

# Vectorborne Diseases in Maine

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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

# Presentation Agenda

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

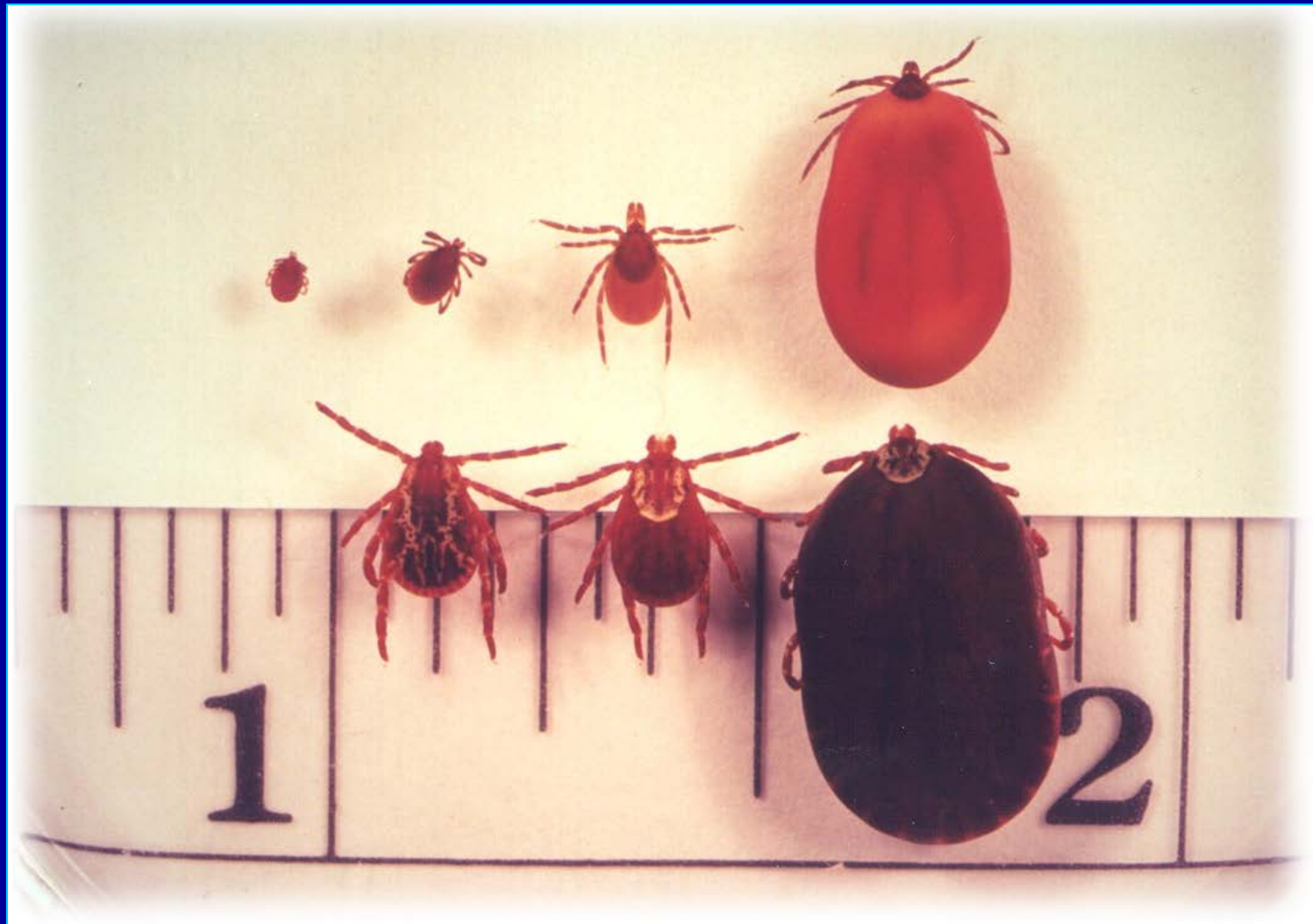
# Ticks in the Northeastern United States

- **Blacklegged (or deer) ticks** (*Ixodes scapularis*) can transmit several tick-borne diseases including anaplasmosis, babesiosis and Lyme disease
- Adult tick (at top)
- Nymphal ticks (at bottom) most commonly bite humans



Larger than actual size.

# Deer Ticks vs. Dog Ticks

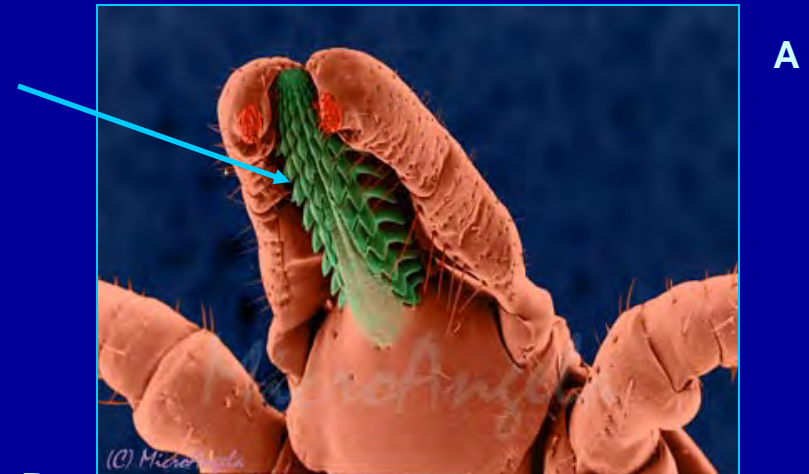


# Deer Ticks Vs. Dog Ticks

- Dog ticks have either a white scutum (dot or shield behind the head) or white 'racing stripes' down the back
- *Generally*, deer ticks prefer woods while dog ticks prefer open habitats
- In the summer, large adult dog ticks (1/8"-3/16") are commonly found as well as the small deer tick nymphs (~1/16")
- If you find ticks in fall or spring, they are probably deer 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!

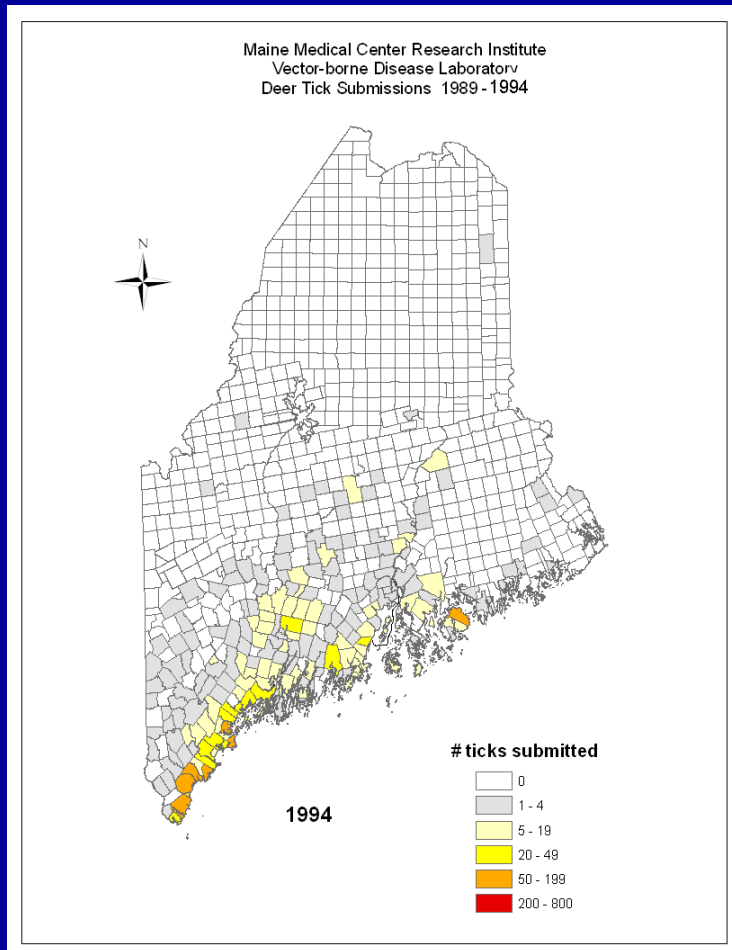


A) Scanning electron microscope (SEM) image of a deer tick. Courtesy of MicroAngela.

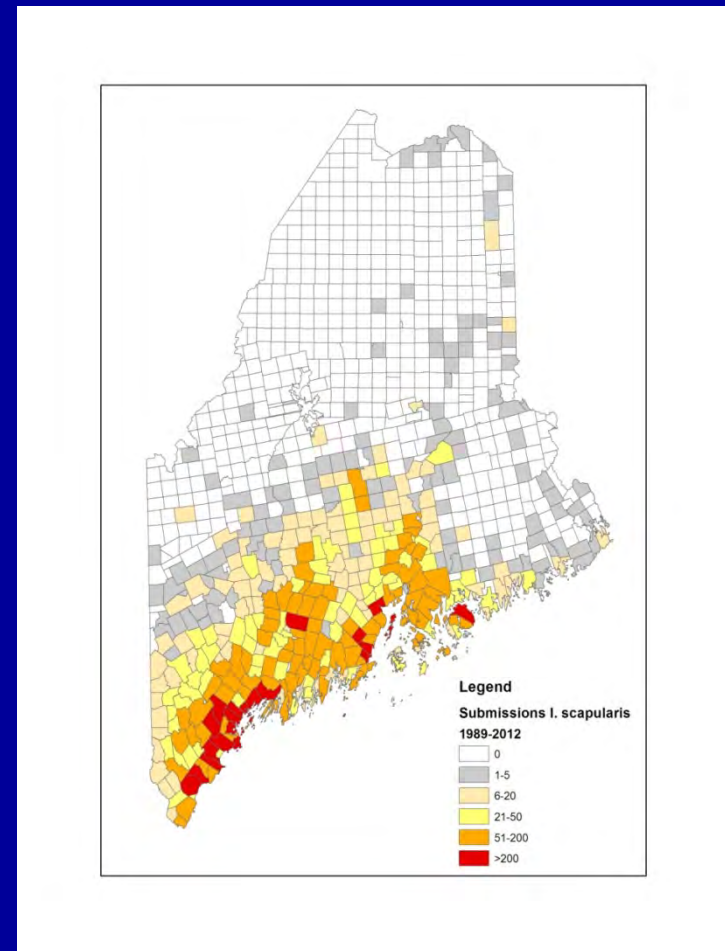
B. *Borrelia burgdorferi* spirochete. CDC.

# Vector Distribution

1994



2012





# Ticks & Habitat

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





# Ticks & Habitat

- Unfavorable habitat
  - Open, dry habitats



# 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

## Late Manifestations of Lyme Disease

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

# Treatment

- Identify symptoms early, as treatment is more effective the earlier it is started
- If you have symptoms consistent with Lyme Disease – consult a physician for treatment
- Current treatment guidelines can be found on the Infectious Diseases Society of America website  
<http://www.journals.uchicago.edu/doi/abs/10.1086/508667>

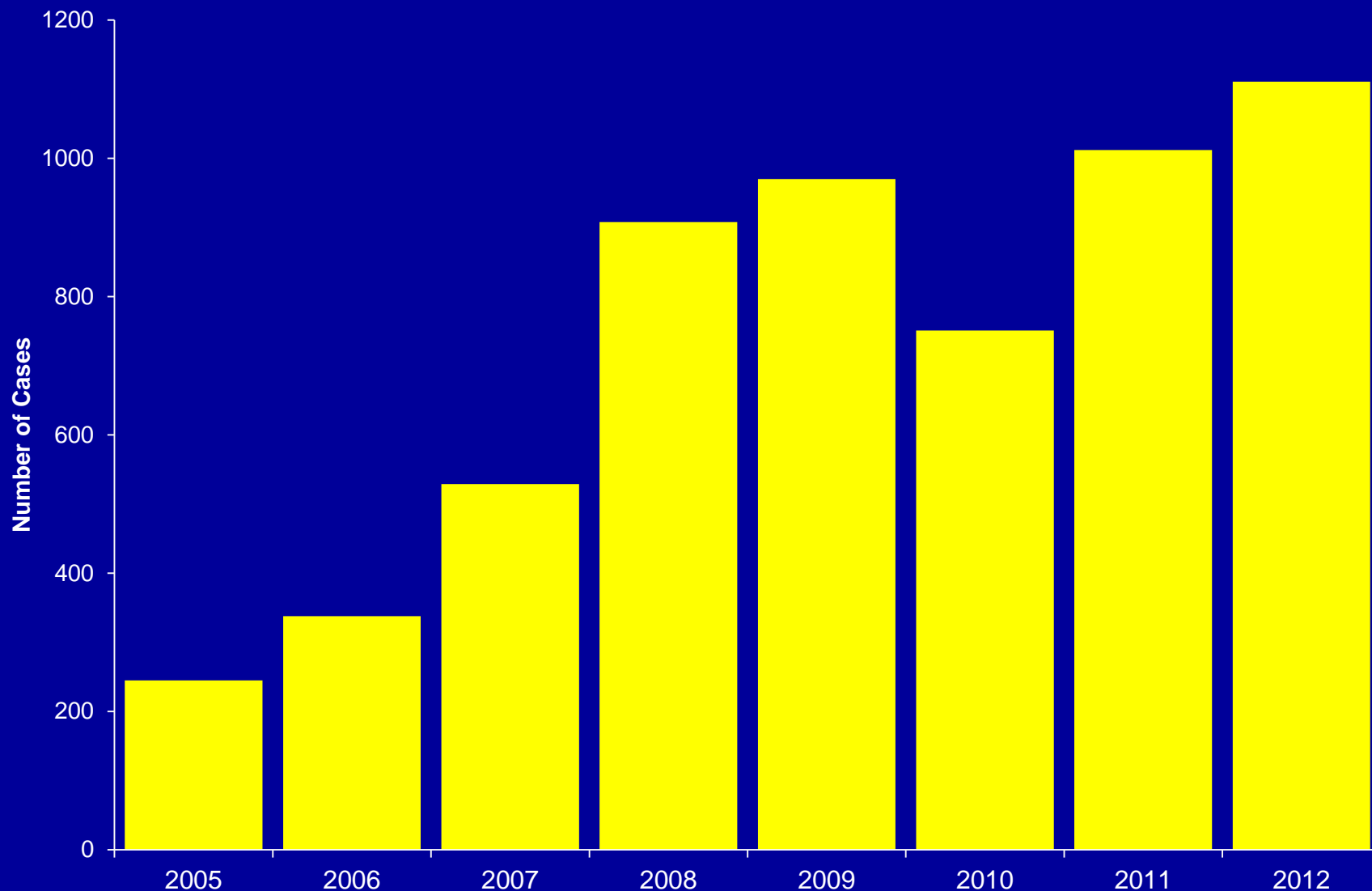
# Lyme Disease Distribution

Reported Cases of Lyme Disease -- United States, 2011



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

# Lyme Disease Cases – Maine, 2005-2012\*

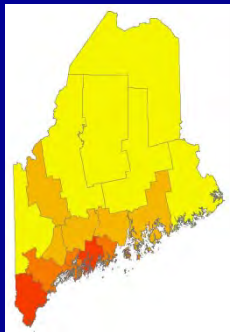


\*data as of 3/25/2013

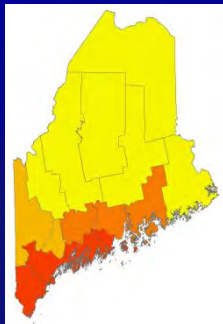


# Lyme Disease in Maine

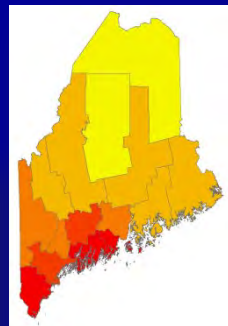
2006



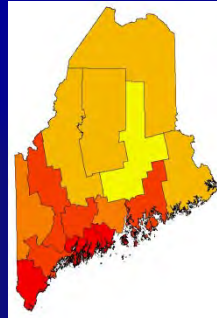
2007



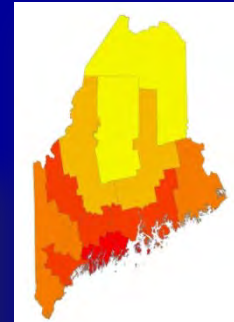
2008



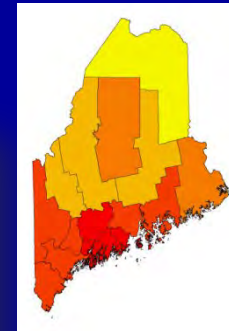
2009



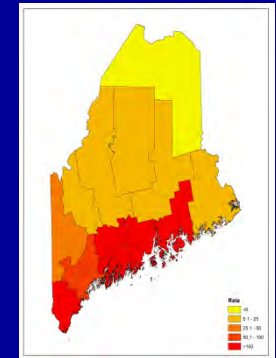
2010



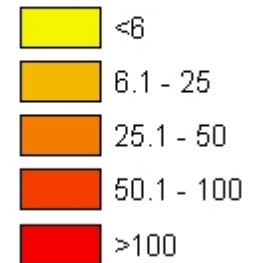
2011



2012

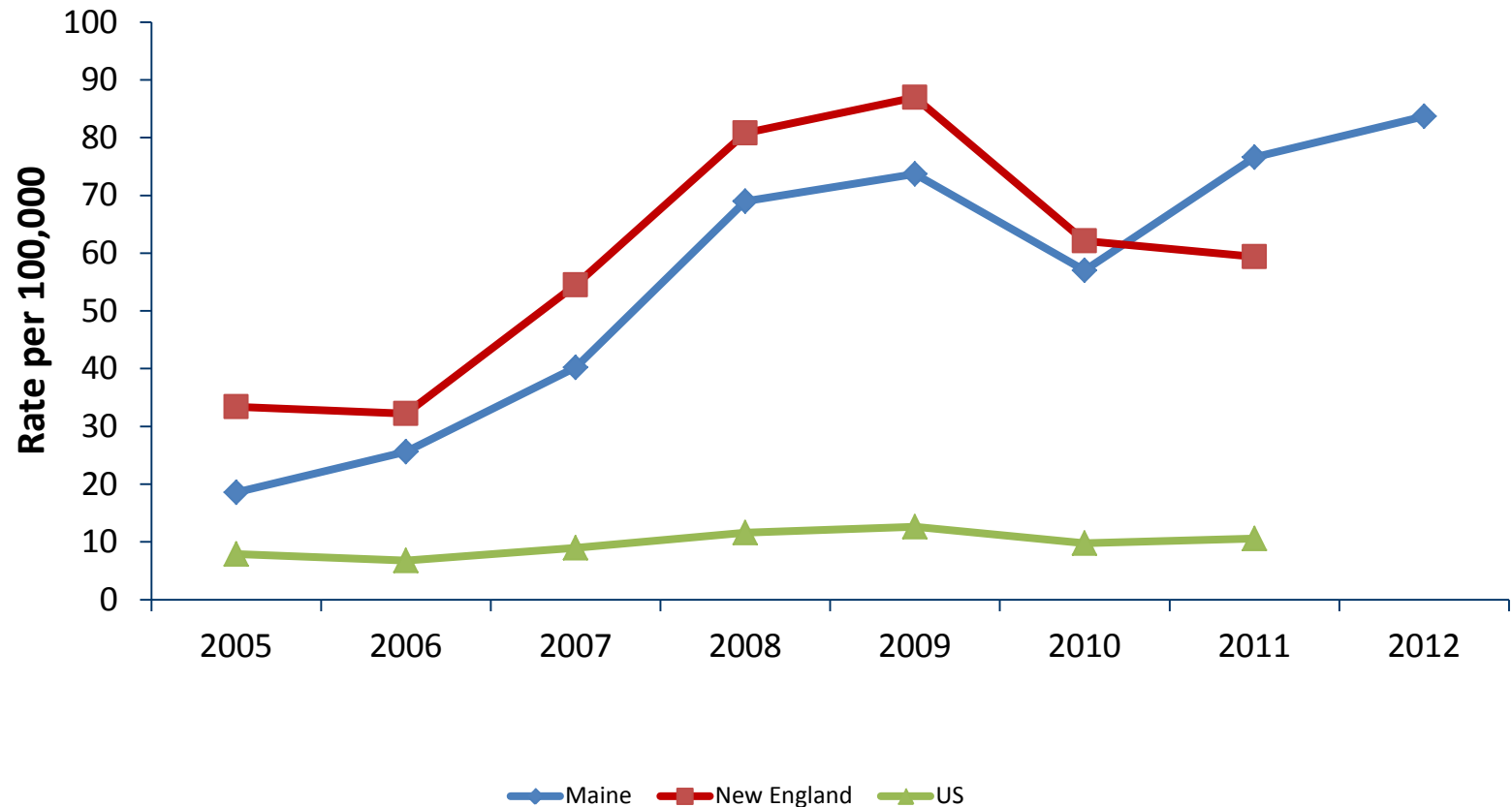


**Rate**



\*data as of 3/25/13

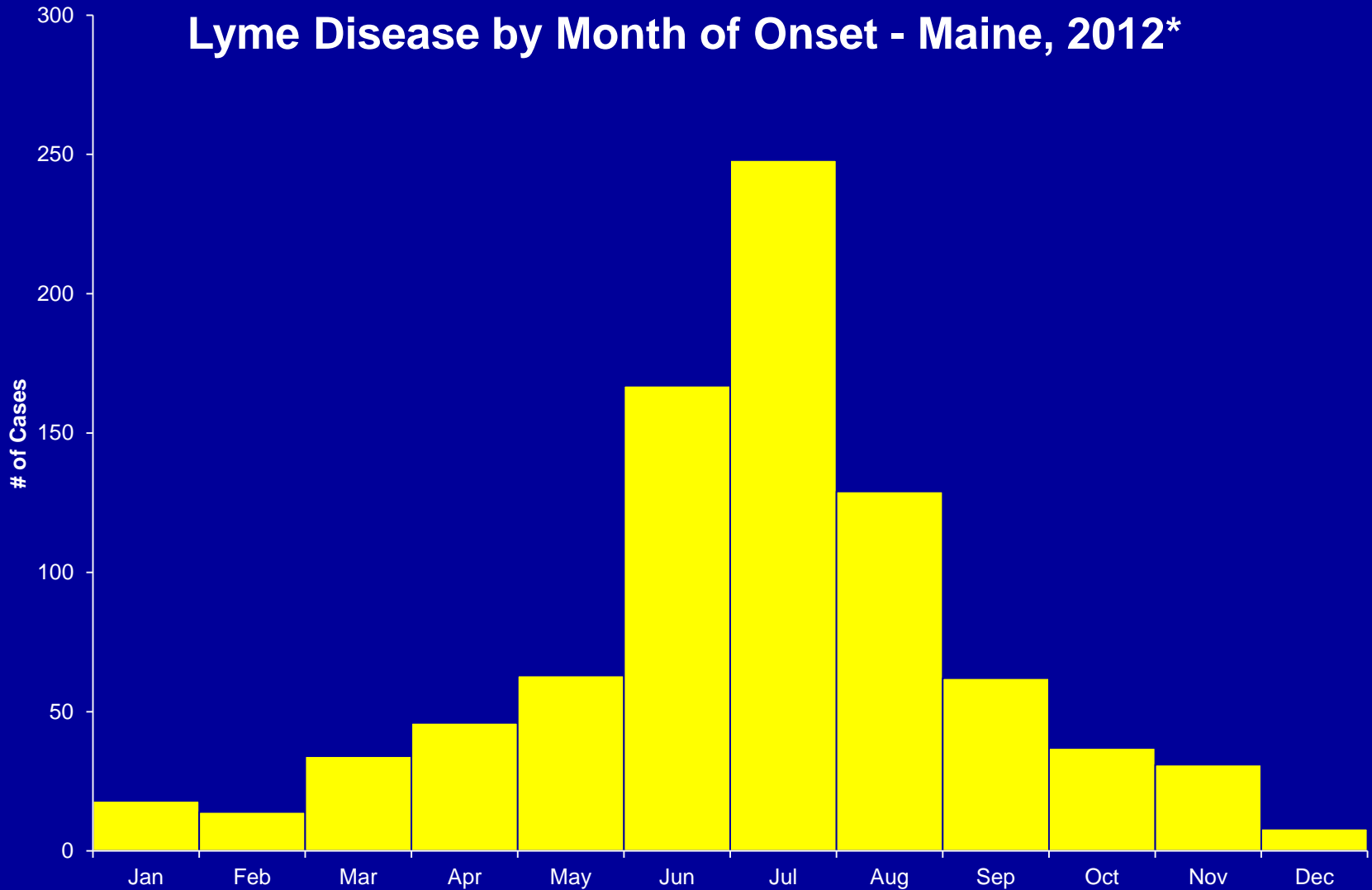
# Lyme Disease Incidence in Maine and the United States: 2005 – 2012\*



\*2012 data as of 3/25/13

# Seasonality of Cases

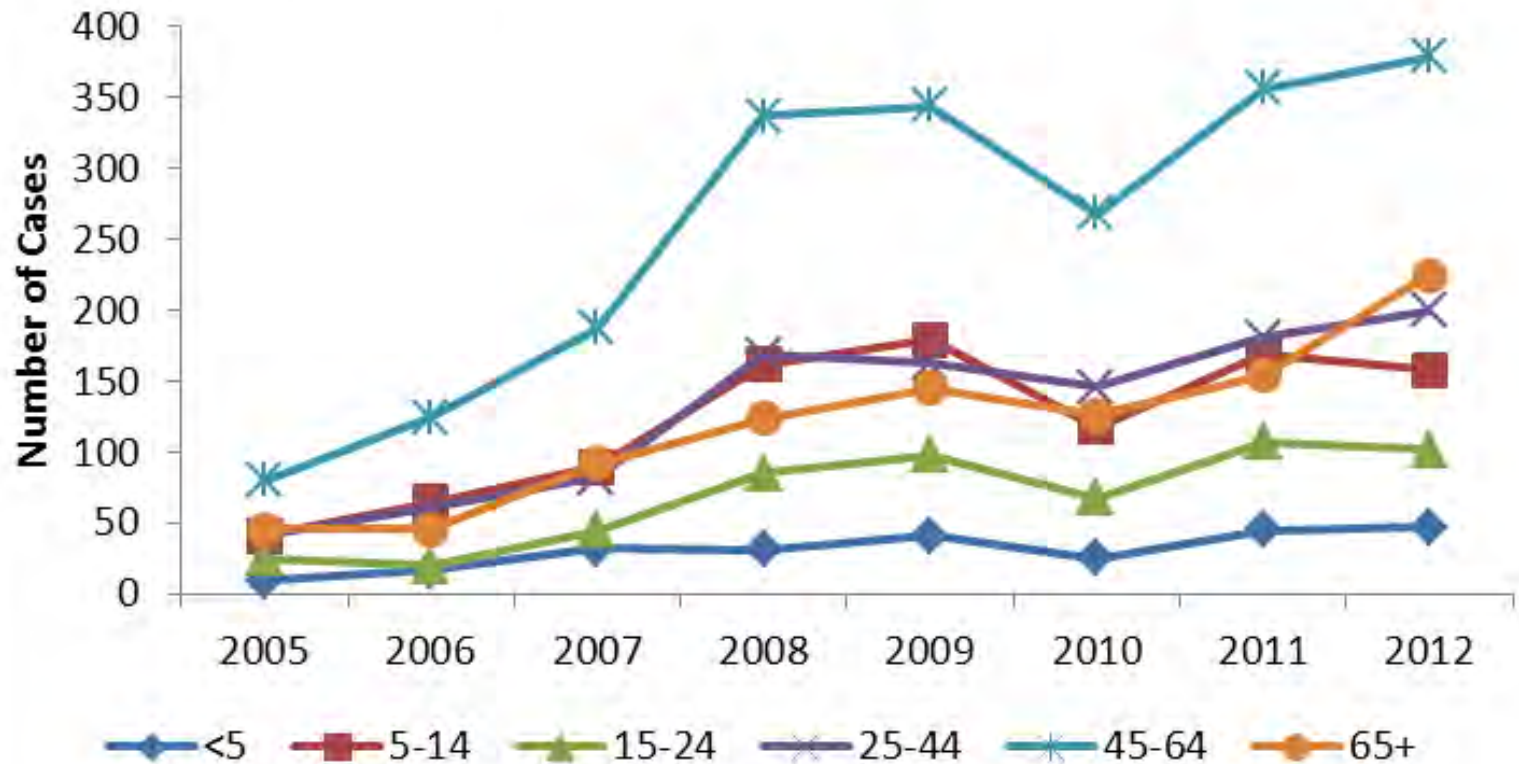
Lyme Disease by Month of Onset - Maine, 2012\*



\*data as of 3/25/13

# Age Distribution of Lyme Disease

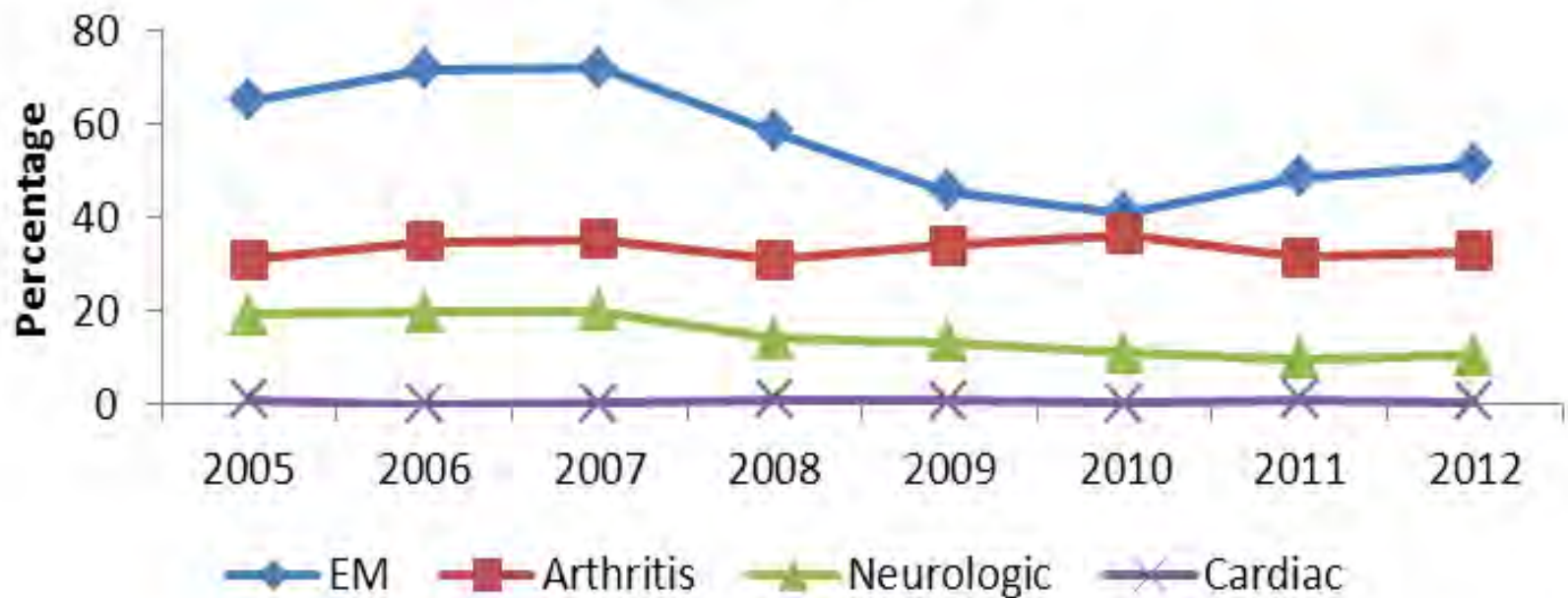
Number of Reported Lyme Disease Cases by Age Group -  
Maine, 2005-2012\*



\* data as of 3/25/13

# Lyme Disease Symptoms

Percentage of Symptoms Reported Among Lyme Disease Cases - Maine, 2005-2012\*



\*2012 data as of 3/25/13



# No Ticks for ME

1. Wear protective clothing
2. Use an EPA approved repellent
3. Perform daily tick checks
4. Use caution in tick-infested areas



# Personal Protection

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



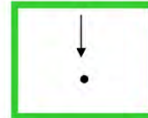
# Personal Protection

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

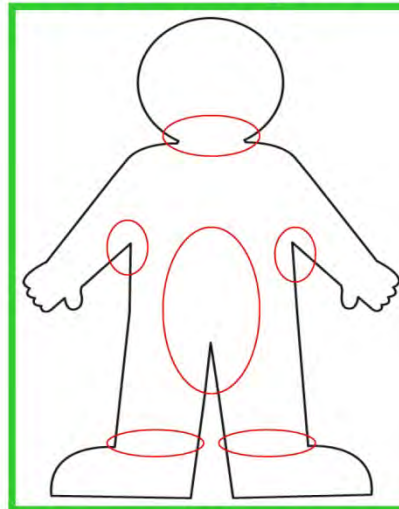
**They look a little  
something like this:**



**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.

# Tick-Safe Landscaping

- Regularly remove brush, leaf litter and tall grass
- Create a dry border between the woods and the lawn
- Consider using a chemical control agent to reduce the number of ticks
- Remove plants that attract deer and construct physical barriers that may discourage deer from entering your yard

# 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

APPROXIMATE 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



# Other Tick-borne Diseases

- Anaplasmosis
- Babesiosis
- Ehrlichiosis
- Powassan
- Rocky Mountain Spotted Tick Fever

# Anaplasmosis

- Caused by *Anaplasma phagocytophilum*
- Symptoms include:
  - Fever, headache, malaise, myalgia, arthralgia, confusion, anemia, thrombocytopenia, leukopenia, elevated hepatic transaminases
- Testing:
  - PCR is preferred method of testing
- Treatment:
  - Appropriate antibiotic therapy as recommended by the IDSA Guidelines for Clinical Assessment, Treatment, and Prevention of Lyme Disease, HGA, and Babesiosis

# Anaplasma Cases

2005: 4

2006: 10

2007: 9

2008: 17

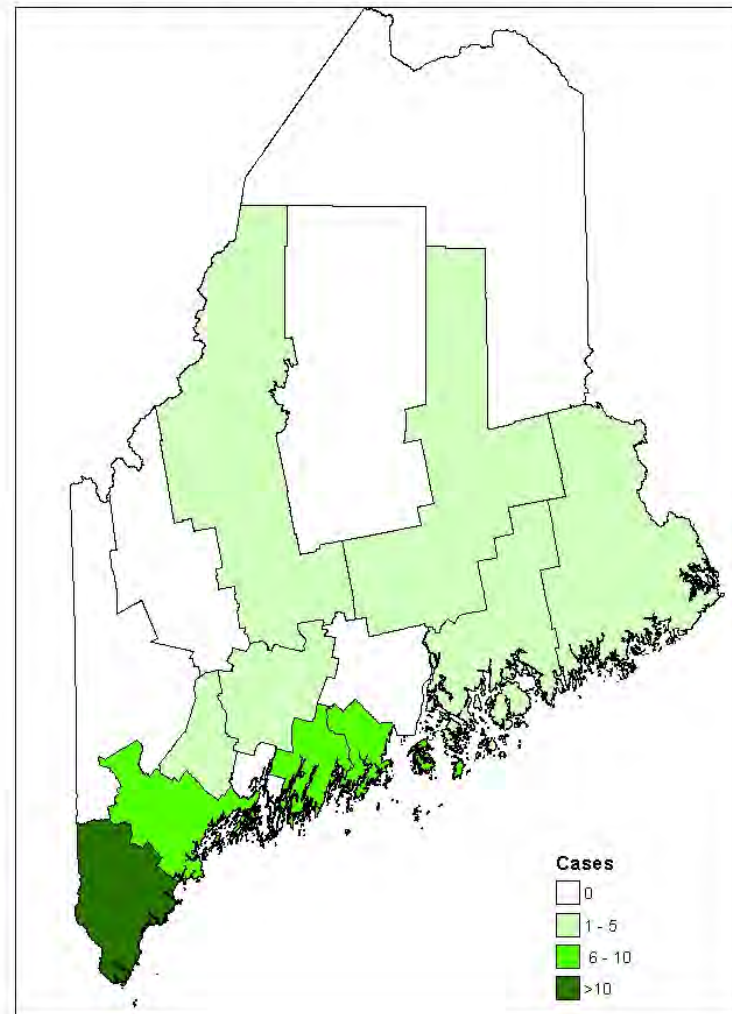
2009: 15

2010: 17

2011: 26

2012: 52

Anaplasma Cases, Maine 2012



# Babesiosis

- Caused by a parasite (*Babesia microti*)
- Symptoms include:
  - Fever, anemia, thrombocytopenia, chills, sweats, headache, myalgia, arthralgia
- Testing:
  - PCR or Microscopy (blood smear) is preferred
- Treatment:
  - Appropriate antibiotic therapy as recommended by the IDSA Guidelines for Clinical Assessment, Treatment, and Prevention of Lyme Disease, HGA, and Babesiosis

# Babesia Cases

2005: 11

2006: 9

2007: 11

2008: 11

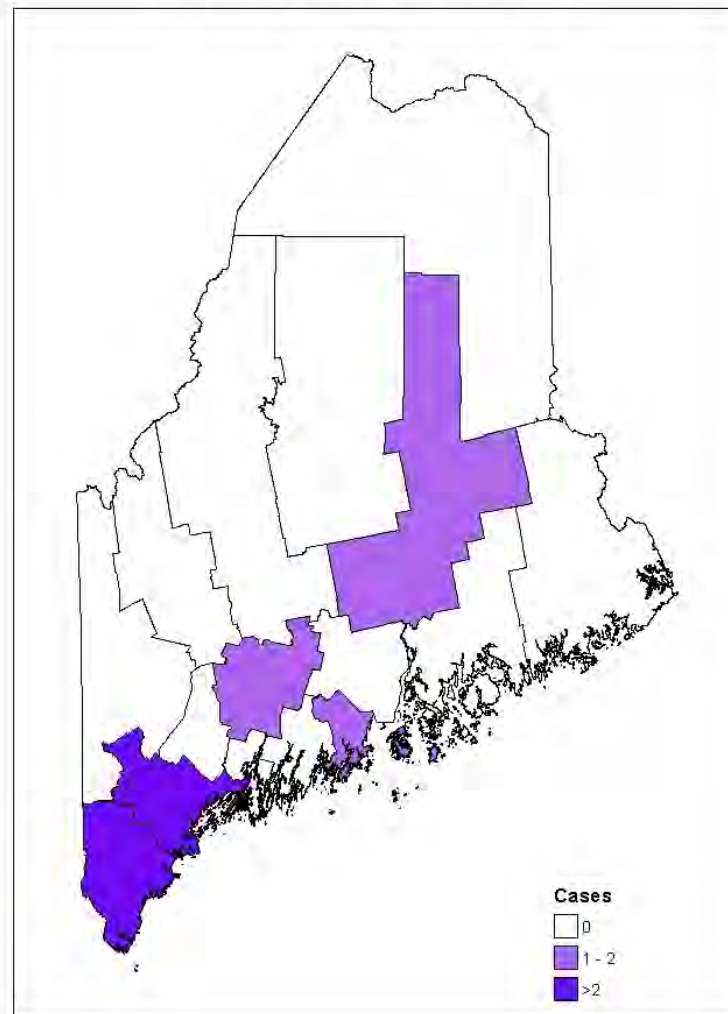
2009: 3

2010: 5

2011: 9

2012: 10

Babesia Cases, Maine 2012



# Non-Endemic Tick Borne Diseases

## **Ehrlichia Cases**

- 2005: 1
- 2006: 4
- 2007: 3
- 2008: 1
- 2009: 1
- 2010: 4
- 2011: 1
- 2012: 3

## **RMSF Cases**

- 2005: 0
- 2006: 0
- 2007: 1
- 2008: 1
- 2009: 5
- 2010: 2
- 2011: 1
- 2012: 3



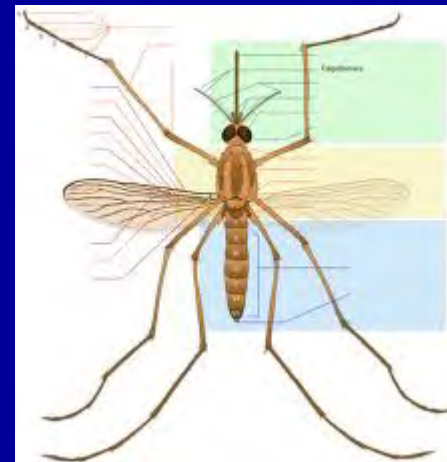
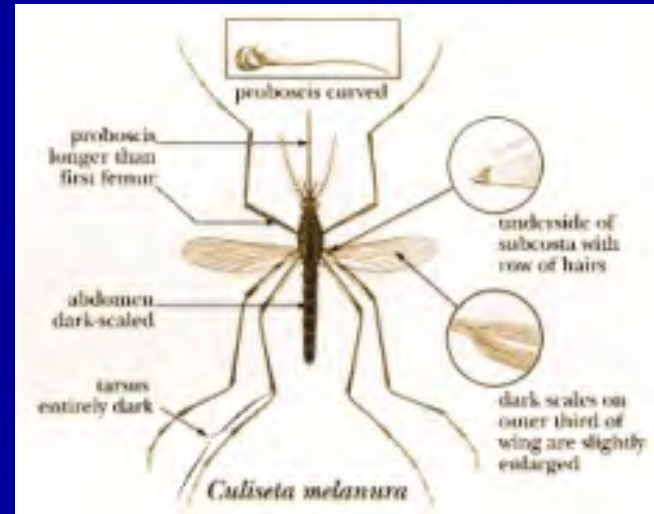
# Mosquito-borne diseases



- 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 EEEV and WNV



# EEE vector habitat



- *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

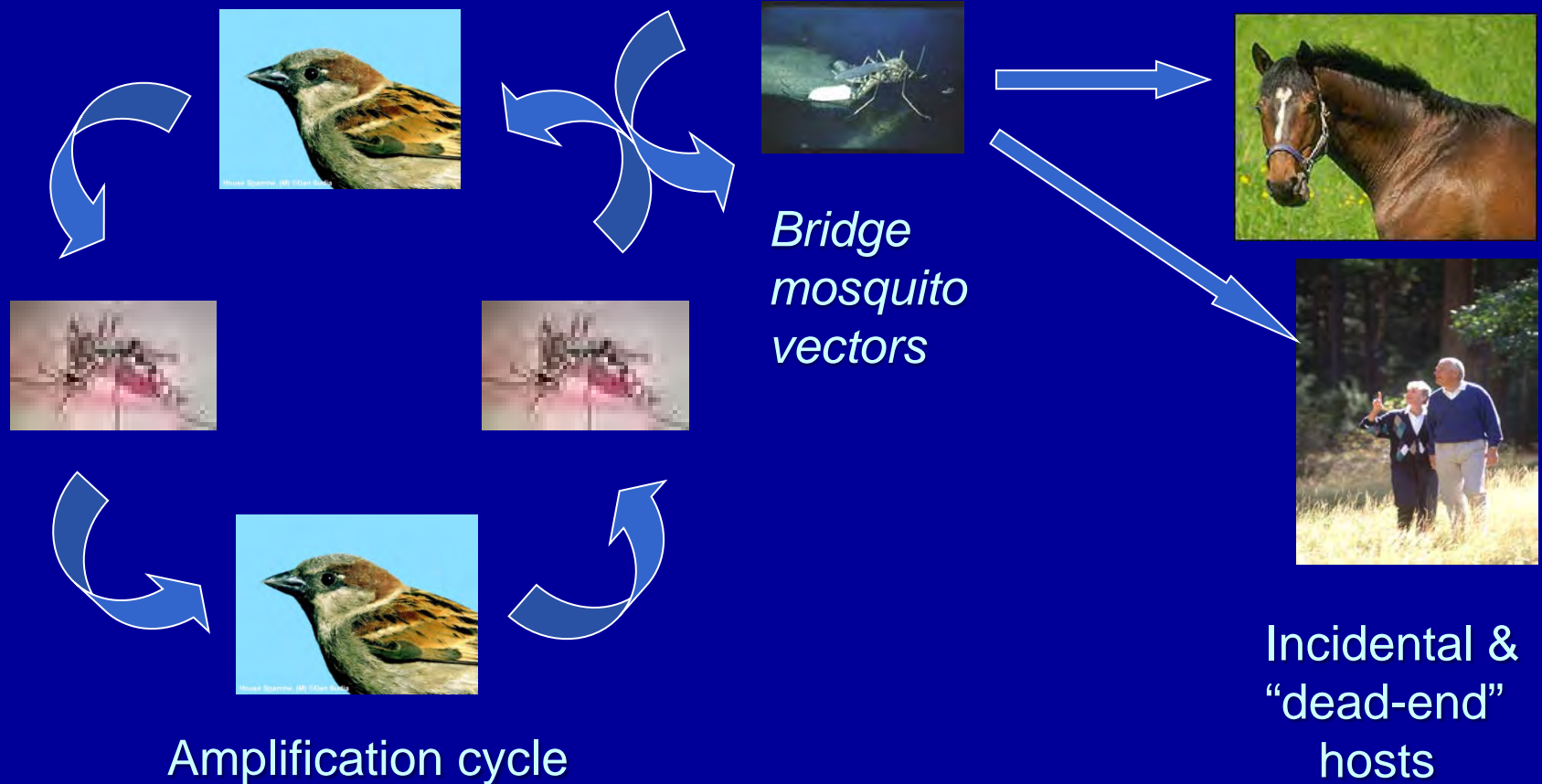
- Can overwinter as adults

- 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
  - 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



# Arbovirus in Maine, 2012

Surveillance	Species	Collection Date	Town	County	Agent
Animal	Pheasant	9/6/2012	Lebanon	York	EEE
Mosquito	Culex pipiens/restuans	9/6/2012	Biddeford	York	WNV
Mosquito	Culiseta melanura	8/31/2012	Scarborough	Cumberland	WNV
Mosquito	Culiseta melanura	8/30/2012	Scarborough	Cumberland	WNV
Mosquito	Culiseta melanura	8/23/2012	Gorham	Cumberland	WNV
Mosquito	Culiseta melanura	8/23/2012	Standish	Cumberland	WNV
Mosquito	Culiseta melanura	8/1/2012	Lebanon	York	WNV
Mosquito	Culex pipiens/restuans	8/1/2012	Gorham	Cumberland	WNV
Human				Cumberland	WNV



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](http://www.mainepublichealth.gov)

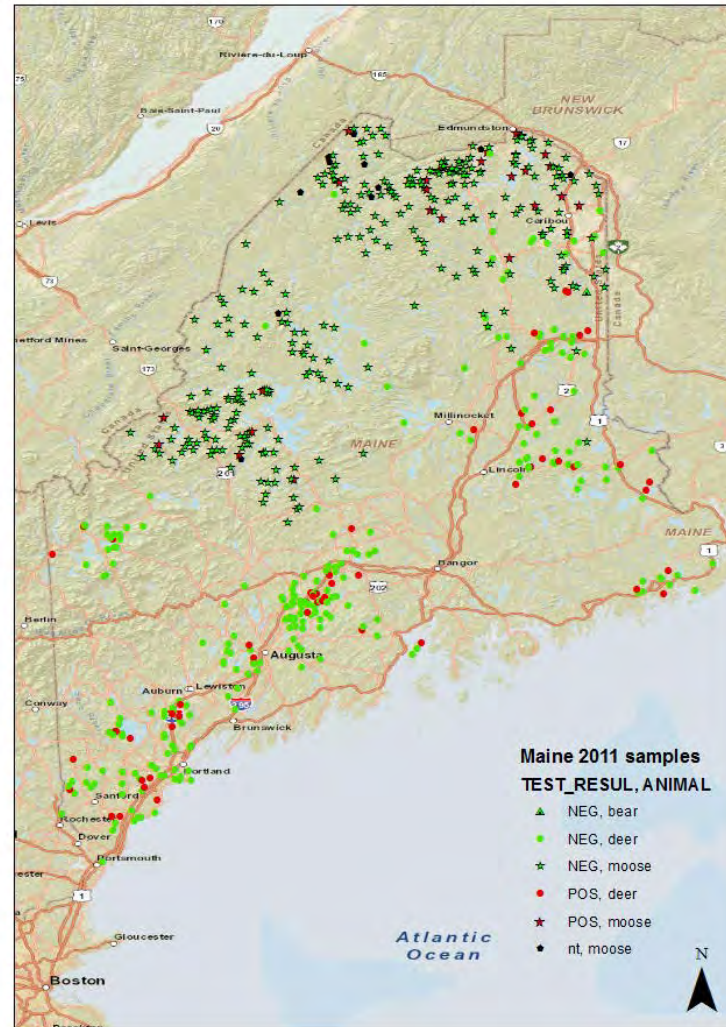
# EEE - serosurvey

- Maine is interested in the geographical range of EEE – so in collaboration with federal CDC, MMCRI, and USDA we have done several serosurveys
  - Deer and moose serosurvey 2009, 2010, 2011, 2012
  - Turkey serosurvey 2011, 2012
- Positives found in 15 Maine counties (all but Lincoln )

# EEE serosurvey

## 2011 results

- Identified EEE pretty much anywhere we looked
- Overall I infection rates:
  - 18.1% in deer
  - 7.6 % in moose
- 2012 results pending



# For More Information

- Maine CDC disease reporting and consultation line: 1-800-821-5821
- Maine Medical Center Research Institute – Vector-borne Disease Lab: 207-662-7142
- Sara Robinson, Vectorborne Epidemiologist:  
[sara.robinson@maine.gov](mailto:sara.robinson@maine.gov)