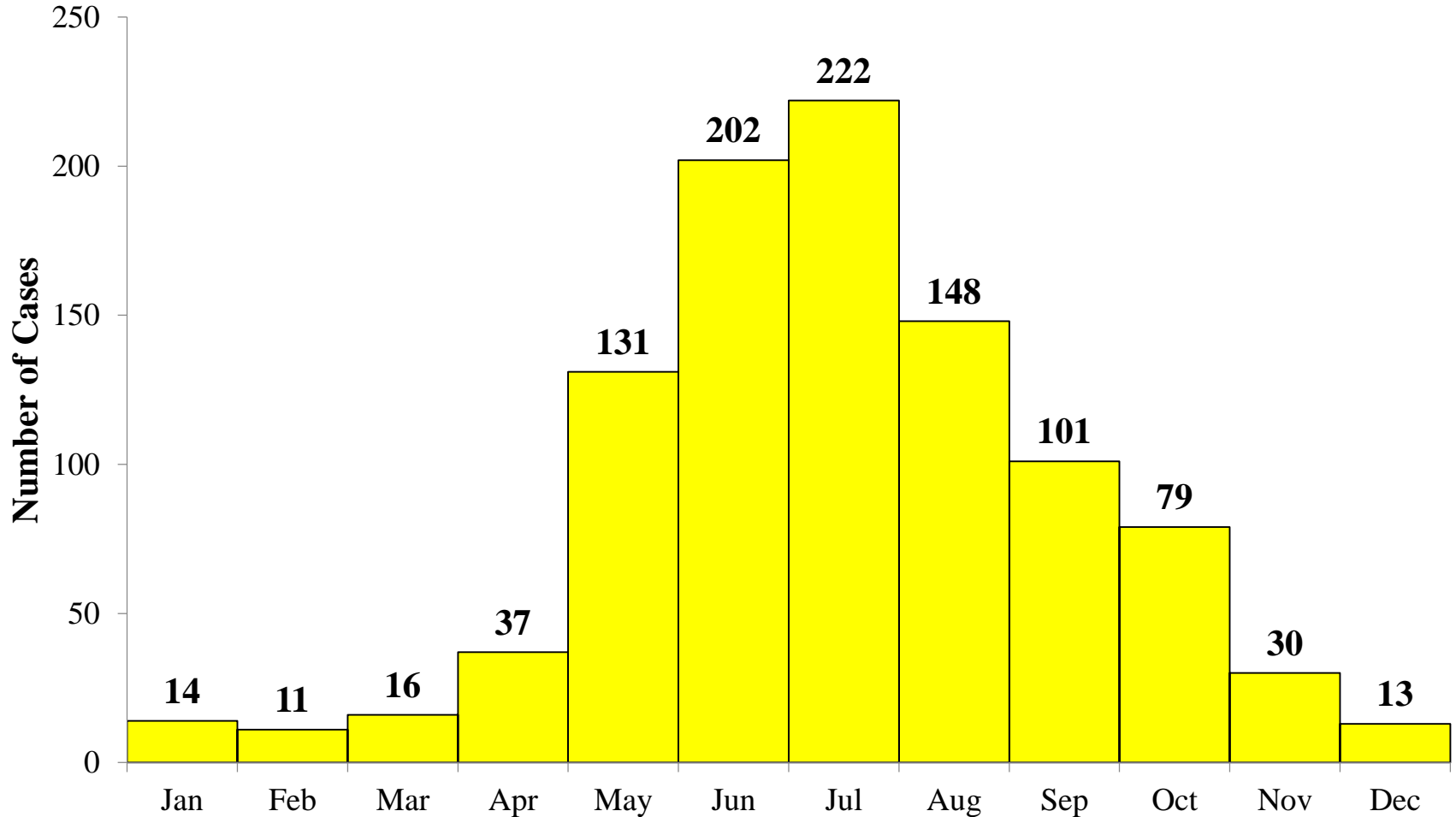


# Lyme Disease Cases – Maine, 2009-2018\*



\*data as of 4/20/2019

# Lyme Disease by Onset Month – Maine, 2018\*

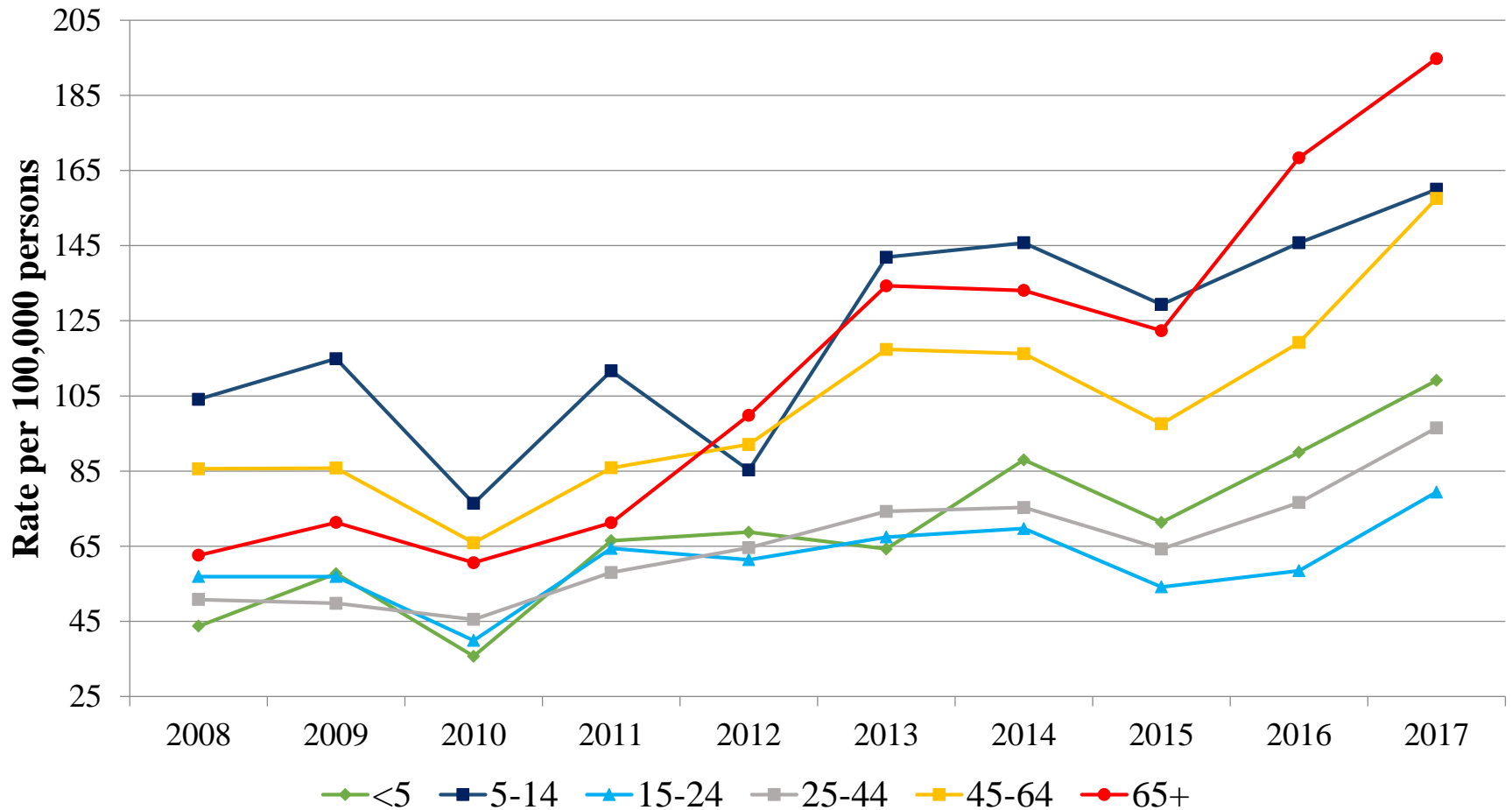


\*data as of 1/15/2019

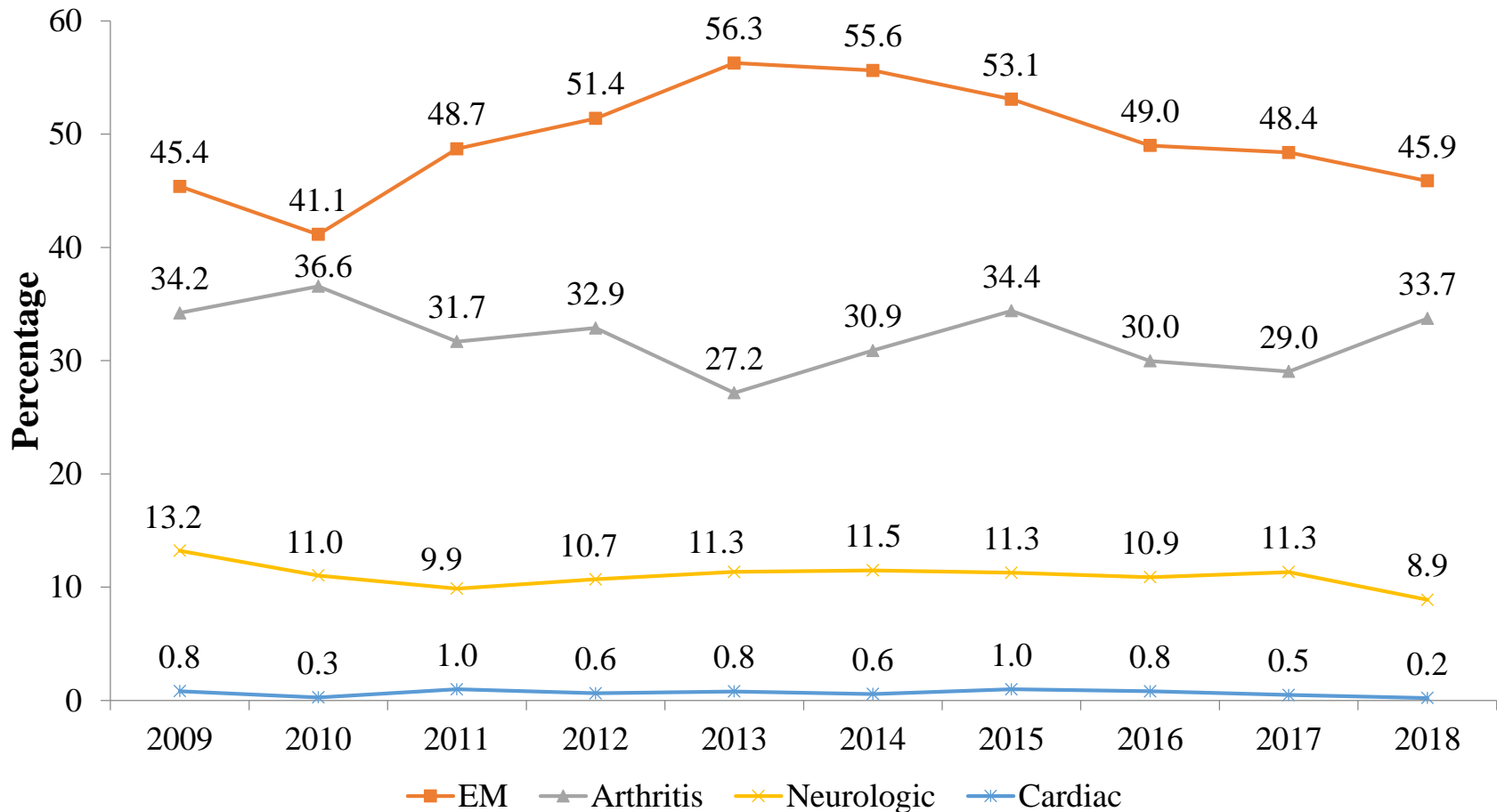
Maine Center for Disease Control and Prevention

20

# Rates of Reported Lyme Disease Cases by Age Group – Maine, 2008-2017



# Percentage of Symptoms Reported Among Lyme Disease Cases – Maine, 2009-2018\*



\*data as of 1/15/2019

# Anaplasmosis

**Anaplasmosis** is an illness caused by the bacteria *Anaplasma phagocytophilum*.

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

Common



Fever and Chills



Headache



Muscle Pain

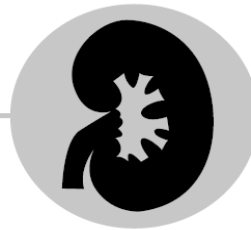


Nausea and  
Abdominal Pain

More Severe



Difficulty Breathing



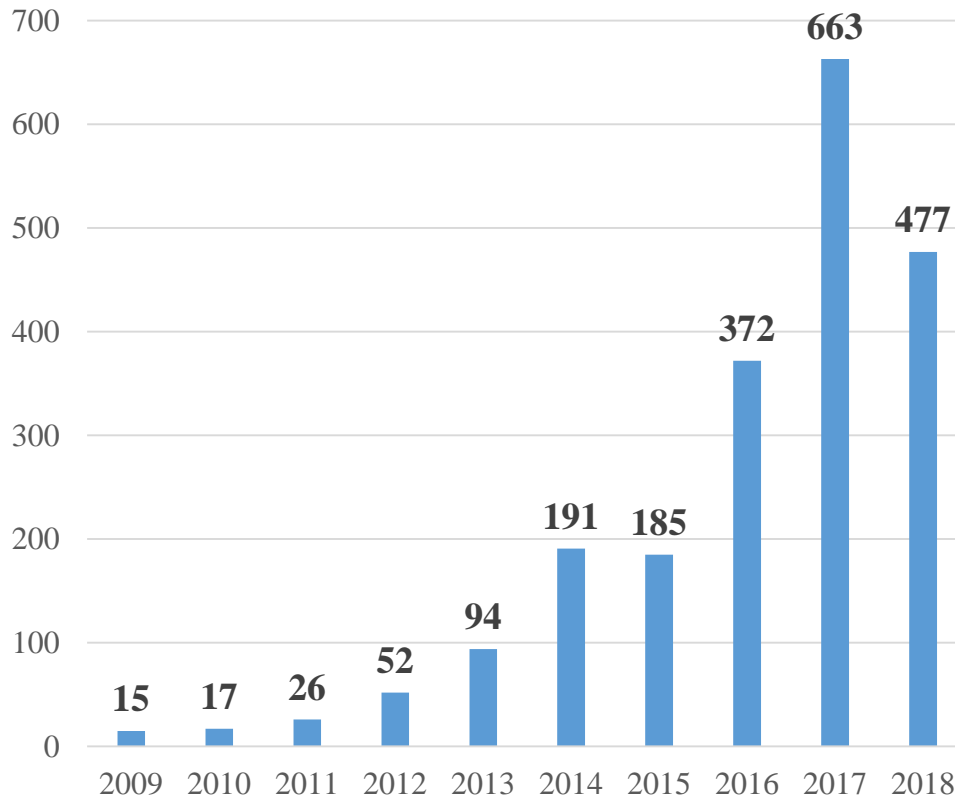
Kidney Failure



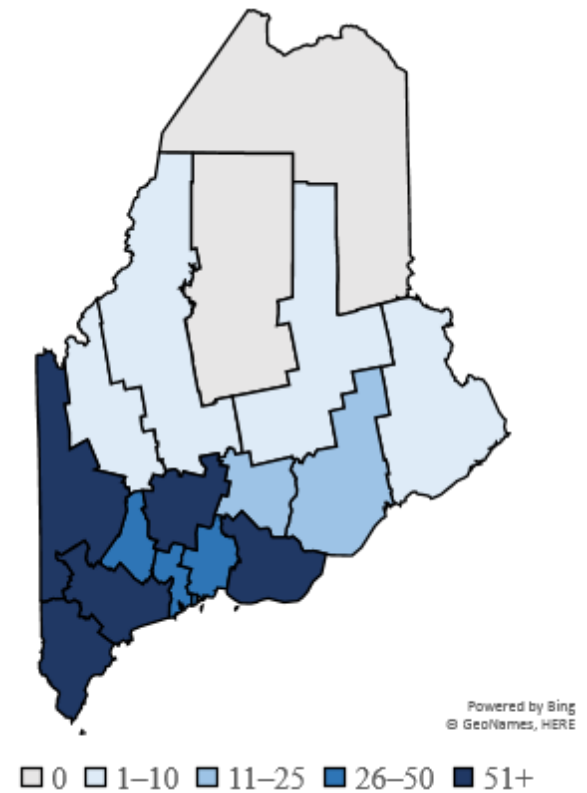
Neurologic Problems

# Anaplasmosis

Anaplasmosis Cases by Year  
– Maine, 2009-2018\*



Anaplasmosis Cases by County –  
Maine, 2018\*



\*data as of 1/15/2019



# Babesiosis

**Babesiosis** is a disease caused by parasites of the genus *Babesia* that infect red blood cells. It can also spread through contaminated blood transfusions. In rare cases, the disease can pass from mother to child during pregnancy.

Symptoms start within a few weeks or months, sometimes longer. They can last days to months and some people may not show any signs.



Fever and Chills



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



Headache

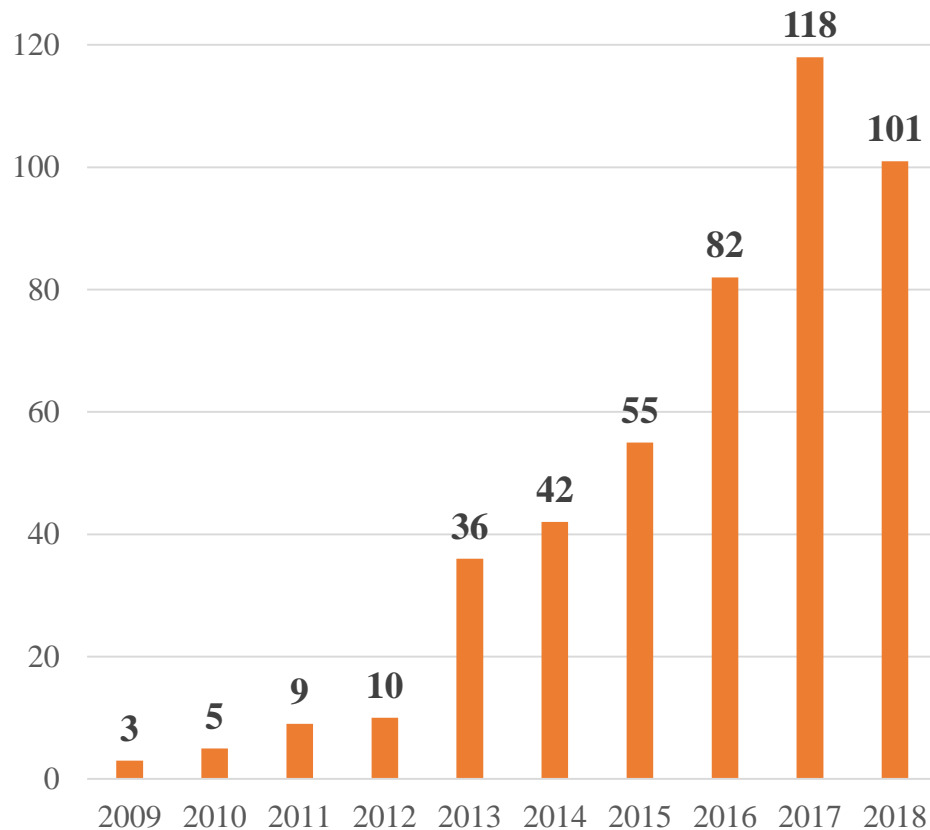


Feeling Very Tired

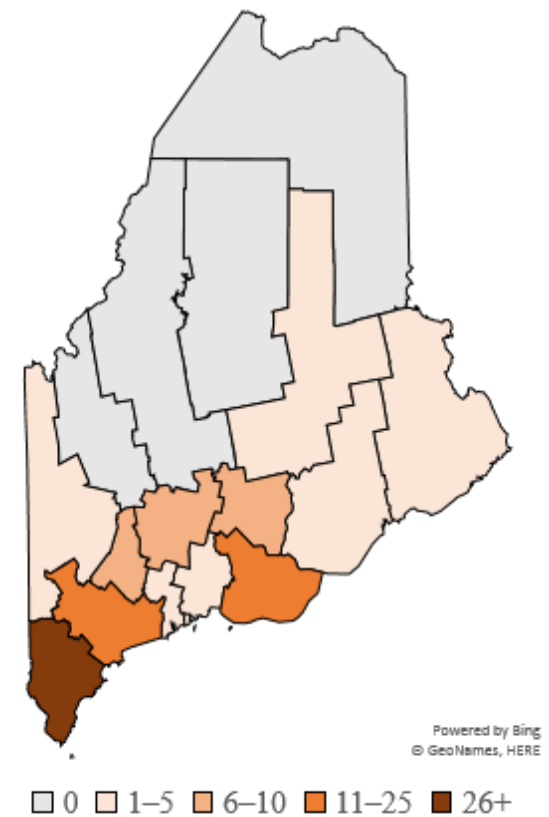
It is found most frequently in the elderly, in those without a healthy spleen, and in those with a weak immune system. Babesiosis can be severe and life-threatening.

# Babesiosis

Babesiosis Cases by Year –  
Maine, 2009-2018\*



Babesiosis Cases by County –  
Maine, 2018\*



\*data as of 1/15/2019

# Other Tickborne Diseases

## **Powassan Encephalitis**

- Symptoms include fever, headache, nausea/vomiting and body aches
  - In more serious cases, the disease may progress to confusion, swelling of the brain, and death
  - Half of survivors have permanent brain damage and 1 in 10 cases die
- Since we began seeing cases in 2013, Maine has cases almost every year

## ***Borrelia miyamotoi***

- Newly described tickborne illness identified in ticks in 1995
- Symptoms include fever/chills, headache, muscle/joint pain, and fatigue
- First cases identified in Maine residents in 2016
  - 6 cases in 2017, and 8 cases in 2018

# Other Tickborne Diseases

## **Ehrlichiosis**

- Carried by the Lonestar tick (*Amblyomma americanum*)
  - The Lonestar tick is uncommon in Maine
- Symptoms last 1-2 weeks and include fever, headache, nausea and body aches (most patients recover with no issues)
  - In more serious cases, respiratory failure, meningitis, and kidney failure can occur
- Maine has cases, usually travel-related, every year

## **Rocky Mountain Spotted Fever (RMSF)**

- Symptoms include fever, headache, and a rash
  - A non-itchy, dotted red rash (called macules) appear on the palms of the hand and soles of the feet
- There have been 0 confirmed cases in Maine

# Treatment



- Following a tick bite, monitor for a fever, chills, and other symptoms for 30 days
- Talk to a doctor if you start to feel unwell
- Tickborne diseases are diagnosed based on symptoms and confirmed through lab tests

- Most tickborne diseases can be treated with antibiotics
- There is no specific treatment for Powassan Encephalitis
  - Some symptoms may be treated with over-the-counter (OTC) drugs
  - Severe illness may include supportive treatment in the hospital

Current treatment guidelines can be found on the Infectious Diseases Society of America website

# Tick Bite Prevention



Wear light colored, long-sleeved clothing. Tuck your pants into your socks.



Use an EPA approved bug spray.



Rake your leaves and keep your lawn mowed.



Do daily tick checks and check your pets too.



Use an EPA-approved repellent for use on skin such as:

- DEET
- Oil of Lemon Eucalyptus
- IR 3535
- Picardin



Use permethrin for use on clothing


# Personal Protection



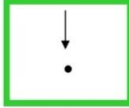
# Personal Protection: Tick Check

**Don't Forget to Check for Ticks!!**

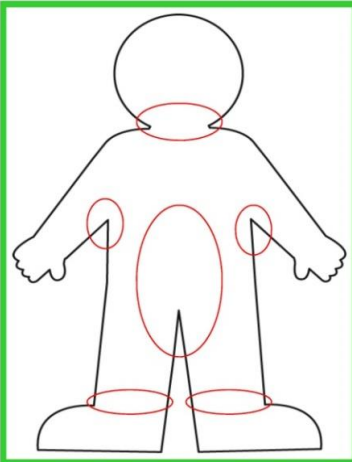
**They look a little something like this:**



**But their actual size is more like this:**



**Places on your body where ticks commonly hide**



**WHAT TO DO IF YOU FIND ONE ON YOUR BODY:**

- Grasp the tick with tweezers as close to the skin as possible.
- Pull gently but firmly until the tick lets go.
- Do not handle the tick with bare hands or squeeze the tick.
- Apply antiseptic to the bite.

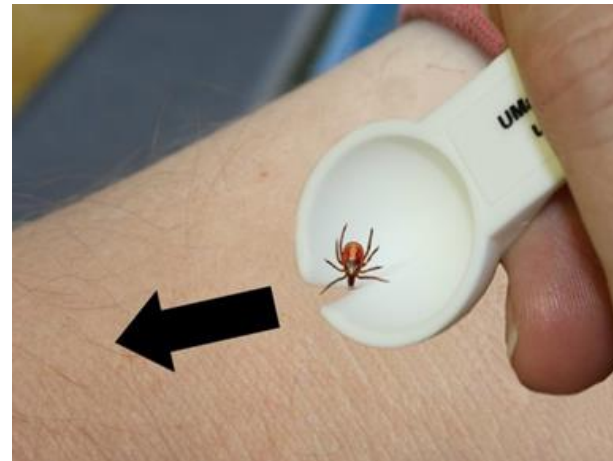
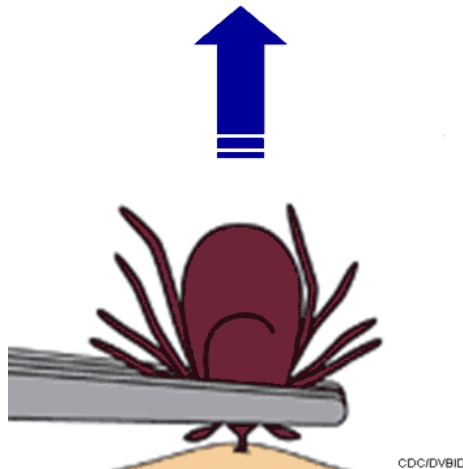


# Safe Tick Removal

Use a tick spoon or fine-tipped tweezers to remove a tick

- Using tweezers, grab the tick by its mouth and use firm, steady pressure to pull the tick out. Do not use twisting motions
- Using a tick spoon, line the notch of the spoon up with the head of the tick and gently scoop

Do **NOT** use nail polish, matches, or petroleum jelly to remove the tick. These methods increase the risk of localized skin infection.



# Make Your Yard Safer

- Remove brush, leaf litter and tall grass
- Create a dry border between woods and lawn
- Remove plants that attract deer and construct physical barriers that may discourage deer from entering your yard



# Killing and Preserving Ticks

- To kill a tick, found either in your home or removed from a person/pet, it is easiest to put it in a container of rubbing alcohol
- Tick will soon die and be preserved in the event it is submitted to a laboratory
- Washing your clothes will not kill the tick, however drying clothes for 15 to 30 minutes on high heat before washing will kill the ticks

# Submitting Ticks

The University of Maine Orono Cooperative Extension's  
Tick Submission Website is live!

[ticks.umaine.edu](https://ticks.umaine.edu)

- Tick identification is still free of charge
  - Includes tick species and degree of engorgement
- Deer ticks can now be submitted for testing (as of March 2019)
  - Deer tick panel includes testing for Lyme disease, anaplasmosis and babesiosis
  - 3-day turnaround
  - ONLY available to Maine residents for \$15
  - Tick testing includes tick identification
- Instructions on how to submit ticks can be found on the website
- An online tick submission form should accompany each tick

\* Reminder: clinical decisions should not be made based on this testing service

# MOSQUITO-BORNE

# Mosquito Habitat

There are more than 45 different species of mosquitoes in Maine.  
About 50% of these species feed on human blood.

- Different types of mosquitoes prefer different types of habitats
  - Some mosquitoes like wetlands, forested areas and artificial containers
  - Other mosquitoes like urban and suburban habitats
- All mosquitoes require standing water for breeding
  - Generally, rivers and fast-flowing streams are not a place where people will find mosquito larvae



# Natural Mosquito Habitats

- Natural plant containers
  - Rain-filled cavities in trees
  - Water-holding plants (e.g., bromeliads)
  - Holes in trees
- Bogs and swamps
  - Mature hemlock, immature red maple, yellow birch, beech, winterberry, shrubs
  - Clear or tea colored water
  - Peat bottom
  - Acidic



Photo courtesy of Kim Foss, Swamp Inc

# Artificial Mosquito Habitats



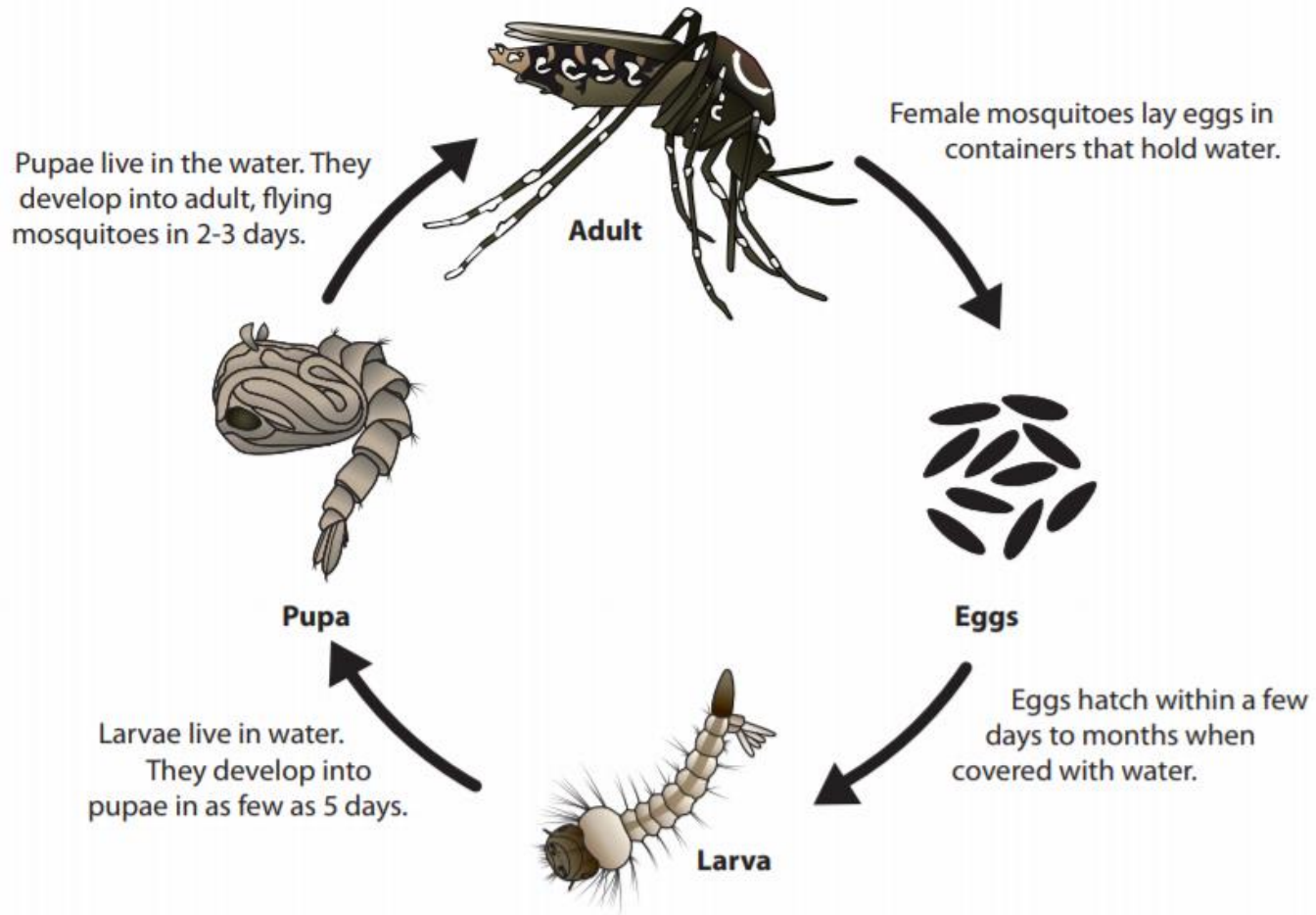
- Large discarded containers (tires, damaged appliances)
- Small discarded containers (paint cans)
- Plant pots and dishes
- Plastic pools
- Trash cans
- Pails or buckets
- Toys
- Bottle caps





# Mosquito Lifecycle

It takes about 7-10 days for an egg to develop into an adult mosquito.



# Mosquito Bite and Behavior

- Only female mosquitoes take blood meals from humans and animals
  - Females have a long proboscis (mouth) to pierce skin and suck blood
    - Blood is a source of nutrients for eggs
  - Prior to taking a blood meal, the female injects saliva into host blood
    - This prevents blood from clotting and causes mild inflammation
- Female mosquitoes search for hosts using a number of different methods
  - e.g., the CO<sub>2</sub> from the air humans exhale or the pheromones of human sweat



# Mosquito-borne Diseases in Maine

## Endemic

- Eastern Equine Encephalitis
- West Nile Virus
- Jamestown Canyon Virus

## Rare

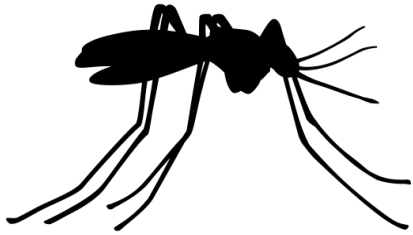
- La Crosse Encephalitis Virus
- St. Louis Encephalitis Virus

## Travel-Associated

- Chikungunya Virus
- Dengue Virus
- Malaria
- Yellow Fever Virus
- Zika Virus

# Arboviruses

## Arthropod-borne viruses



- Arboviruses spread to people mostly through the bite of an infected mosquito
- Some arboviruses, like WNV, can also spread through blood transfusions, organ transplants, breastfeeding, and from mother to baby during pregnancy

- Anyone can get an arboviral disease, but people who spend time outdoors are at the highest risk
- People over 50 and under 15 are also at high risk for severe illness
- Arboviruses can not only infect people, but also livestock, birds, and other animals



# Endemic Arboviruses

## **Eastern Equine Encephalitis Virus (EEE)**

EEE is a rare but serious disease. It is one of the most serious mosquito-borne diseases in the United States. About a third of people with EEE die.

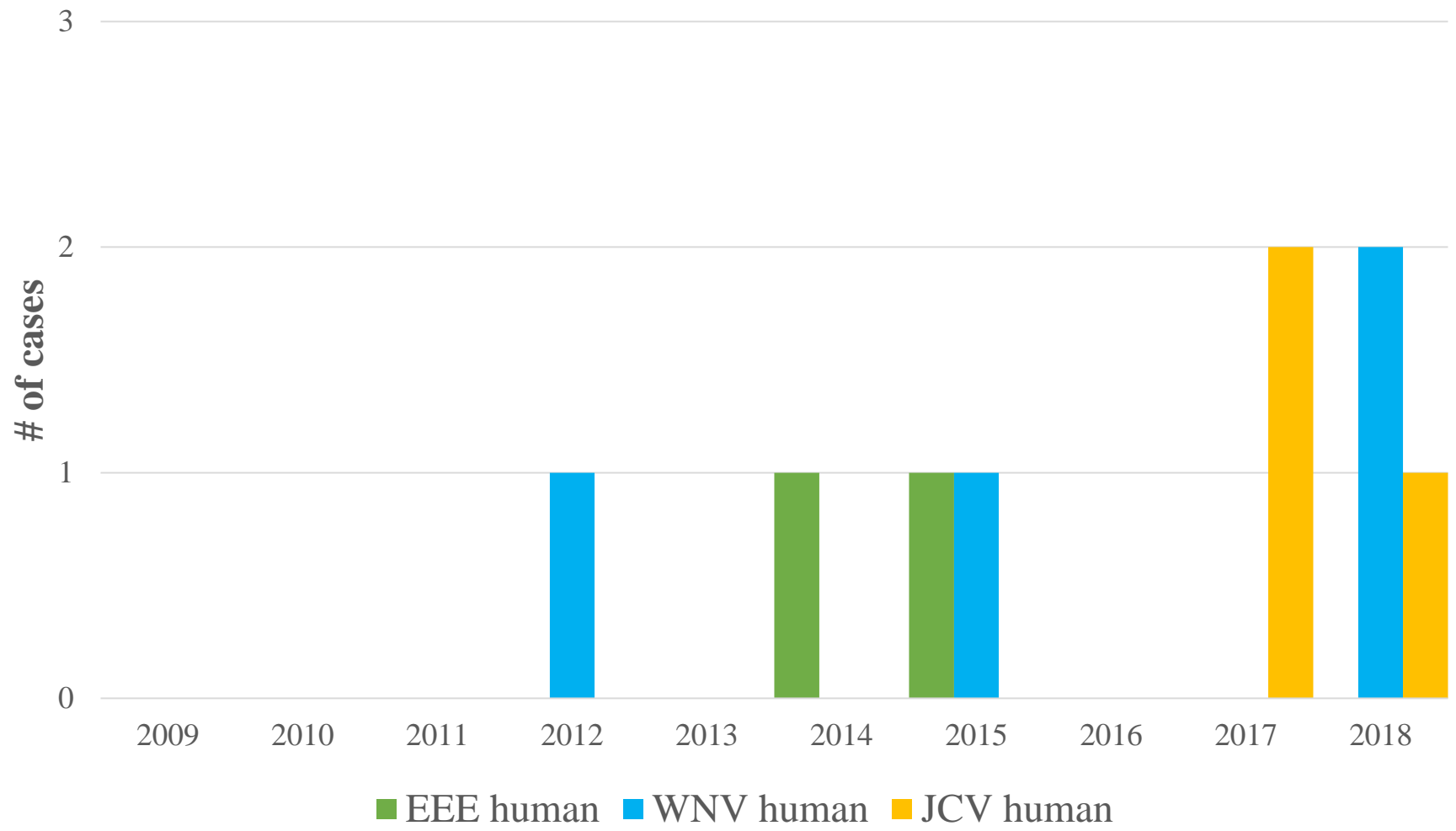
## **Jamestown Canyon Virus (JCV)**

Reports of JCV are rare in the United States. About half of JCV cases result in hospitalization.

## **West Nile Virus (WNV)**

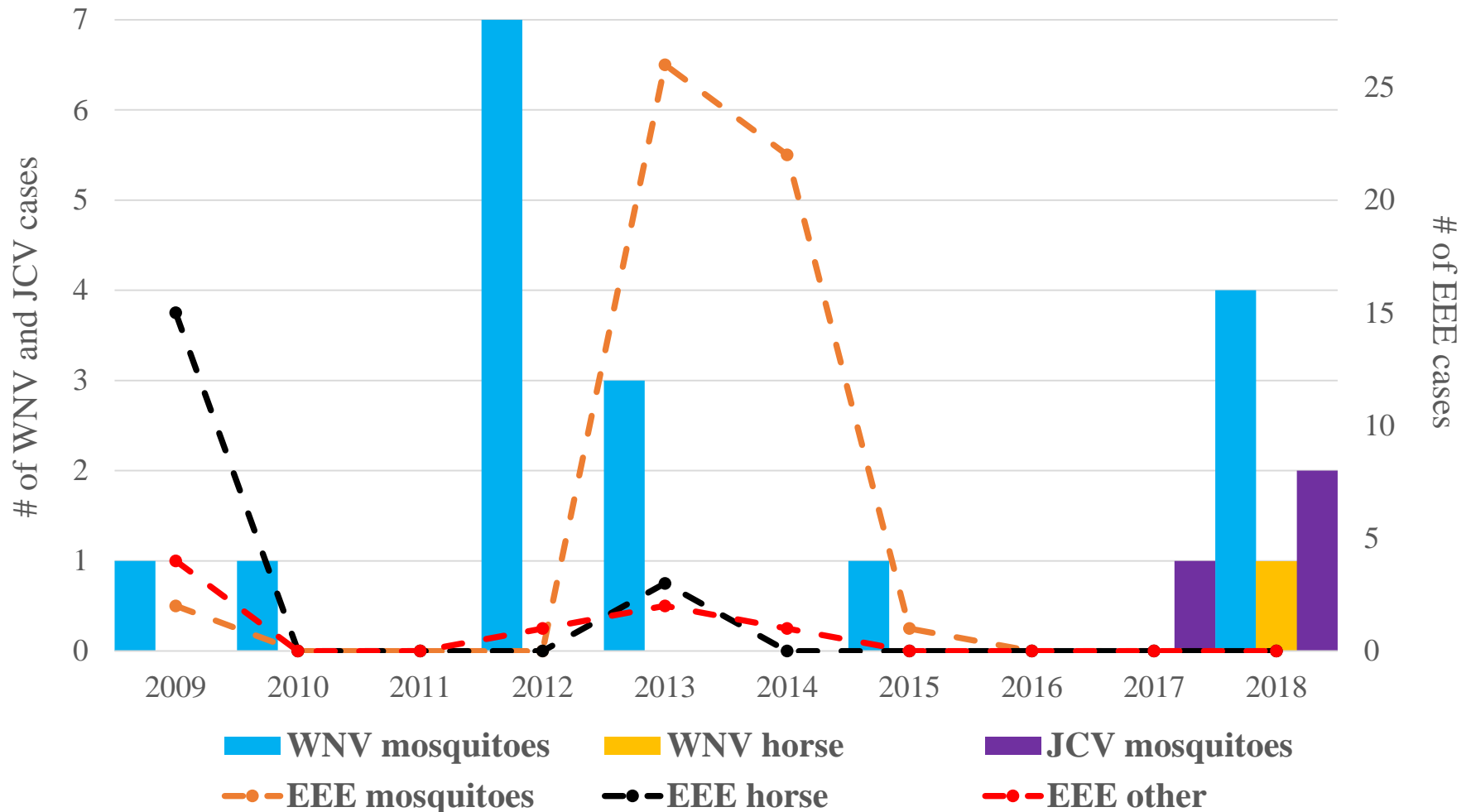
WNV occurs throughout the United States. Most people with WNV that show mild signs and symptoms recover completely, but fatigue and weakness can last for weeks or months. A small number of cases with serious signs and symptoms die.

# Reported Human Cases of Endemic Arboviruses – Maine, 2009-2018\*



\*data as of 4/20/2019

# Endemic Arboviruses in Non-Humans – Maine, 2009-2018\*



\*data as of 4/20/2019

# Symptoms of Arboviral Illness

- Symptoms range from mild to severe
- Some people will not show any signs of illness
- Symptoms of EEE and WNV start a few days to 2 weeks after being bitten by an infected mosquito
- The incubation period for JCV is unknown



Fever and Chills



Head and Body Aches



Nausea



Swollen Glands



Disorientation



Muscle Weakness



Coma



Neck Stiffness



Feeling Very Tired



Inflammation of the Brain



Diarrhea



# Treatment



- Talk to your doctor if you have any of these signs or symptoms
- Your doctor may take samples of blood and cerebral spinal fluid to test for these viruses
- There is no specific treatment for these diseases, but some symptoms can be treated with over-the-counter (OTC) drugs
- Severe illness usually requires supportive treatment in the hospital

# Mosquito Bite Prevention

Avoid being outdoors at dawn and dusk when many mosquitoes are most active. The best way to prevent disease is to protect yourself and others from mosquito bites.



Use an EPA-approved repellent for use on skin such as:

- DEET
- Oil of Lemon Eucalyptus
- IR 3535
- Picaridin



Wear long-sleeved shirts and long pants when outside



Use permethrin on clothing



Get rid of places where mosquitoes can lay their eggs by draining standing water outside the house

# Make Your Yard Safer

- Standing water should be drained at least once a week from any open container with water
  - This includes buckets, pet bowls, bird baths, etc.
- Additional prevention methods include
  - Drilling holes in things like tires and buckets
  - Fixing holes in doors and window screens



# For More Information

## Maine CDC

- Tick FAQ: <https://www.maine.gov/dhhs/tickfaq>
- Mosquito FAQ: <https://www.maine.gov/dhhs/mosquitofaq>
- School Health page: <https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/shm/index.shtml>
- 1-800-821-5821 (Disease Reporting and Consultation Line)
- [disease.reporting@maine.gov](mailto:disease.reporting@maine.gov)

## Maine Medical Center Research Institute Vector-borne Disease Lab

- 207-396-8246

## University of Maine Cooperative Extension

- 207-581-3880

