



Commonwealth of Massachusetts  
Department of Public Health

Helping People Lead Healthy Lives In Healthy Communities

# WNV and EEE Surveillance and Response Presentation to the Public Health Council July 16, 2014



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# Eastern Equine Encephalitis Human Disease

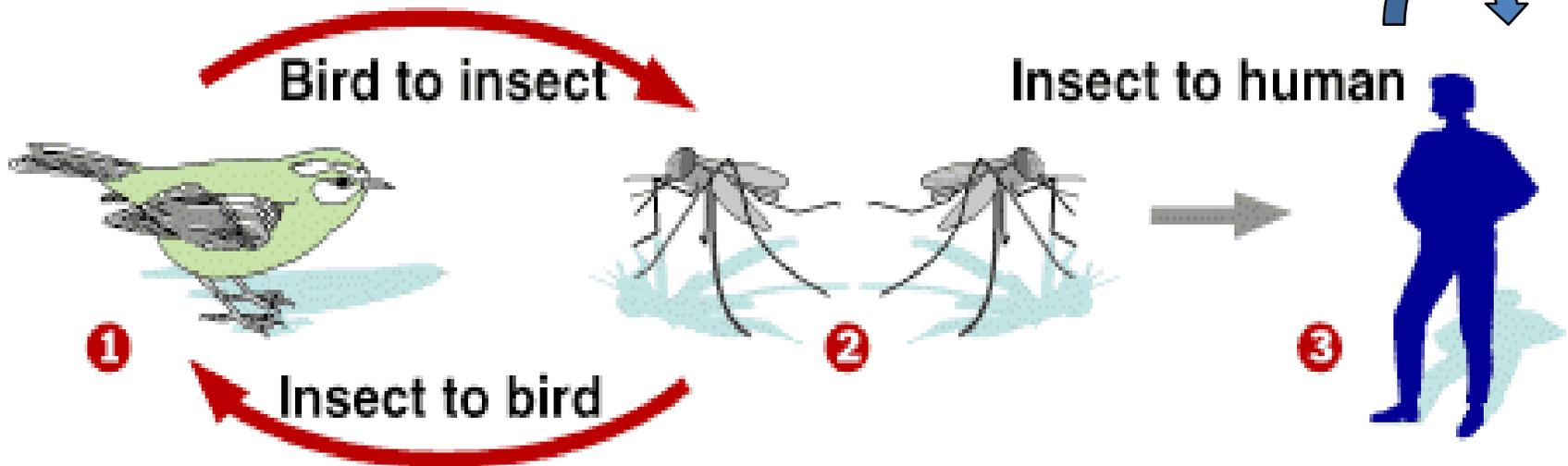
- Rare, but severe disease
- Children are disproportionately affected
- Incubation period of 3-10 days
- Abrupt onset fever, chills, headache, muscle aches, nausea and vomiting, seizures, coma
- ~30-50% mortality
- ~80% of survivors have residual neurological deficits
- 23 MA cases (plus 2 exposures to non-residents) in the past decade, and 11 deaths
- We should expect EEE activity and a possible human case each year

# West Nile Virus Infection

## Human Disease

- More common, generally less severe
- Incubation period 3 to 14 days
- Highest risk of severe illness for those over 50
- 80% get mild, sub-clinical infection
- 20% get headache, sore throat, fatigue, muscle and joint aches, moderate to high fever
- <1% progress to aseptic meningitis, encephalitis, or meningoencephalitis
- 74 human cases in the past decade, and 4 deaths
- Widespread, endemic reality

**Enzootic Cycle:**  
Virus Amplification by *Ornithophilic* Mosquitoes



**Epizootic Cycle:**  
*Incidental Transmission by Zoophilic Mosquitoes*

EEEV: *Cq perturbans, Ae vexans, Ae sollicitans, Oc. canadensis*

WNV: *Cx. spp.*

# An Interagency Effort: Arbovirus (ARthropod BORne Virus) Surveillance and Response

- **Executive Office of Health and Human Services**
  - Department of Public Health
    - Bureau of Laboratory Science
    - Bureau of Infectious Disease
    - Bureau of Environmental Health
- **Executive Office of Energy and Environmental Affairs**
  - State Reclamation and Mosquito Control Board
  - Department of Agricultural Resources
  - Department of Conservation and Recreation
  - Department of Environmental Protection
- **9 Local Mosquito Control Projects** (Berkshire, Bristol, Central Massachusetts, Cape Cod, East Middlesex, Norfolk, Northeast Massachusetts, Plymouth, Suffolk)
- **Local Health Departments**

# Routine Preparedness and Response Activities

- **DPH:**
  - Set and collect long-term mosquito traps
  - Perform sorting by species and testing for virus
  - Interpret mosquito abundance and infection rates
  - Determine and report specific areas of risk
  - Support public education on personal prevention (curtailing evening outdoor activity, covering exposed skin, using approved insect repellants)
  - Support local health department activities (social media messages to be ready for season)
- **DAR, State Reclamation and Mosquito Control Board (SRMCP) and local MCPs:**
  - Perform early season larvaciding
  - Set and collect supplemental mosquito traps
  - Conduct ground spraying to kill adult mosquitoes (both nuisance control and vector control)

# DPH Roles in Responding to EEE/WNV Threats

## **Surveillance**

- Set and collect traps from long-term sites in southeastern MA  
Collaborate supplemental trapping with local Mosquito Control Projects (MCPs)

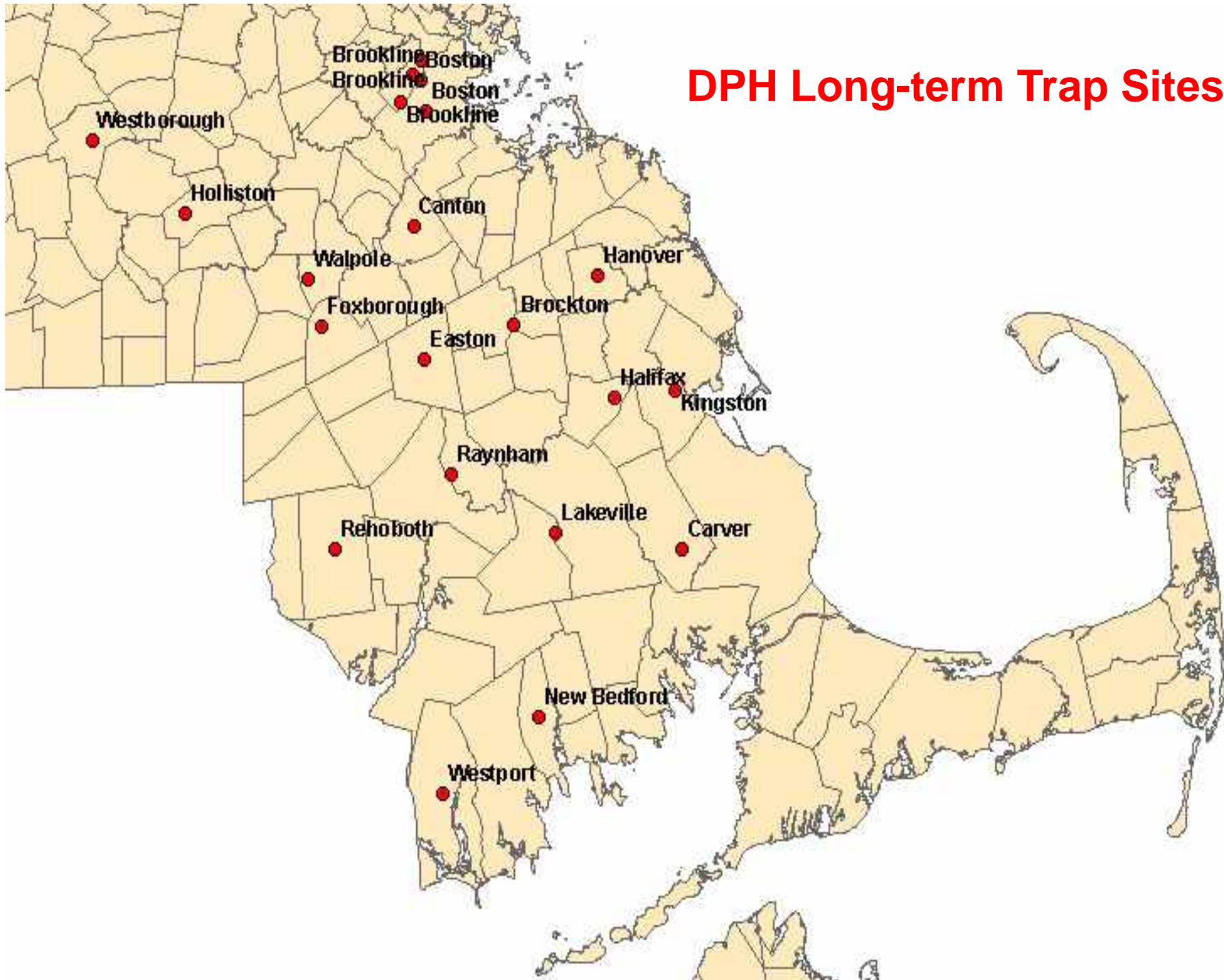
## **Laboratory Testing and Correlation with Patient Information**

- Test specimens for EEE/WNV infection  
Mosquitoes, suspect animal and human clinical specimens

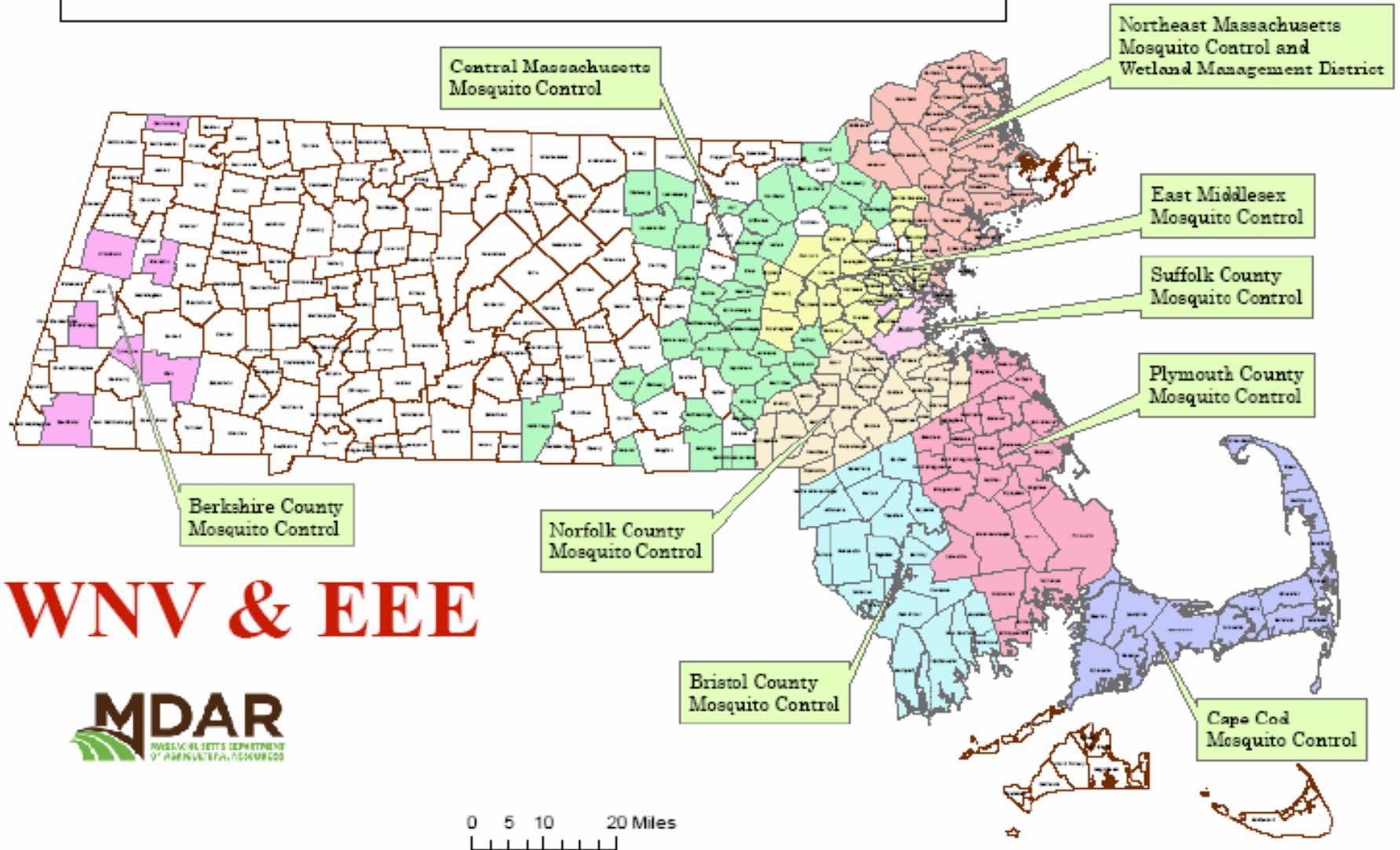
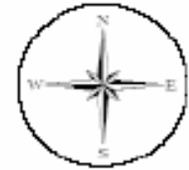
## **Risk Analysis and Communication**

- Identify areas of risk for human disease
- Communicate findings with local health agents, local Mosquito Control Projects, and the public
- Provide information to guide the control actions to reduce the risk of disease

## DPH Long-term Trap Sites



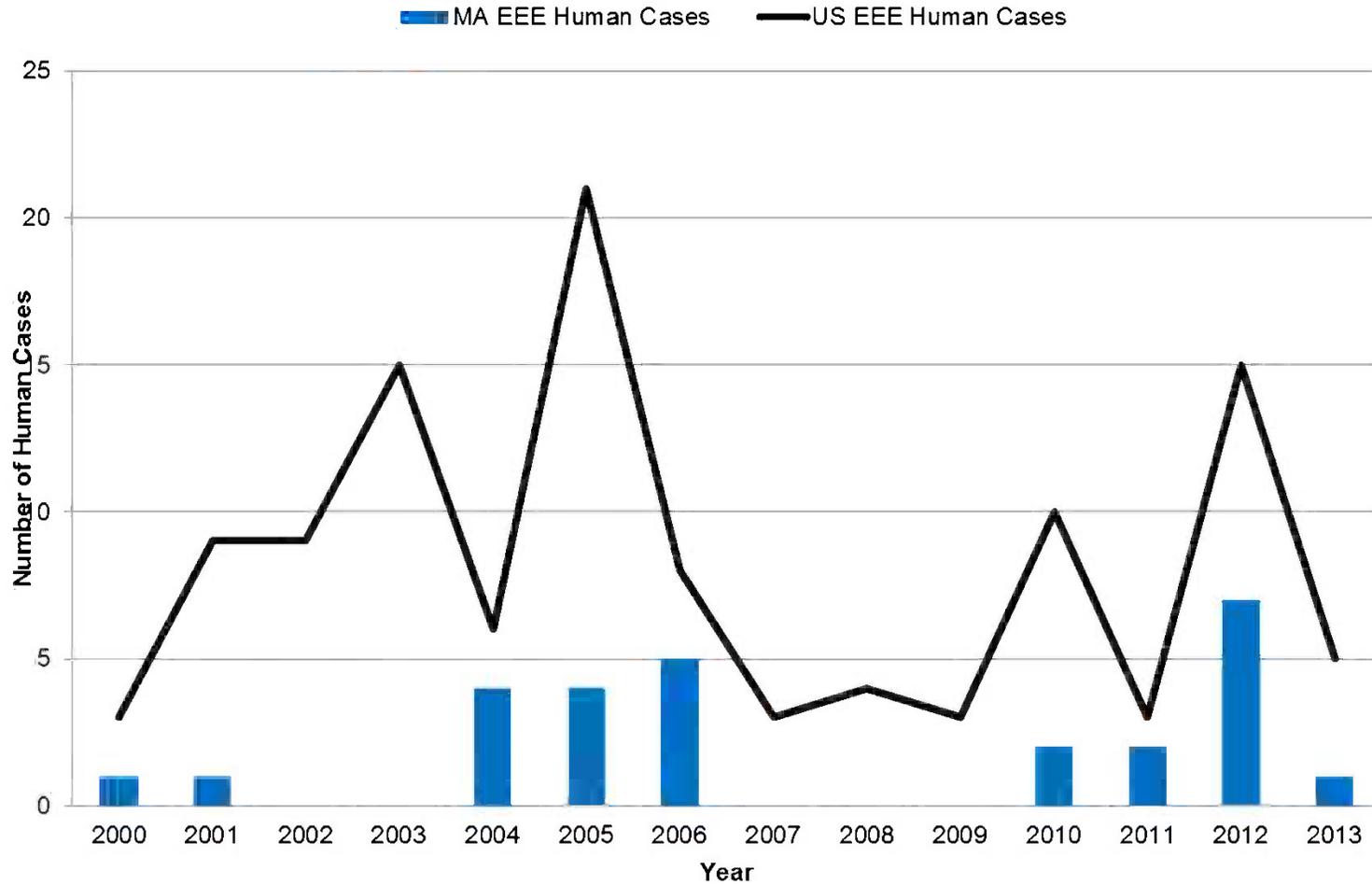
# Mosquito Control Projects and Districts Commonwealth of Massachusetts



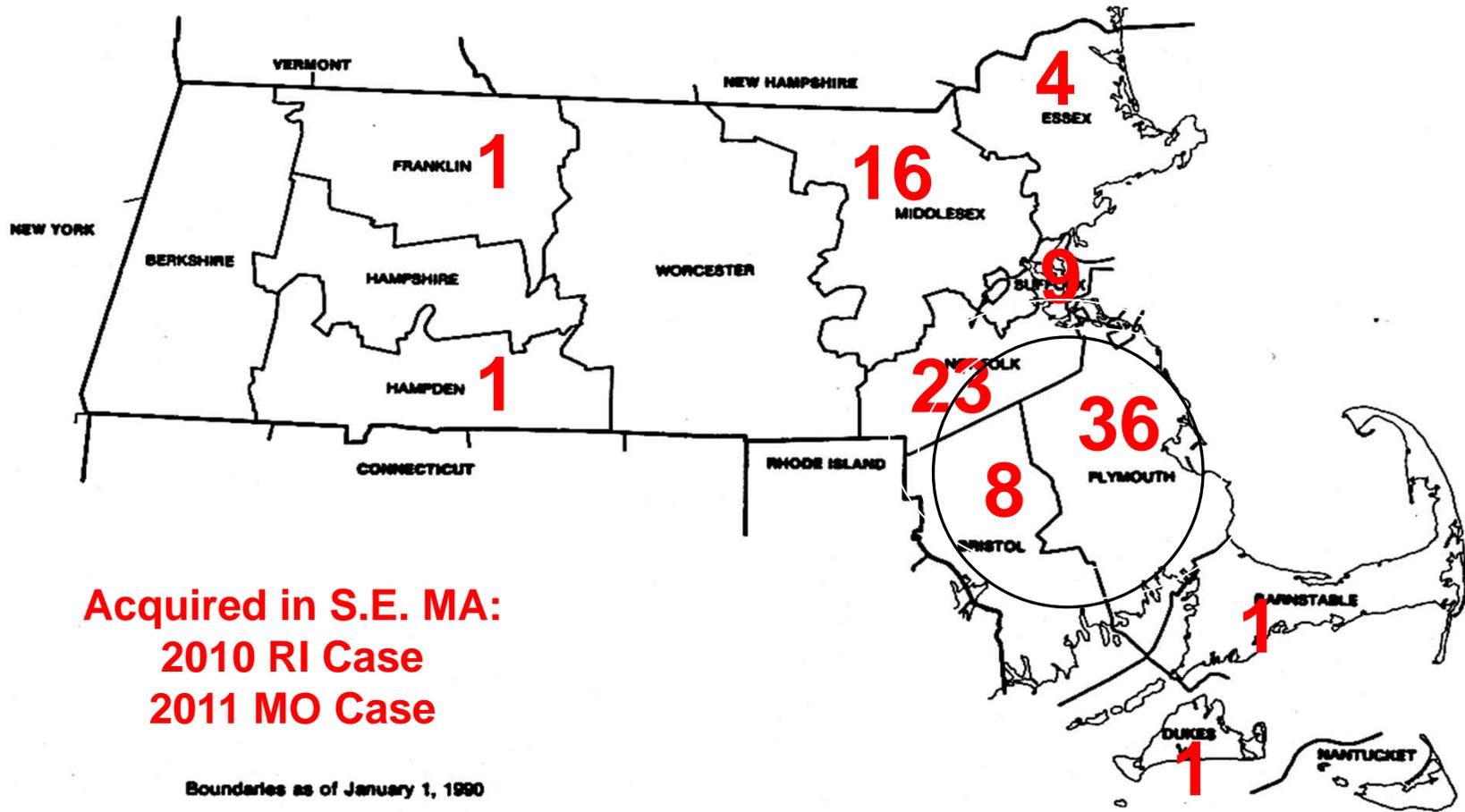
**WNV & EEE**



# Number of EEE Human Cases MA and US, 2000-2013

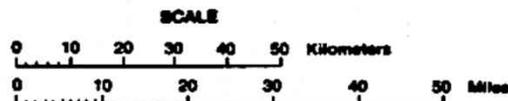


# Human EEE Cases by County of Residence, 1938-2013

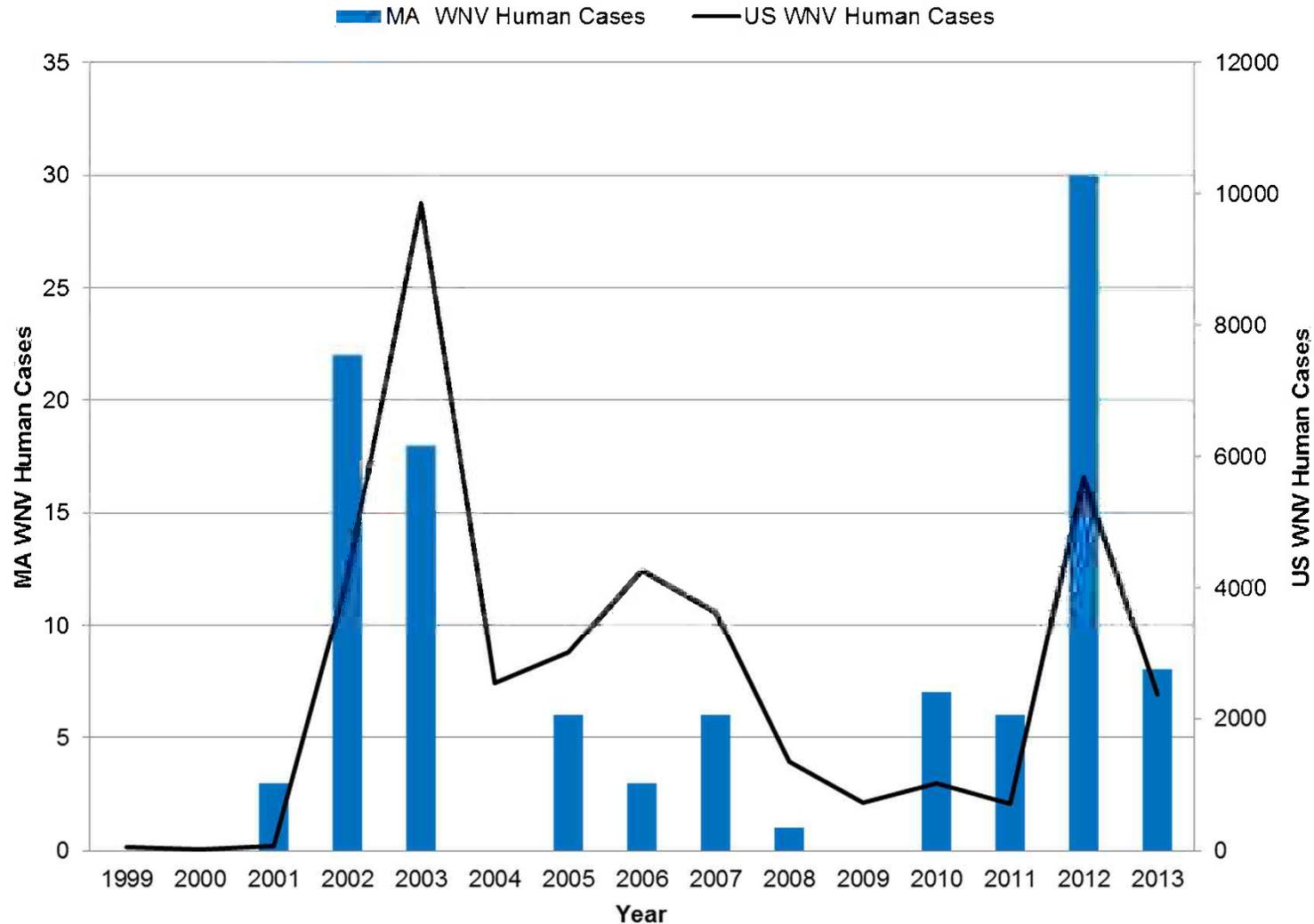


Acquired in S.E. MA:  
2010 RI Case  
2011 MO Case

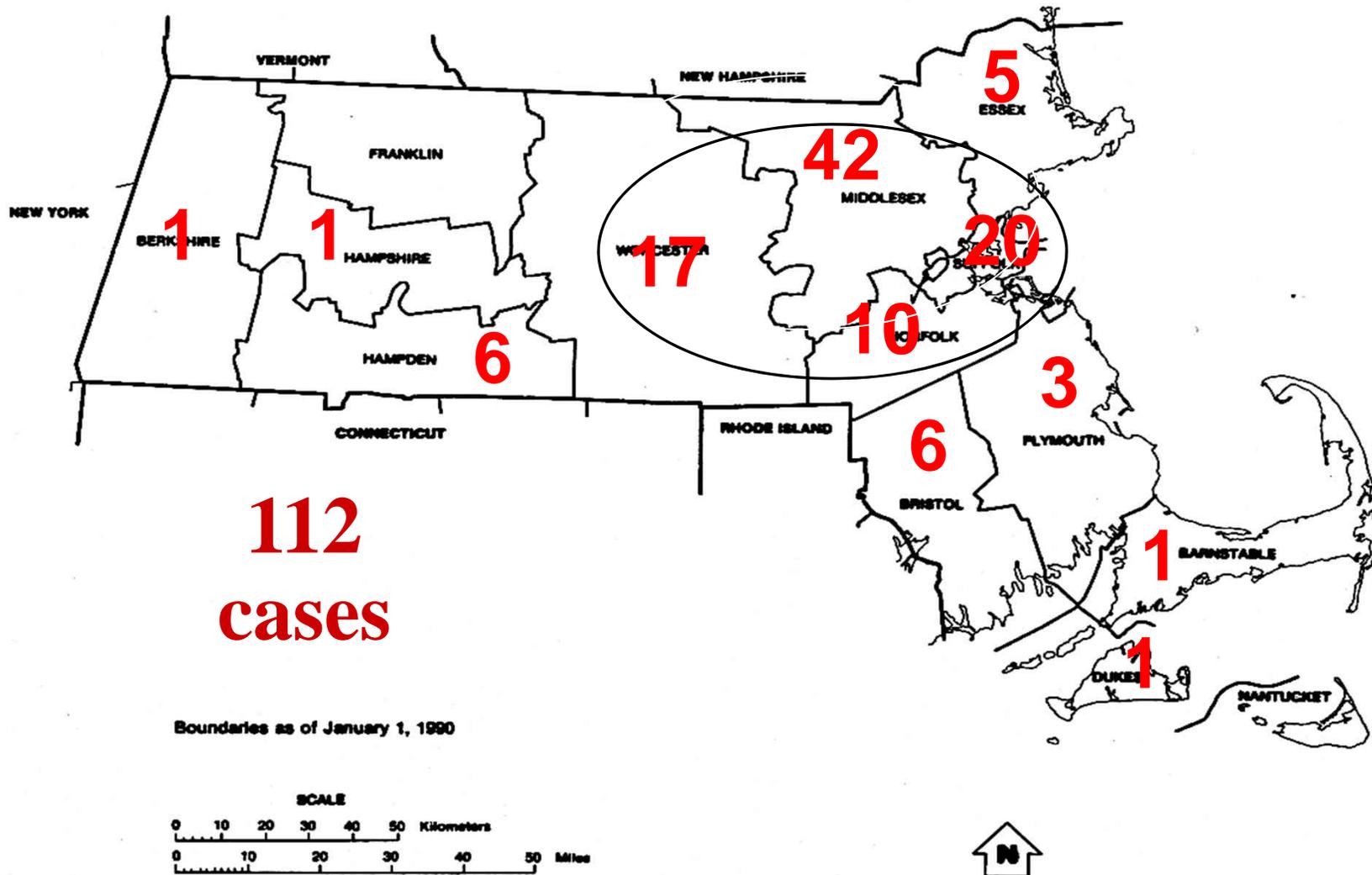
Boundaries as of January 1, 1990

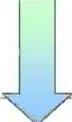
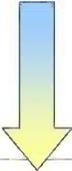
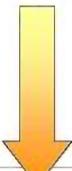
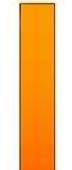


# Number of WNV Human Cases MA and US, 1999-2013

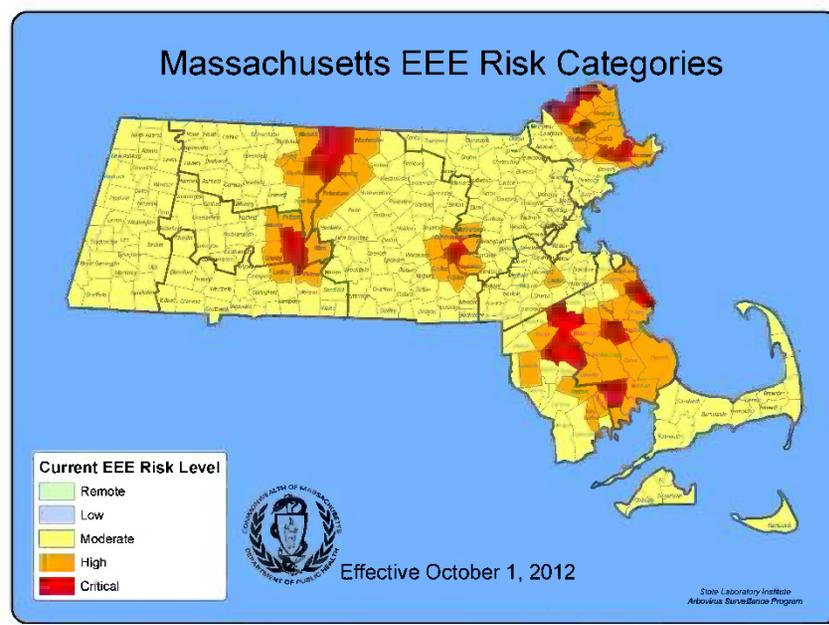


# Human WNV Cases by County of Residence, 2001-2013



Key to Color Coding on Risk Maps		
Risk	What it Means	What You Should Do
<b>Remote</b> 	<p>Multiple cases of human disease caused by EEE or WNV are considered <u>highly unlikely at this time</u>.</p> <p>No human, animal or mosquito infections have been identified in the area so far this year.</p>	<ul style="list-style-type: none"> <li>• Repair screens</li> <li>• Dump standing water twice weekly</li> </ul>
<b>Low</b> 	<p>Multiple cases of human disease caused by EEE or WNV are considered <u>unlikely at this time</u>.</p> <p>Infected mosquitoes have been found in the area this year, but no human or animal infections.</p>	<ul style="list-style-type: none"> <li>• Repair screens</li> <li>• Dump standing water twice weekly</li> <li>• Wear mosquito repellent when outdoors during peak mosquito hours (from dusk to dawn)</li> <li>• Wear long sleeves and long pants when outdoors during peak mosquito hours (from dusk to dawn)</li> <li>• Use mosquito netting on baby carriages and playpens outdoors</li> <li>• Arrange neighborhood cleanups to get rid of mosquito breeding sites</li> </ul>
<b>Moderate</b> 	<p>Multiple cases of human disease caused by EEE or WNV are considered <u>moderately likely at this time</u>.</p> <p>There have been multiple infected mosquitoes this year in addition to human or animal cases <u>last year</u>.</p>	<ul style="list-style-type: none"> <li>• Repair screens</li> <li>• Dump standing water twice weekly</li> <li>• Wear mosquito repellent when outdoors during peak mosquito hours (from dusk to dawn)</li> <li>• Weather permitting, wear long sleeves and long pants when outdoors during peak mosquito hours (from dusk to dawn)</li> <li>• Use mosquito netting on baby carriages and playpens outdoors</li> <li>• Arrange neighborhood cleanups to get rid of mosquito breeding sites</li> <li>• Be aware of stagnant water on private property (e.g. unused swimming pools) and report to the local board of health.</li> </ul>
<b>High</b> 	<p>Multiple cases of human disease are considered <u>very likely at this time</u>.</p> <p>There have been infected mosquitoes repeatedly in the area</p>	<ul style="list-style-type: none"> <li>• Repair screens</li> <li>• Dump standing water twice weekly</li> <li>• Wear mosquito repellent when outdoors</li> <li>• Weather permitting, wear long sleeves and long pants when outdoors during peak mosquito hours (from dusk to dawn)</li> <li>• Use mosquito netting on baby carriages and playpens outdoors</li> <li>• Arrange neighborhood cleanups to get rid of mosquito breeding sites</li> <li>• Be aware of stagnant water on private property (e.g. unused swimming pools) and report to the local board of health.</li> <li>• Avoid outside areas with obvious mosquito activity</li> <li>• Adjust outdoor activity to avoid peak mosquito hours (from dusk to dawn)</li> <li>• Avoid overnight camping near freshwater swamps where EEE activity is likely</li> <li>• Consider cancelling or rescheduling outdoor gatherings, organized sporting events, etc. during peak mosquito hours</li> </ul>
<b>Critical</b> 	<p>Multiple cases of human disease are <u>extremely likely at this time</u>.</p> <p>There has been at least one human and/or animal case of disease or rapid escalation of indications of risk in the area this year.</p>	<ul style="list-style-type: none"> <li>• Repair screens</li> <li>• Dump standing water twice weekly</li> <li>• Wear mosquito repellent when outdoors during peak mosquito hours (from dusk to dawn)</li> <li>• Wear long sleeves and long pants when outdoors during peak mosquito hours (from dusk to dawn)</li> <li>• Use mosquito netting on baby carriages and playpens outdoors</li> <li>• Arrange neighborhood cleanups to get rid of mosquito breeding sites</li> <li>• Be aware of stagnant water on private property (e.g. unused swimming pools) and report to the local board of health.</li> <li>• Avoid outside areas with obvious mosquito activity</li> <li>• Avoid overnight camping near freshwater swamps where EEE activity is likely</li> <li>• Towns should work with their community around cancelling or rescheduling outdoor gatherings, organized sporting events, etc. during peak mosquito hours</li> </ul>

# Risk Analysis and Phased Response



## RECOMMENDED CANCELLATION TIMES FOR OUTDOOR ACTIVITIES IN AREAS OF HIGH RISK FOR EASTERN EQUINE ENCEPHALITIS (EEE) 2012

The types of mosquitoes most likely to transmit EEE infection are likely to be out searching for food (an animal to bite) at dusk, the time period between when the sun sets and it gets completely dark. **The exact timing of this increased activity is influenced by many factors including temperature, cloud cover, wind and precipitation and cannot be predicted precisely for any given day.** Here, the approximate time of sunset was used to establish standardized recommendations for cancellation times of outdoor activities during periods of high EEE risk.

**This does not eliminate risk nor does it alleviate the need for the use of repellants or clothing for protection from mosquitoes.**

August 2012						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
July 29	July 30	July 31	1	2	3	4
←			8:00 PM	→		
5	6	7	8	9	10	11
←			8:00 PM	→		
12	13	14	15	16	17	18
←			7:30 PM	→		
19	20	21	22	23	24	25
←			7:30 PM	→		
26	27	28	29	30	31	Sept 1
←			7:00 PM	→		

September 2012						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
2	3	4	5	6	7	8
←			7:00 PM	→		
9	10	11	12	13	14	15
←			6:45 PM	→		
16	17	18	19	20	21	22
←			6:45 PM	→		
23	24	25	26	27	28	29
←			6:15 PM	→		

October 2012						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
Sept 30	1	2	3	4	5	6
←			6:15 PM	→		
7	8	9	10	11	12	13
←			6:00 PM	→		
14	15	16	17	18	19	20
←			6:00 PM	→		
21	22	23	24	25	26	27
←			5:30 PM	→		
28	29	30	31	Nov 1	Nov 2	Nov 3
←			5:30 PM	→		

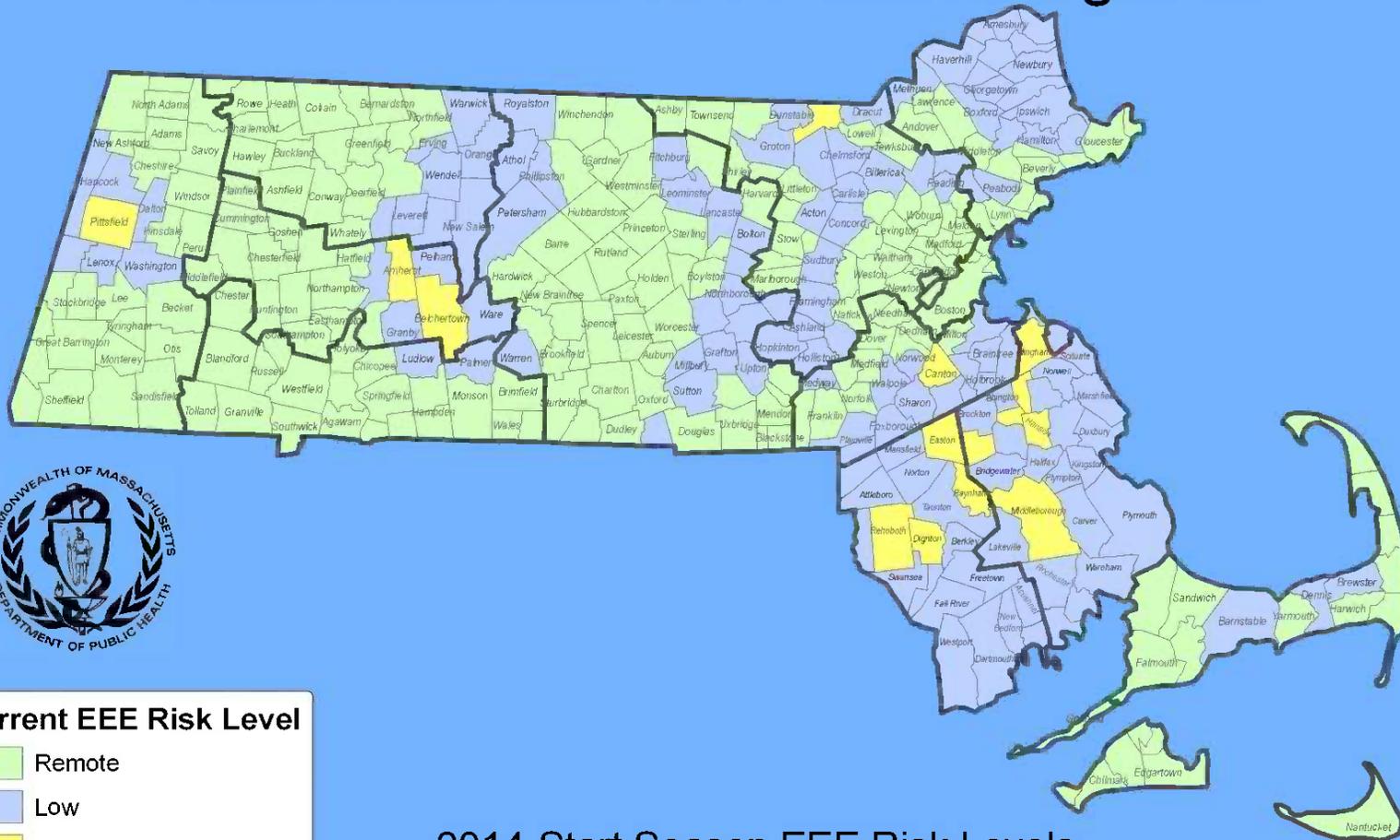
# 2013 Successes

- Moderate WNV activity with low EEE activity
- Smoother chains of communication with prompt reporting of all results
- More standardization between communities with respect to curtailing evening activities
- Better alignment of WNV risk categories with recommended responses

# Communication Plan

- **Daily positive mosquito results, if any**
- **Bi-weekly routine risk level announcements:**
  - Notification of EOHHS Secretariat (and, in turn, the Governor's Office)
  - Notification of EHS and EEA partners
  - Notification of MCP(s)
  - Notification of local health department(s)
  - Website updates
  - Media announcements only for first positives and extraordinary mosquito/risk results
- **Preliminary positive animal or human results:**
  - Same intra-governmental notifications as above, plus
  - Notification of ordering clinicians/veterinarians
  - Notification of MCP(s)
  - Notification of local health department(s)
  - No media or website announcement
- **Confirmed positive animal or human results:**
  - Same as above, plus
  - Notification of affected legislators
  - Media announcement

# Massachusetts EEE Risk Categories



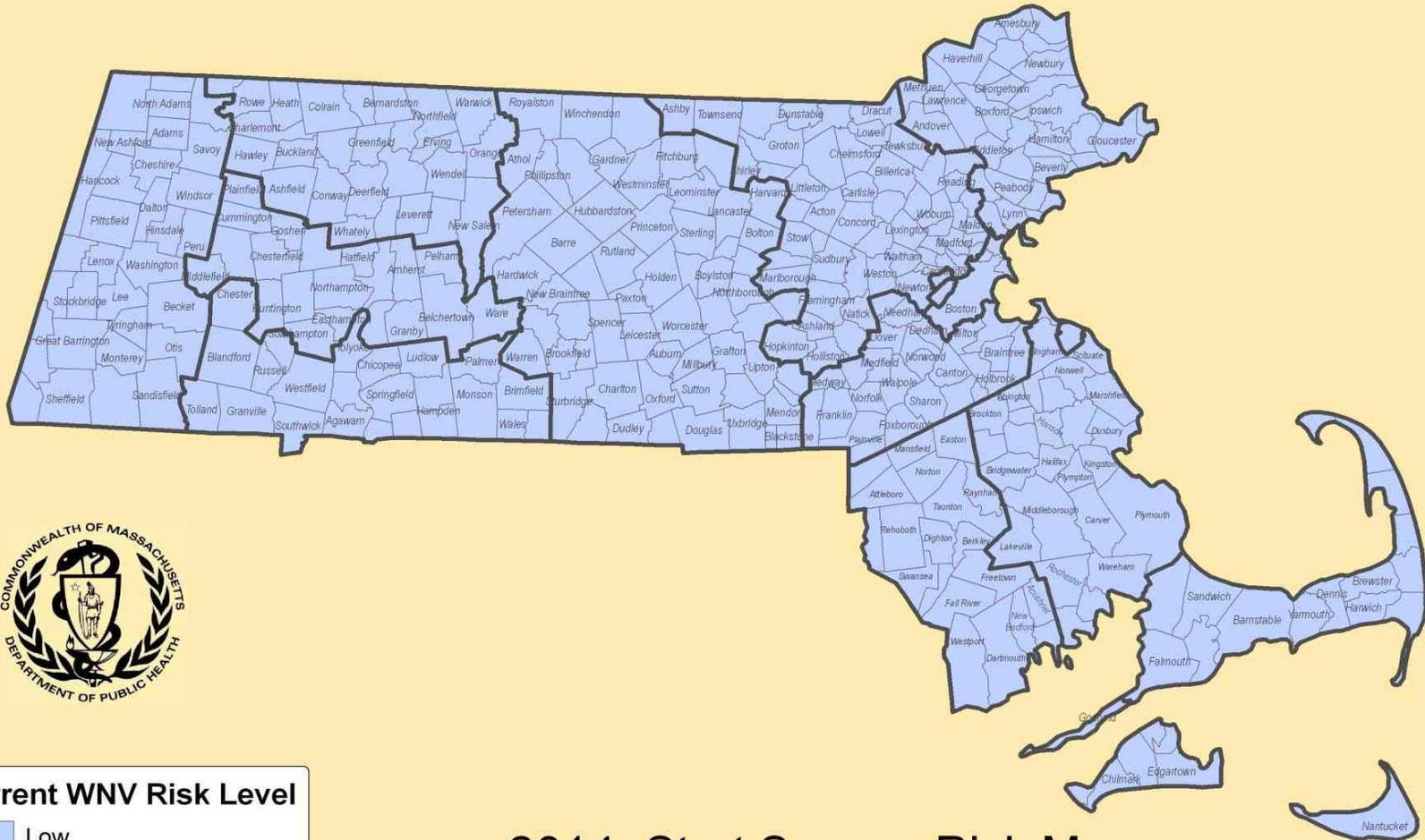
## Current EEE Risk Level

- Remote
- Low
- Moderate
- High
- Critical

2014-Start Season EEE Risk Levels

State Laboratory Institute  
Arbovirus Surveillance Program

# Massachusetts WNV Risk Categories



**Current WNV Risk Level**

- Low
- Moderate
- High
- Critical

2014- Start Season Risk Map

State Laboratory Institute  
Arbovirus Surveillance Program

# Moving Forward: Challenges

- WNV and EEE are both occurring in an evolving environment
- Current surveillance system is robust but doesn't cover all areas of potential concern
- DPH arbovirus infrastructure flexible and responsive to emergencies
  - Insufficient to provide routine surveillance in all areas at risk
  - Diverts resources from other areas

# Moving Forward: Challenges

- Local jurisdictions interested in surveillance
  - Not all have access to MCPs
  - Not all can afford MCP services
  - How to integrate results from a private contractor into our system?
  - What is appropriate response to high risk in an area without MCP services?

# Moving Forward: Concerns for the future

- Risk of introduction of chikungunya
- Question of importance of Jamestown Canyon virus
- Need to monitor for emergence of non-native mosquito populations (*Aedes albopictus*)