

Vectorborne Diseases in Maine

Presented by:

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Maine Center for Disease
Control and Prevention
An Office of the
Department of Health and Human Services

Paul R. LePage, Governor

Mary C. Mayhew, Commissioner

Maine Center for Disease Control and Prevention



maine.gov/idepi
800-821-5821

Presentation Agenda

- Tick biology
- Lyme disease
- Other tick-borne diseases in Maine
- Prevention
- Mosquito ecology
- Mosquito-borne illnesses

Ticks in Maine

- There are 15 different species of ticks endemic to Maine
- **Deer Ticks, Dog Ticks,** Woodchuck tick, squirrel tick, *Ixodes muris*, *Ixodes angustus*, Moose tick, Rabbit tick, Lone Star Tick, Brown Dog Tick (Kennel Tick), Bird Tick, *Ixodes brunneus*, *Ixodes dentatus*, *Ixodes uriae*, and *Ixodes banksi*.

Ixodes Scapularis (Deer Tick)

- **Blacklegged (or deer) ticks** (*Ixodes scapularis*) can transmit several tick-borne diseases including anaplasmosis, babesiosis, and Lyme disease
- Nymphal ticks (~1/16"): most commonly bite humans and are usually found in the spring and fall
- *Generally*, deer ticks prefer wooded areas.



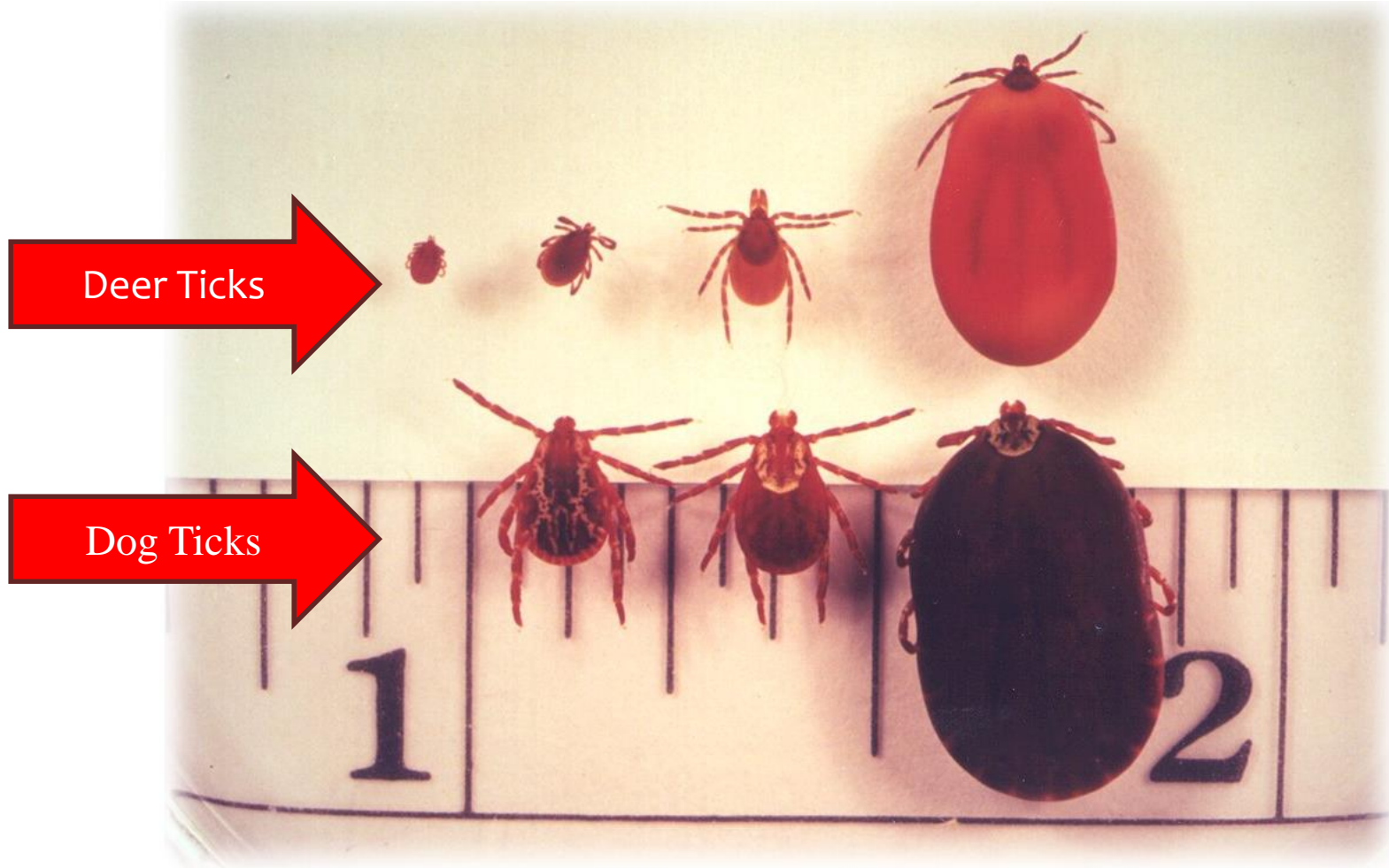
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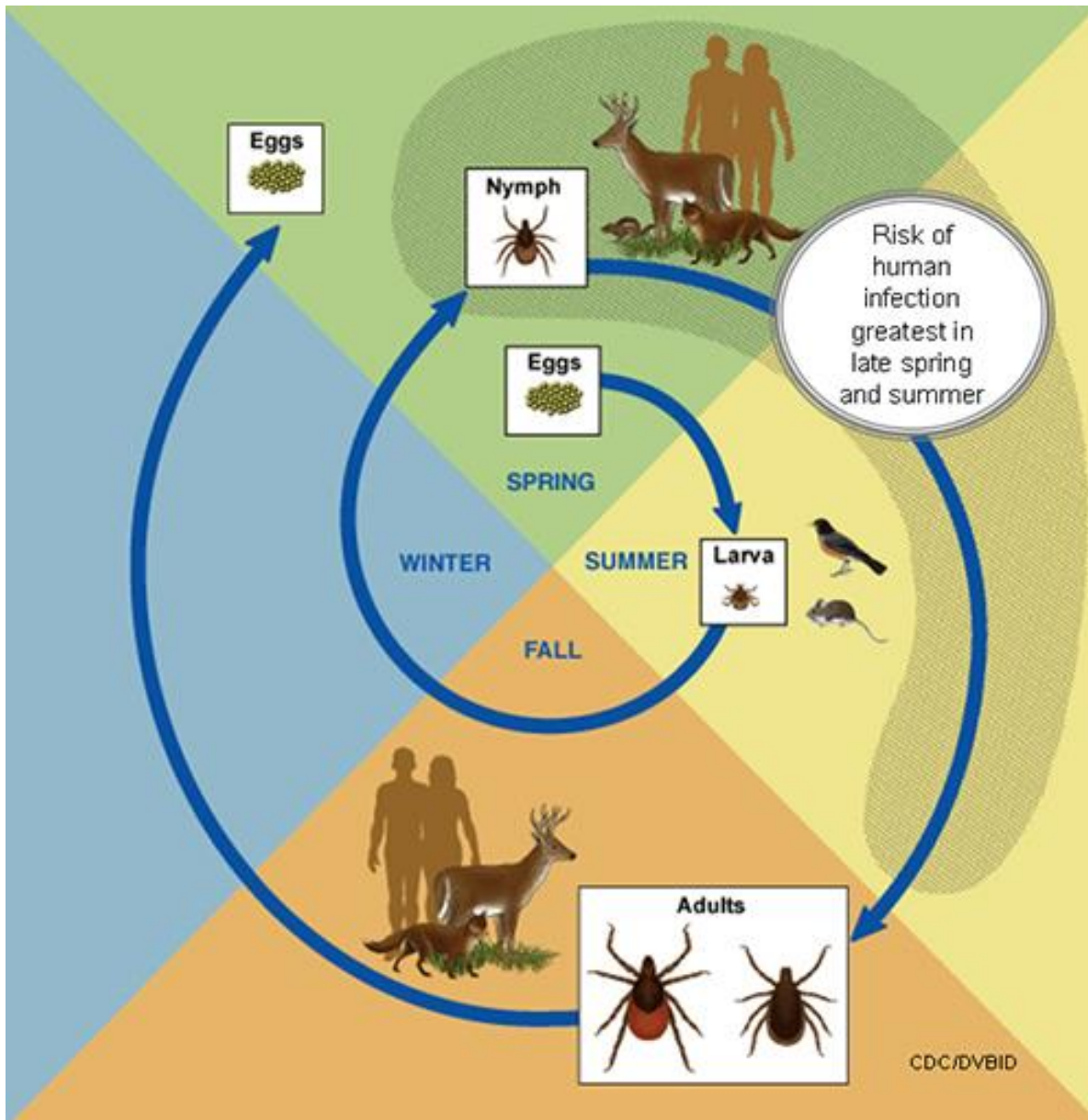
Dermacentor Variabilis (Dog Tick)

- **Dog ticks** (*Dermacentor variabilis*) have either a white scutum (dot or shield behind the head) or white 'racing stripes' down the back
- In the summer, large adult dog ticks (1/8" - 3/16") can be found.
- Typically they are commonly found in open habitats



Deer Ticks vs. Dog Ticks

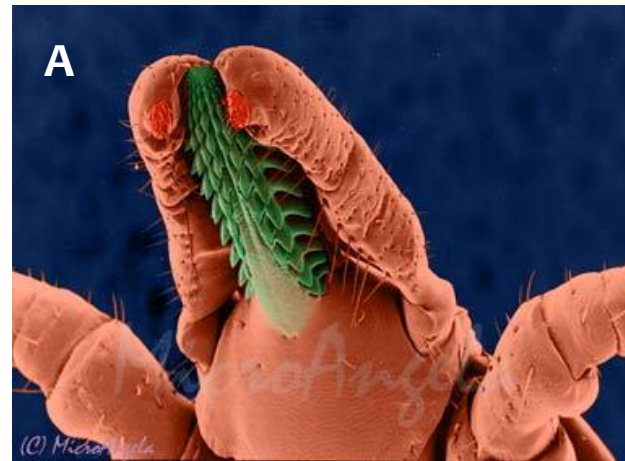






Bite is Worse Than the Bark

- Hypostome barbed
- Ticks secrete an anesthesia and anticoagulant when biting
- To transmit the Lyme bacterium (*Borrelia burgdorferi*), ticks must feed for at least 24 hours!



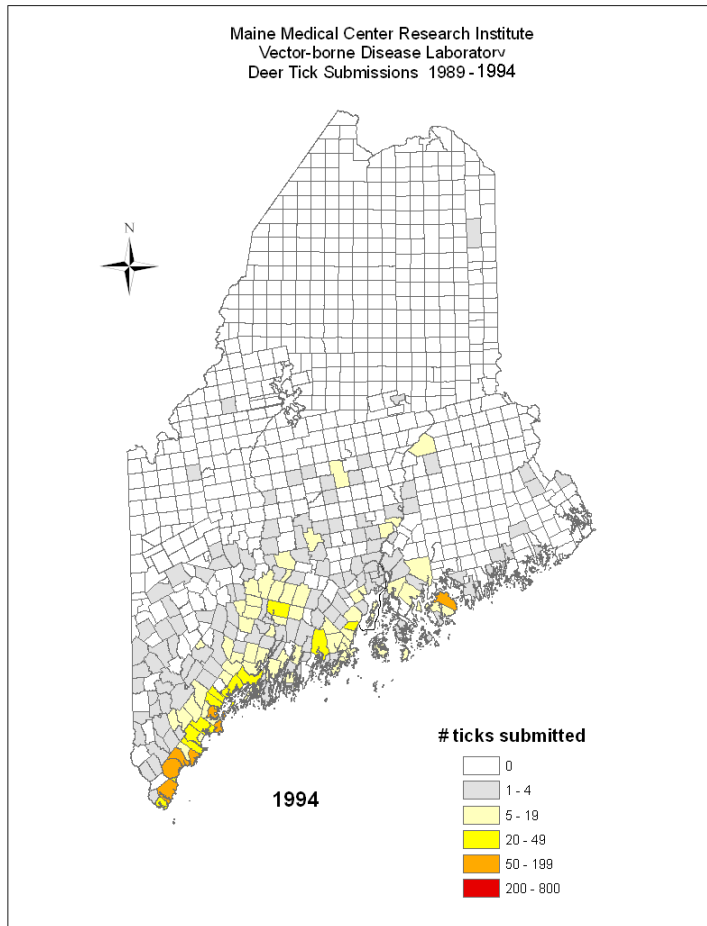
A: Scanning Electron Microscope (SEM) image of a deer tick. Courtesy of MicroAngela



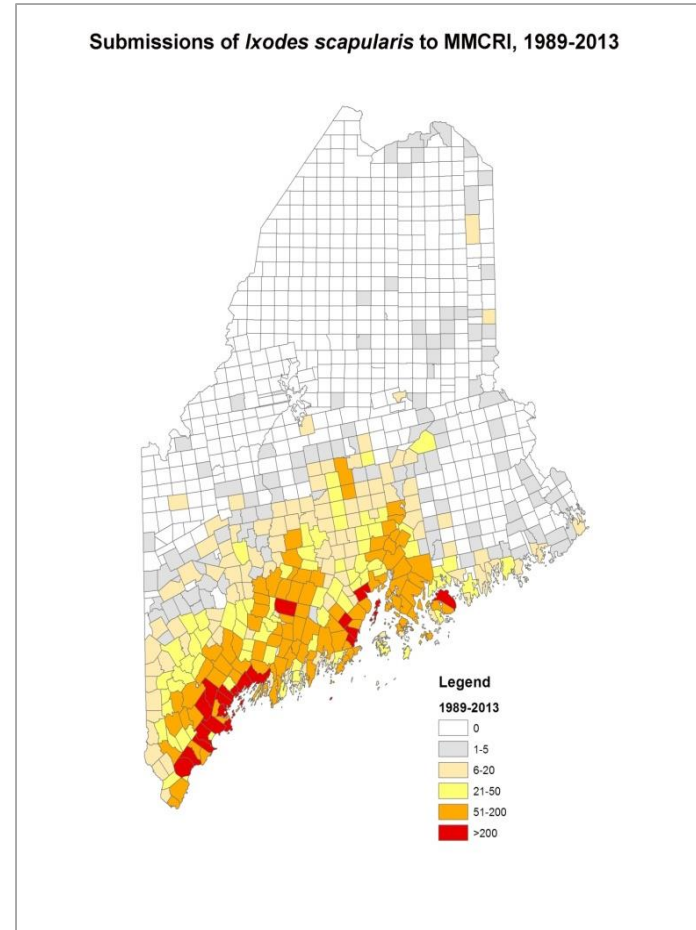
B: *Borrelia burgdorferi* spirochete. Courtesy of US CDC

Tick Distribution

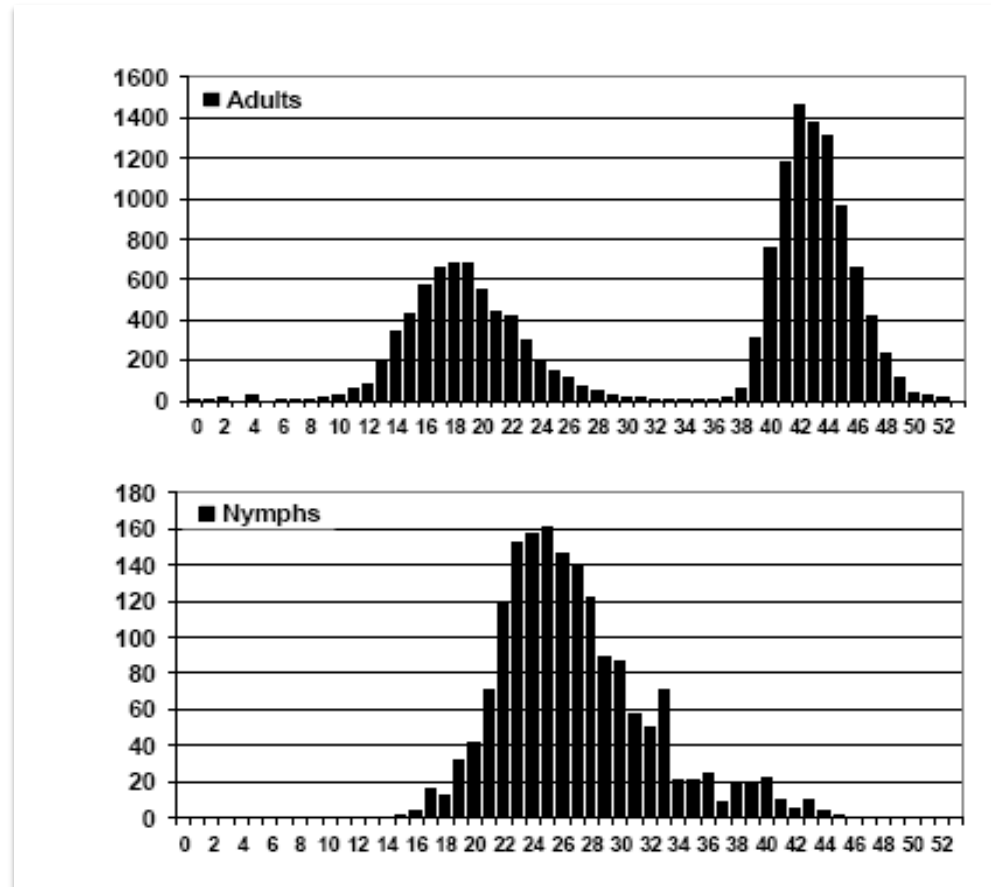
1994



2013



Weekly Deer Tick Submissions: 1989-2010



Ticks & Habitat

- **Favorable Habitat**
 - Deciduous (broadleaf) forest such as oaks
 - Shrubby areas



Photos: MMCRI

Unfavorable Habitat

- **Open, dry habitats**



Lyme Disease

Symptoms of Lyme Disease

Early Manifestations of Lyme Disease

- Erythema migrans (bull's eye rash)
- Muscle and joint pain
- Fatigue
- Chills, fever, and headache
- Swollen lymph nodes

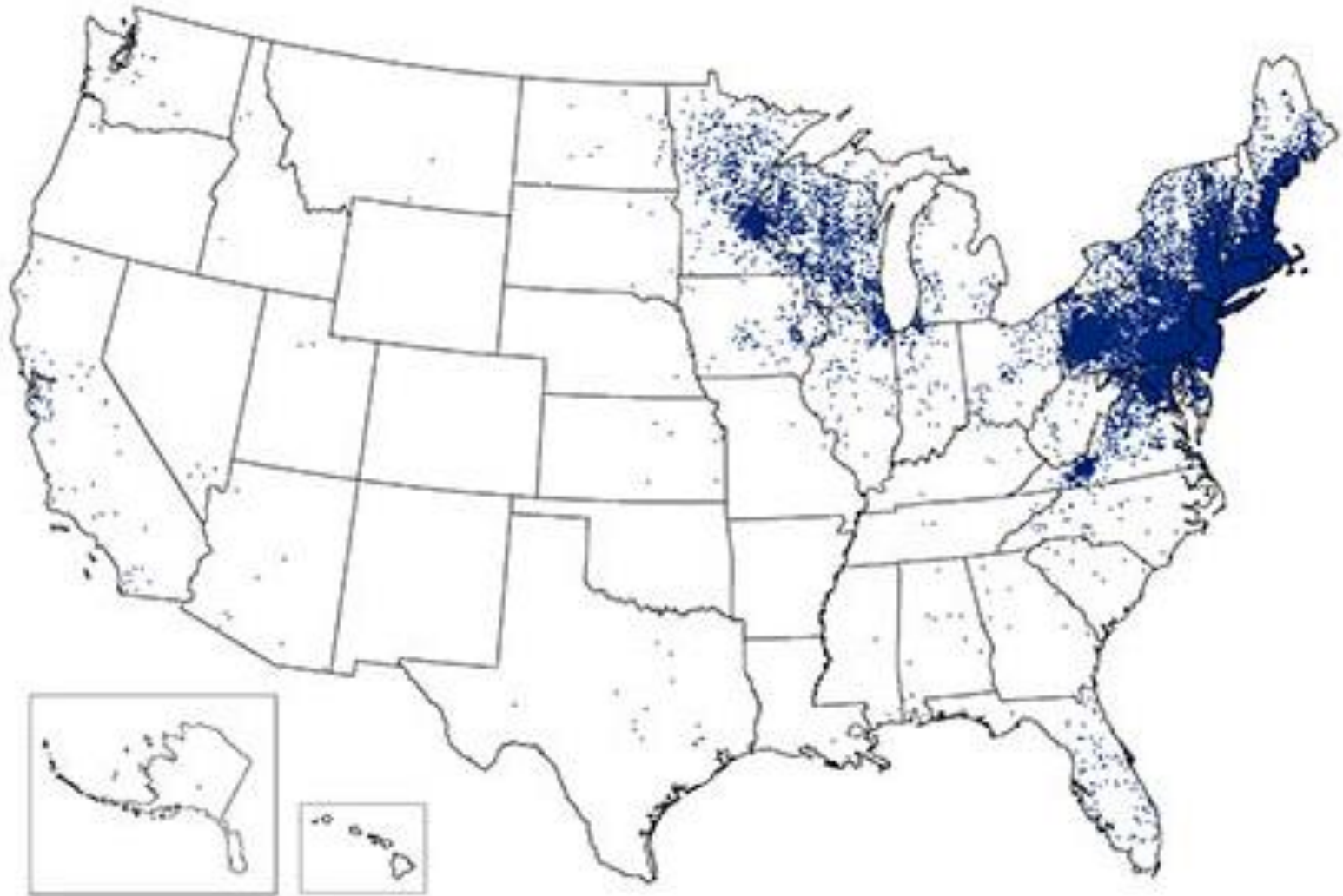


EM image: CDC

Disseminated Manifestations of Lyme Disease

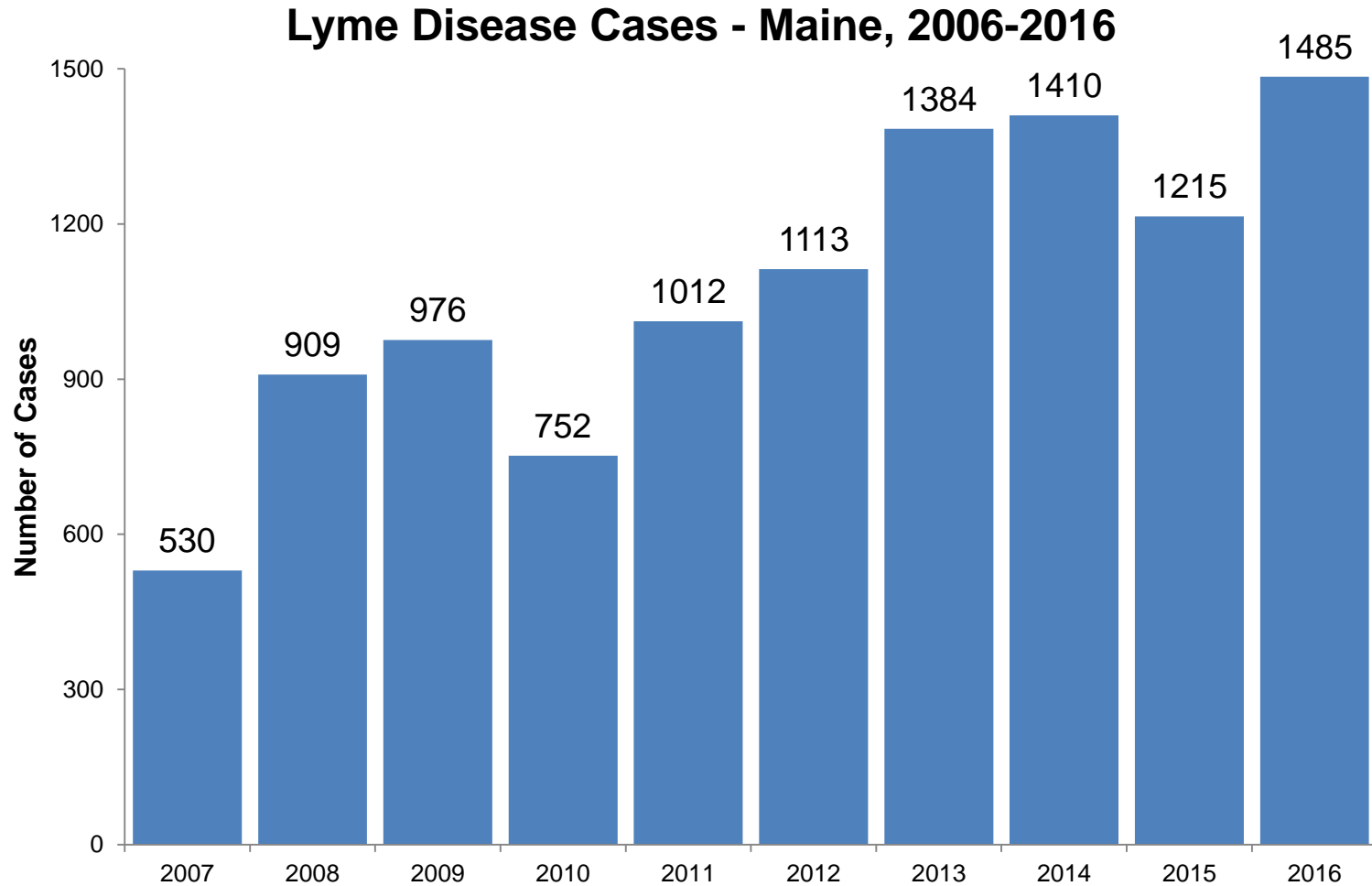
- Arthritis with recurrent, brief attacks of joint swelling
- Lymphocytic meningitis
- Cranial neuritis (such as Bell's palsy)
- Encephalitis
- 2nd or 3rd degree atrioventricular block

Reported Cases of Lyme Disease -- United States, 2015



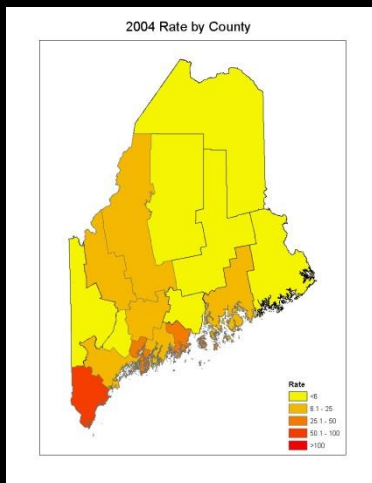
1 dot placed randomly within county of residence for each confirmed case

Lyme Disease Cases Maine, 2007-2016

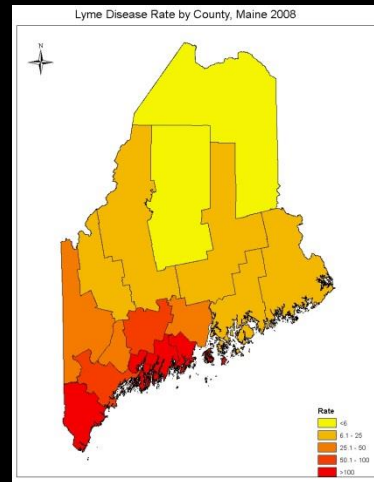


Lyme Disease in Maine

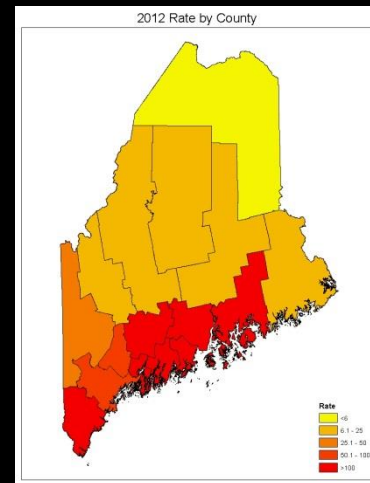
2004



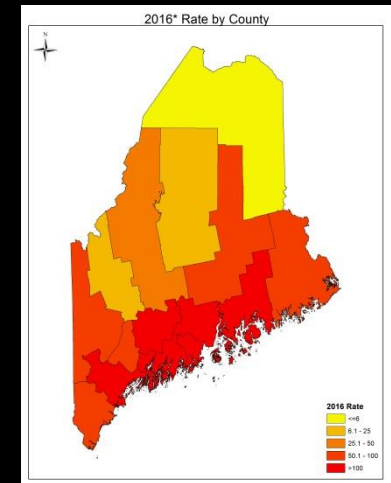
2008



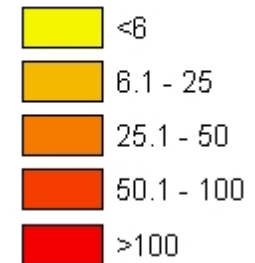
2012



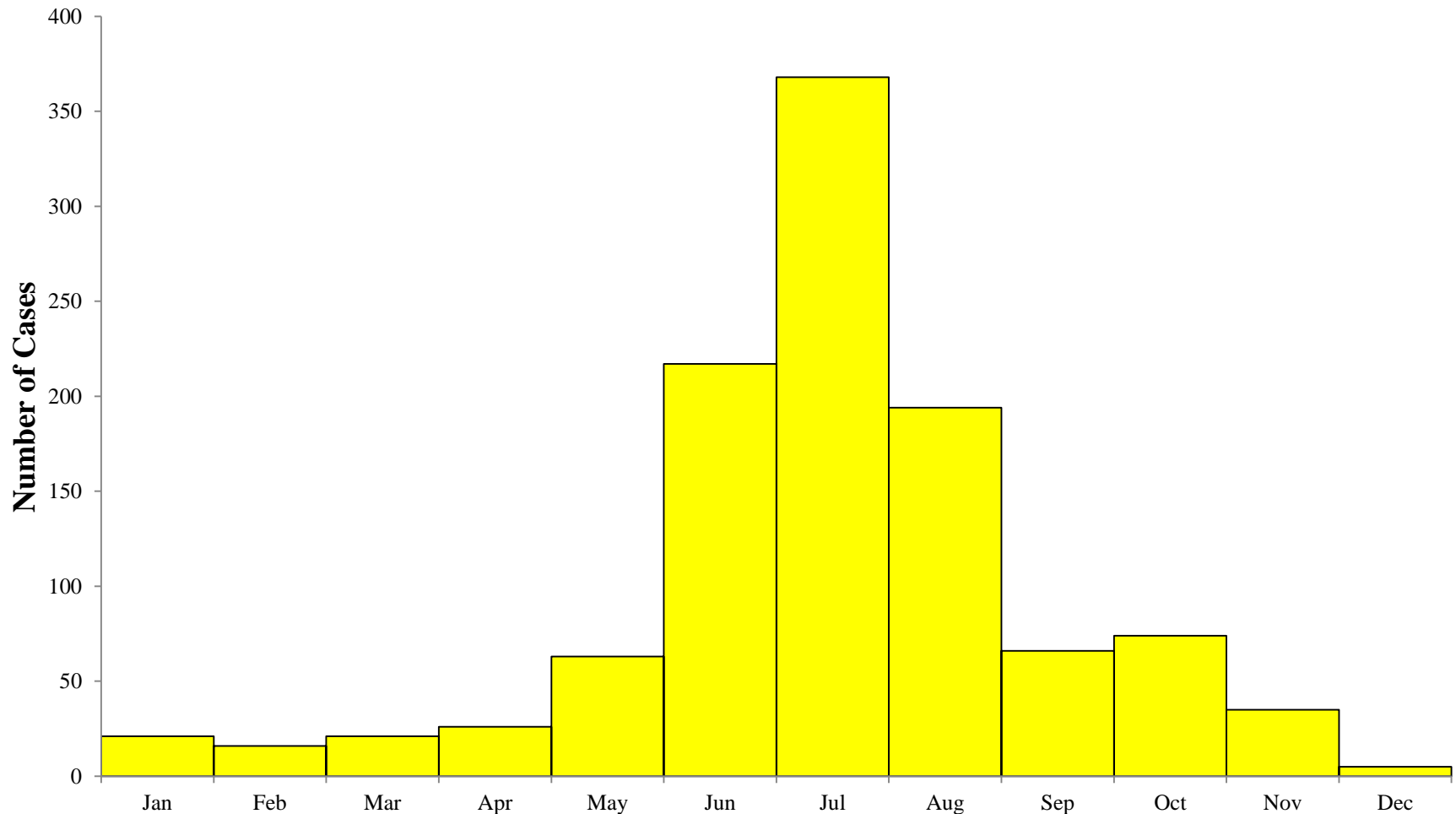
2016



Rate



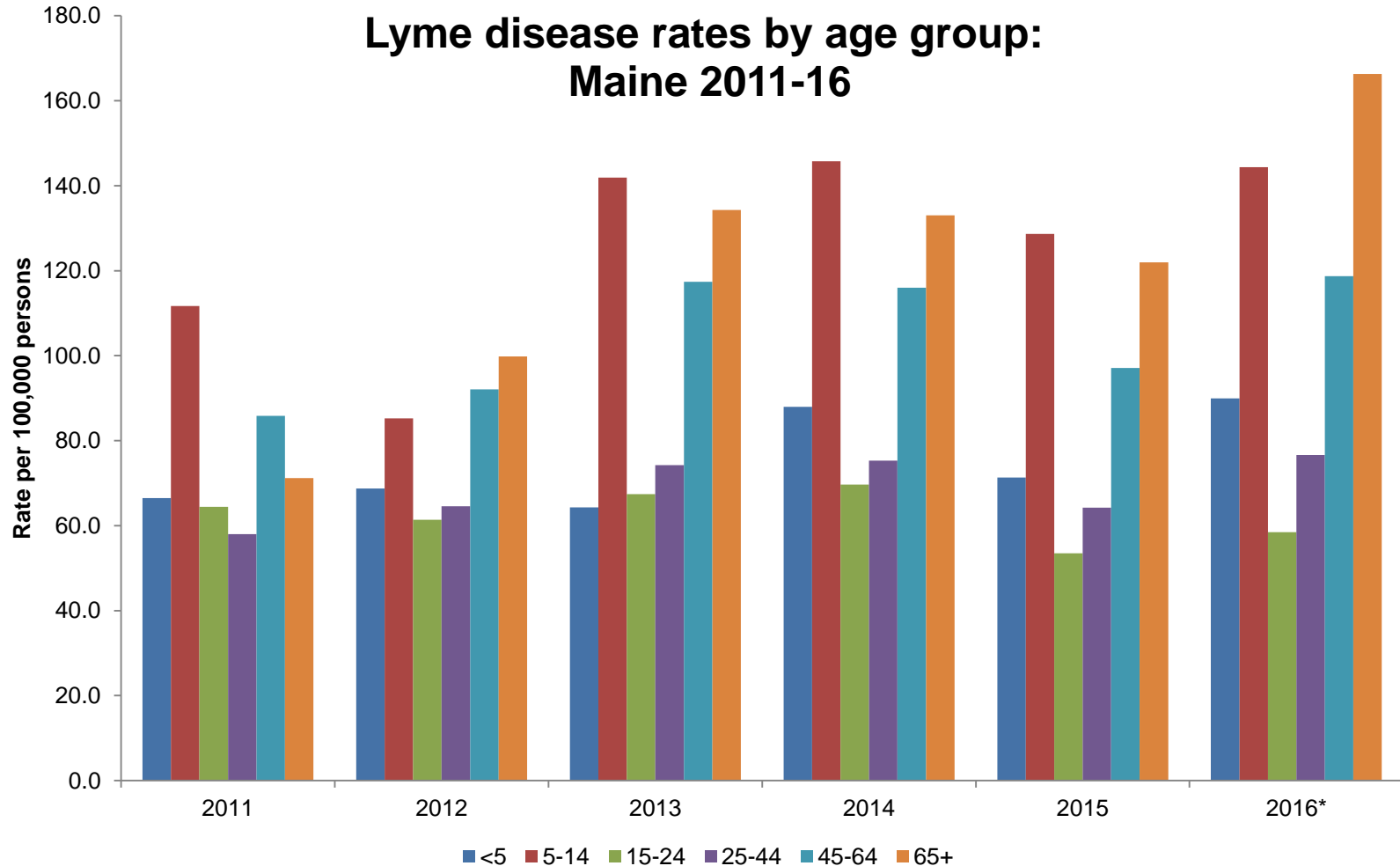
Seasonality of Cases in Maine



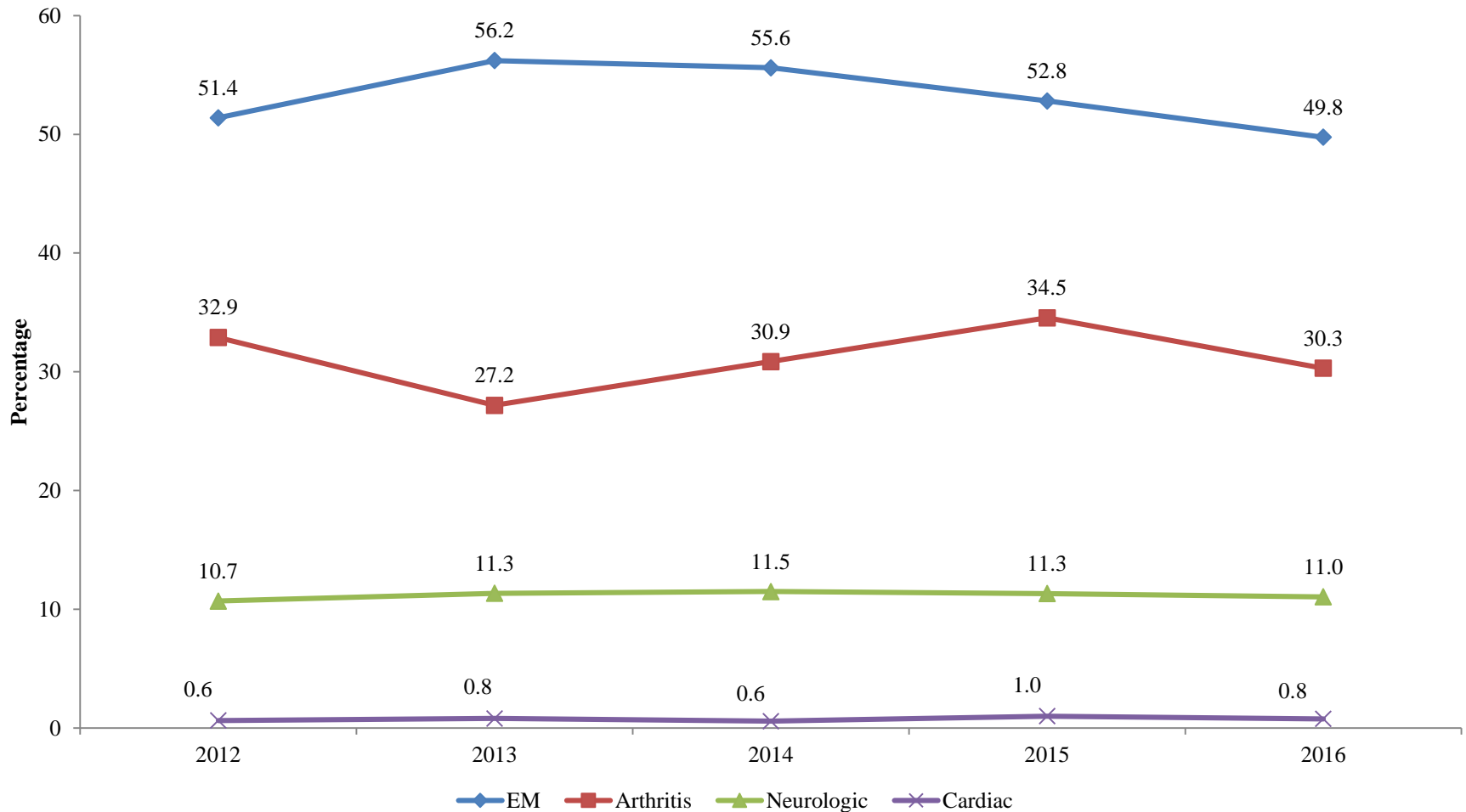
*data as of 1/18/2017

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Lyme Disease Rates by Age Group Maine, 2011-2016



Lyme Disease Symptoms Maine 2012-2016*



*data as of 1/18/2017

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Treatment

- Identify symptoms early, as treatment is more effective the earlier it is started
- If bitten by a deer tick: monitor for signs and symptoms of Lyme disease for 3-30 days following bite
- If you have symptoms consistent with Lyme Disease, consult a healthcare provider for treatment
- Current treatment guidelines can be found on the Infectious Diseases Society of America website:

<http://www.idsociety.org/Lyme/>

<https://academic.oup.com/cid/article-lookup/doi/10.1086/508667>

Other Tick-borne diseases

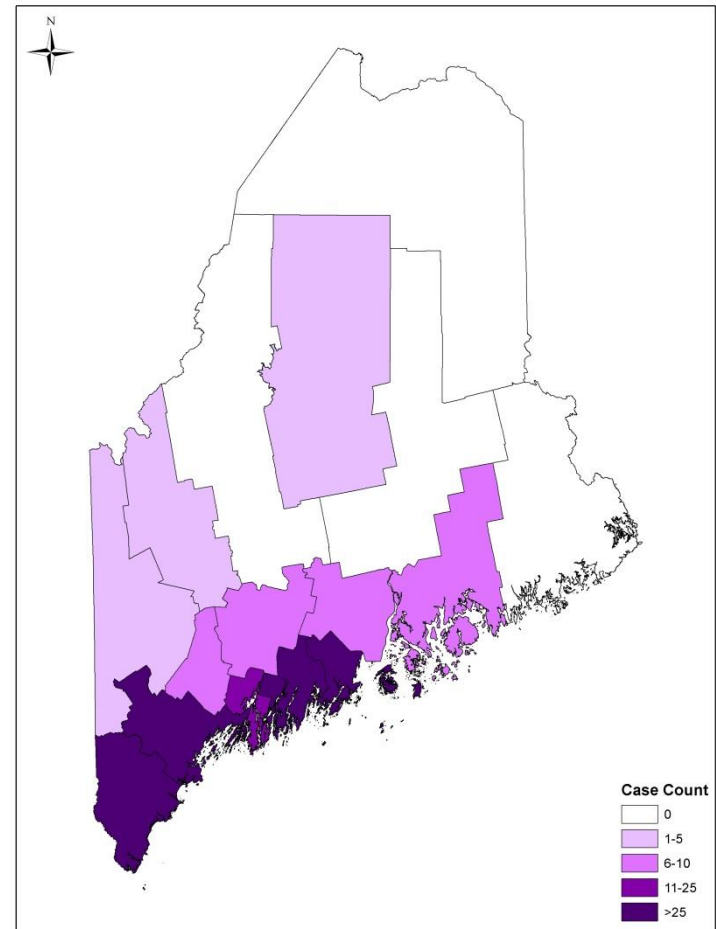
Anaplasmosis

- Carried by *Ixodes scapularis* tick
- Symptoms range from mild: (fever, headaches, body aches) to severe: (encephalitis, death).
- Testing can be done by PCR (preferred), morulae visualization, or serology

Anaplasmosis

- Cases
 - 2016: 372
 - 2015: 185
 - 2014: 191
 - 2013: 94
 - 2012: 52
 - 2011: 26
 - 2010: 17
 - 2009: 15
 - 2008: 17
 - 2007: 9

Anaplasmosis cases - Maine, 2015



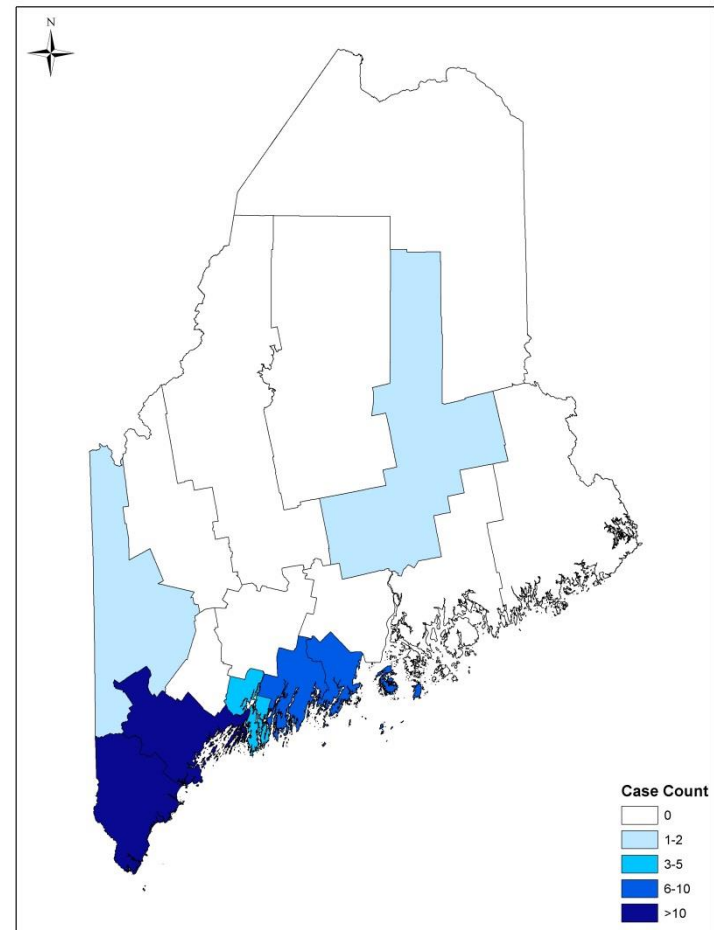
Babesiosis

- Carried by *Ixodes scapularis* tick
- Symptoms include: fatigue, sweating, dark urine, chills and possible anemia.
- Testing can be done by PCR (preferred), parasite visualization, or serology

Babesiosis

Babesiosis cases - Maine, 2015

- Cases
 - 2016: 82
 - 2015: 55
 - 2014: 42
 - 2013: 36
 - 2012: 10
 - 2011: 9
 - 2010: 5
 - 2010: 5
 - 2009: 3
 - 2008: 11
 - 2007: 11



Powassan

- Maine had confirmed cases in 2013, 2015, 2016, and 2017
- Rare
- Two strains of the virus, one carries by *Ixodes scapularis* (DTV) and one carried by *Ixodes cookei*. Clinically there is no difference between the strains
- Only tickborne arboviral disease in the U.S. and Canada



Powassan

This is the link to the PubMed abstract for the article that is most commonly cited for the 15 minute transmission time for Powassan...

<https://www.ncbi.nlm.nih.gov/pubmed/15381804>



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Other Tick-Borne diseases

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

- Potentially carried by the dog tick (*Dermacenter variabilis*)
- Ticks in Maine not known to be infected
- Symptoms include fever, headache, rash
- Testing is by serology

- **Ehrlichiosis**

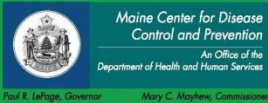
- Carried by the Lonestar tick (*Amblyomma americanum*) which is uncommon in Maine
- Symptoms include fever, headache, nausea and body aches
- Testing by PCR (preferred) or serology

Borrelia miyamotoi

- Newly described tick-borne illness
- Closely related to bacteria that cause tick-borne relapsing fever
- First identified in ticks in 1995
- First cases identified in Maine residents in 2016
- Commercial tests available from multiple reference laboratories (Imugen, Mayo, Quest)



- ✓ Wear protective clothing
- ✓ Use repellent
- ✓ Use caution in tick infested areas
- ✓ Perform daily tick checks



FOR MORE INFORMATION ABOUT LYME DISEASE VISIT: WWW.MAINE.GOV/LYME
INSPECT AND PROTECT 2015 K-8 POSTER CONTEST

Personal Protection

- Dress appropriately when outdoors
- Use repellants containing DEET, oil of lemon eucalyptus, IR3535, picaridin, or permethrin
- Thoroughly wash and dry clothes



Personal Protection


- Do a daily “Tick Check” by sight and by touch- inspect your body after being outdoors, and again a few hours later
- Pay attention to your head, hairline, nape of the neck, armpits, waist, between your legs, thighs, and behind the knees
- Do a “Tick Check” on your pets as well



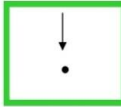
Personal Protection: Tick Check

Don't Forget to Check for Ticks!!

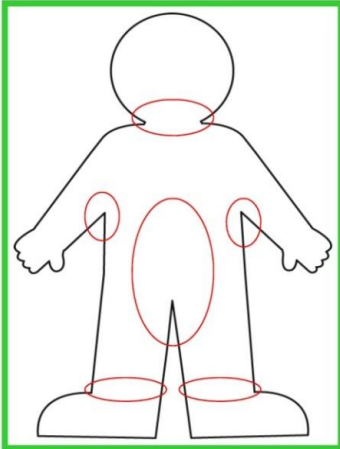
They look a little something like this:



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.

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



Tick Removal: Prompt Removal is Important!

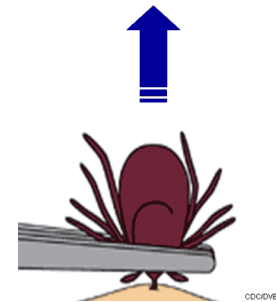
With a Tick Spoon

- Place the wide part of the notch on the skin near the tick (hold skin taut if necessary)
- Applying slight pressure downward on the skin, slide the spoon forward so the small part of the notch is framing the tick
- Continuous sliding motion of the remover detaches the tick



With Tweezers

- Grasp the tick close to the skin with tweezers
- Pull gently until the tick lets go



Killing / Preserving Ticks

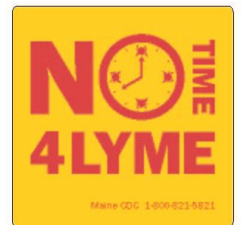
- To kill a tick found in your home or removed from a person or pet, it is easiest to put it in a container of rubbing alcohol
- Tick will soon die and be preserved in the event it is submitted to a laboratory
- Washing your clothes will not kill the tick, however drying the clothes on high heat before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

Submitting Ticks

- Tick identification is available at the University of Maine Orono Cooperative Extension
- Tick submission form should accompany each tick. Forms and instructions can be downloaded at <http://umaine.edu/ipm/tickid/>

Submitting Ticks

- Contact physician for medical advice
- Send ticks in crushproof, waterproof container in rubbing alcohol.
- Tick species and degree of engorgement will be identified
- Ticks will not be tested to see if they carry Lyme



tick ID

KNOW THEM. PREVENT THEM.



Deer Tick (Black-Legged Tick)



nymph



adult male



adult female

- Deer ticks may transmit the agents that cause Lyme disease, anaplasmosis, and babesiosis
- **What bites:** nymphs and adult females
- **When:** anytime temperatures are above freezing, greatest risk is spring through fall

ACTUAL SIZE

nymph
(1/32"–1/16")

adult
(1/8")

engorged adult
(up to 1/2")

Dog Tick



adult male



adult female

- Dog ticks do not transmit the agent that causes Lyme disease
- **What bites:** adult females
- **When:** April–August through fall

(examples are not actual size, dog tick nymphs are rarely found on humans or their pets)

prevent the bite

- Wear light-colored protective clothing
- Use EPA-approved insect repellent on skin or clothing
- Use caution in tick infested areas
- Perform daily tick checks
- Protect your pets, use repellents, acaricides, and a Lyme disease vaccine for dogs



tick removal

Remove ticks immediately. They usually need to attach for 24 hours to transmit Lyme disease. Consult a physician if you remove an engorged deer tick.

Using a tick spoon:

- Place the wide part of the notch on the skin near the tick (hold skin taut if necessary)
- Applying slight pressure downward on the skin, slide the remover forward so the small part of the notch is framing the tick
- Continuous sliding motion of the remover detaches the tick

Using tweezers:

- Grasp the tick close to the skin with tweezers
- Pull gently until the tick lets go

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Mosquito Borne Diseases

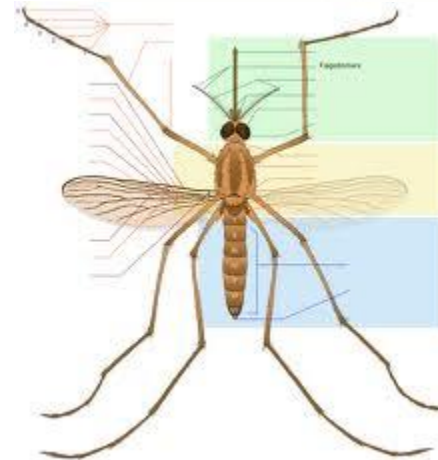
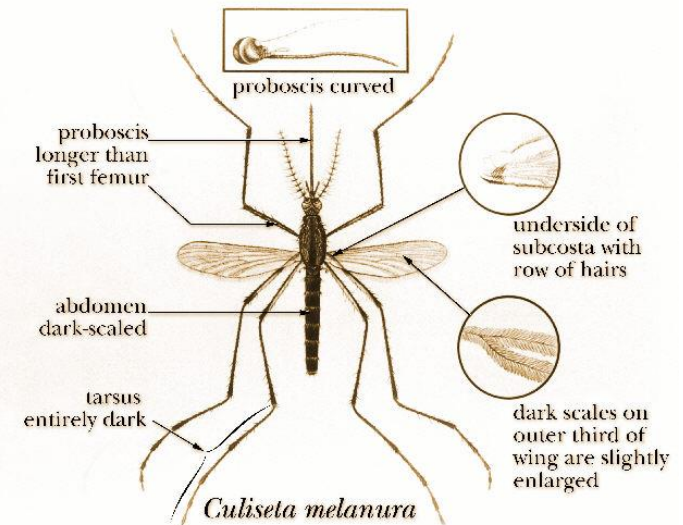
Mosquito-borne diseases

- Eastern Equine Encephalitis
 - One of the most serious mosquito-borne diseases in the United States
 - Many persons infected will have no obvious symptoms
- West Nile virus
 - Occurs throughout the United States
 - Many persons infected will have no obvious symptoms



Mosquito Species

- 45 mosquito species in Maine, however less than half are considered to be likely vectors for EEE and WNV



EEE vector habitat



Photo courtesy of Kim Foss, Swamp Inc

- *Cs. melanura* primary vector of EEE
- Bogs and swamps
 - Mature hemlock, immature red maple, yellow birch, beech, winterberry, shrubs
 - Clear or tea colored water
 - Peat bottom
 - Acidic
- Early emergence in spring, overwinter as larvae, multiple generations
- Also WNV competent
- Primarily bird biters

WNV vector habitat

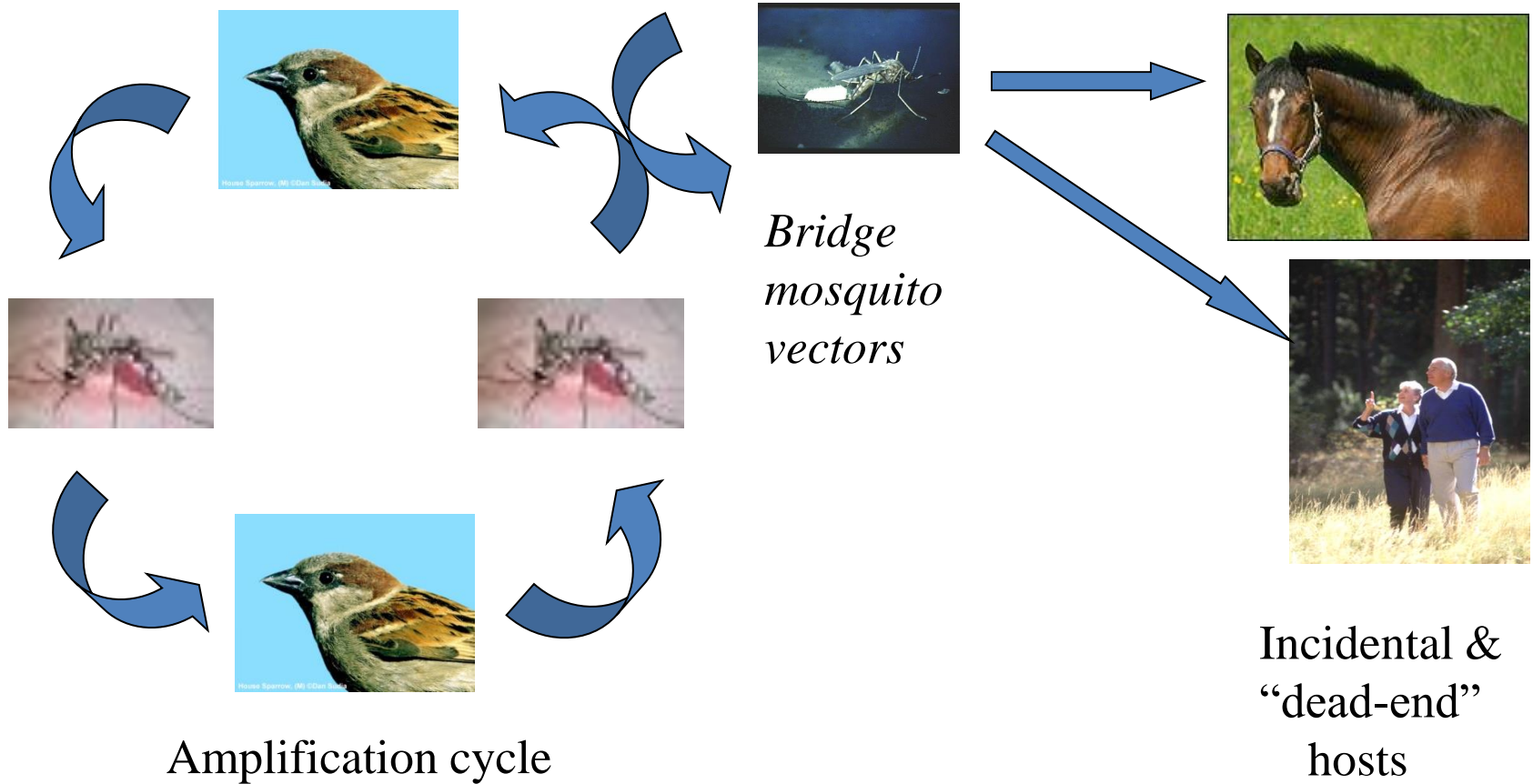


Cx. pipiens/restuans
common WNV vector

- Artificial containers
 - Catch basins
 - Flower pots
 - Discarded tires
- Stagnant temporary pools
- Holes in trees
- Multiple generations
 - Can overwinter as adults
- Generalist feeders



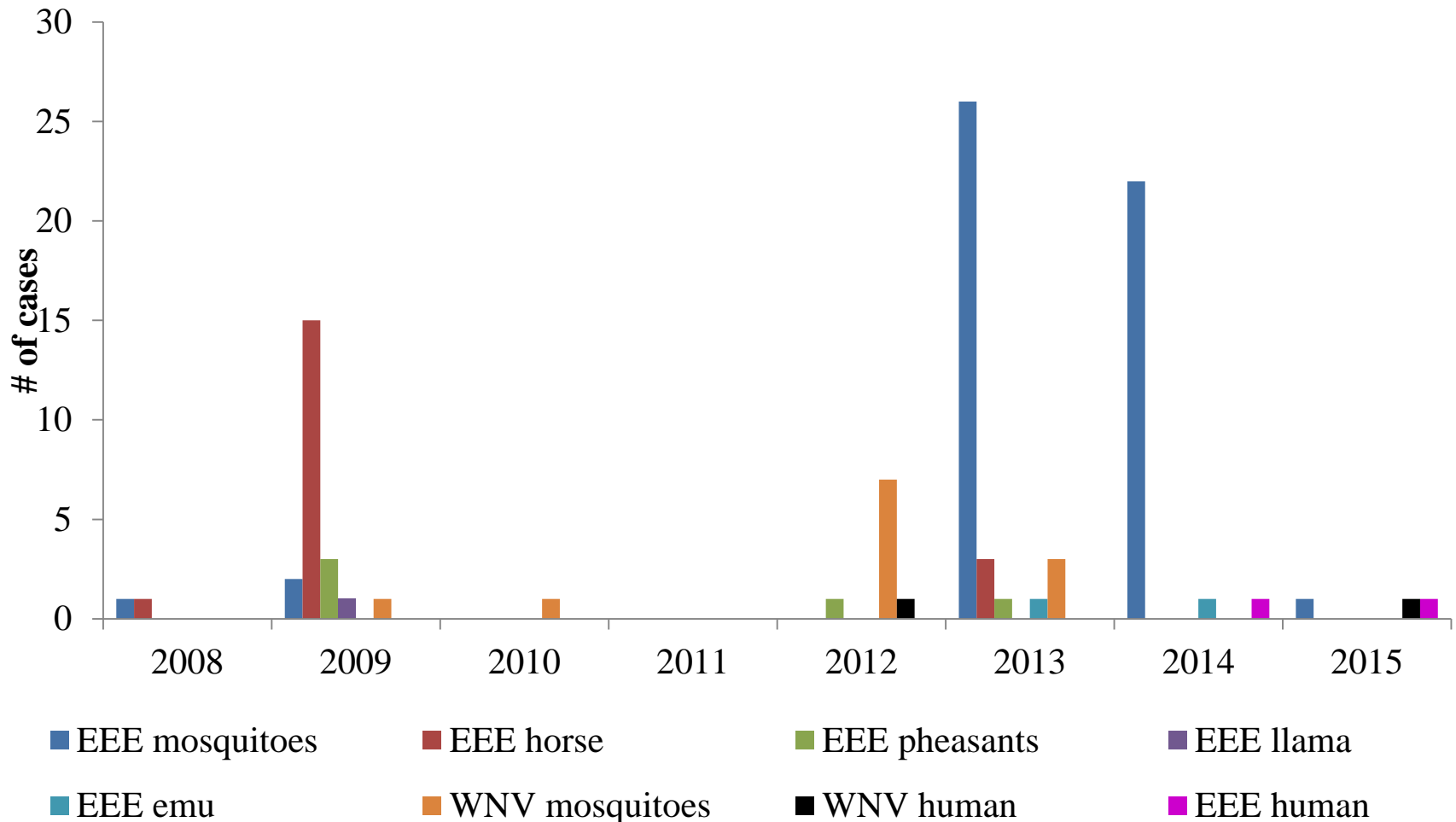
EEEV and WNV Transmission Cycle



Symptoms of Arboviral Illness

- MOST people infected with an arbovirus will not have symptoms
- Symptoms can be very mild to very severe and appear 3-18 days after infection
 - Mild
 - Fever
 - Head and body aches
 - Lack of energy
 - Neuroinvasive Disease
 - Central nervous system involvement
 - Stiff neck, altered mental status, inflammation of the brain, respiratory distress, paralysis, coma, death
- Symptoms usually last 1-2 weeks, no treatment, only support

Arboviruses in Maine, 2008-15





go ahead
**the fight
bite**

You can protect yourself against West Nile virus and Eastern equine encephalitis

- ▶ Wear long sleeves and long pants.
- ▶ Use repellent on skin and clothes.
- ▶ Take extra precautions at dusk and dawn.
- ▶ Use screens on your windows and doors
- ▶ Drain artificial sources of standing water where you live, work and play.

For more information about mosquito-borne diseases
visit www.mainepublichealth.gov

For More Information

- Maine CDC disease reporting and consultation line: 1-800-821-5821
- Maine Medical Center Research Institute – Vector-borne Disease Lab: 207-396-8246 ticklab@mmc.org
- UMaine Cooperative Extension: 207-581-3880
- Maine CDC Vector-Borne Disease Website:
<http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/index.shtml>
- Disease.reporting@maine.gov



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Thank You!

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