

# Massachusetts Arbovirus Surveillance and Response Plan

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## Outbreak of Encephalitis in Man Due to the Eastern Virus of Equine Encephalomyelitis\*

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*Director of the Division of Communicable Diseases of the  
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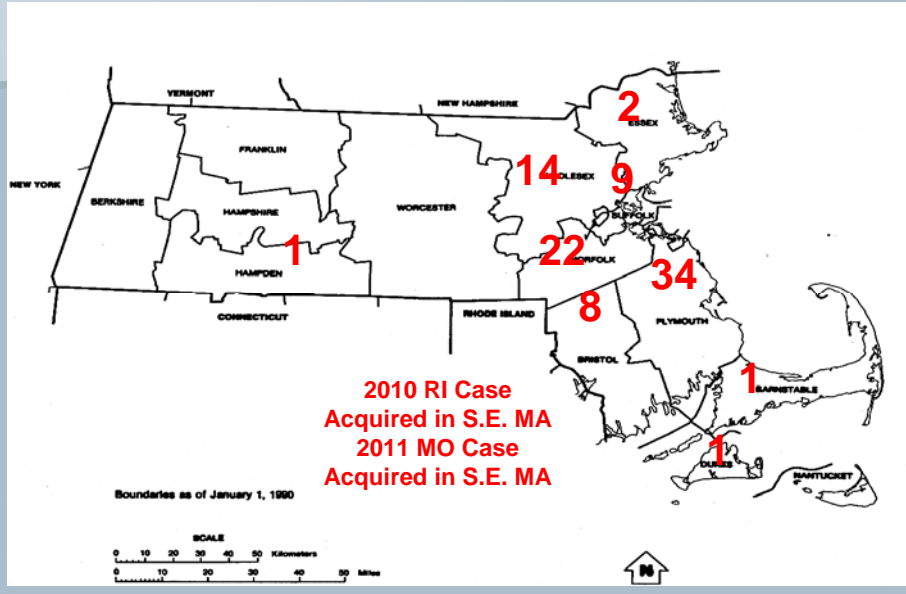
ABOUT the middle of August, 1938, cases of encephalomyelitis in horses were recognized in Massachusetts and it was soon ascertained that an epidemic of this disease had broken out. All five of these cases occurred within 15 miles of each other, the nearest being 20 miles southeast of Boston. An interesting coincidence was that they

1831	Epidemic of brain disease in horses in Massachusetts
1931	Differentiated from other equine encephalitides
1933	Virus isolated
1933-36	Birds implicated as reservoir of virus
1938	Outbreak of "brain disease" in horses in Massachusetts (~ 300 cases)
1938-39	Outbreak of human EEE in Massachusetts (35 cases)
1947	Louisiana and Texas outbreaks
1955-56	Second Massachusetts outbreak (16 cases), aerial spraying, DDT
1957	Taunton Field Station of the USPHS
1969	Taunton Field Station closed, State Laboratory continues surveillance
1973	Equine vaccine
1973-75	Outbreak (7 cases), aerial spraying, malathion
1982-84	Outbreak (10 cases)
1990	Outbreak (3 cases), aerial spraying, malathion

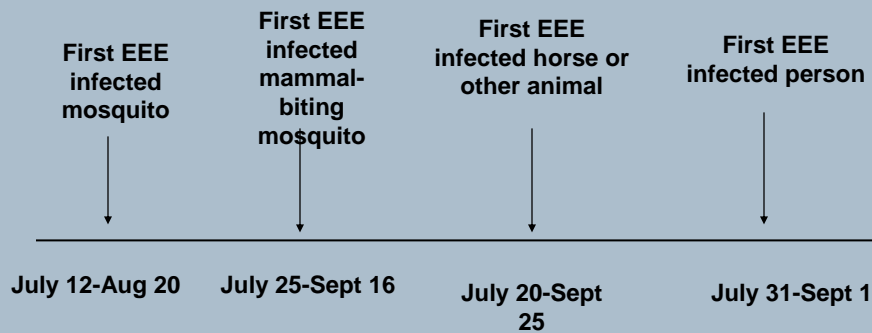
### Eastern Equine Encephalitis Virus Neuroinvasive Disease Cases Reported by State, 1964-2010

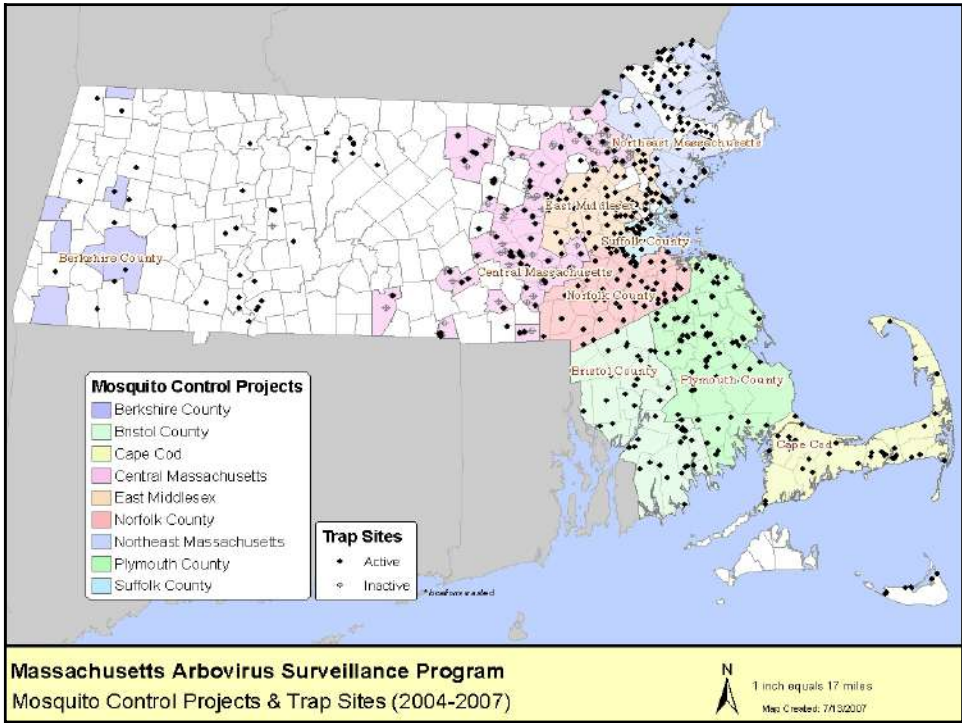
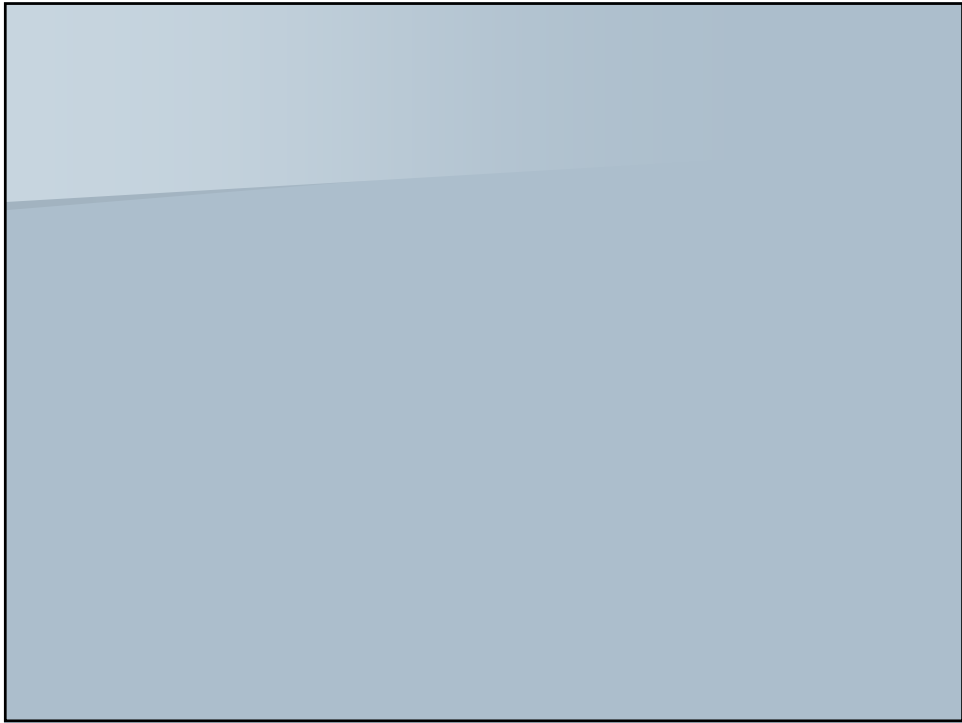


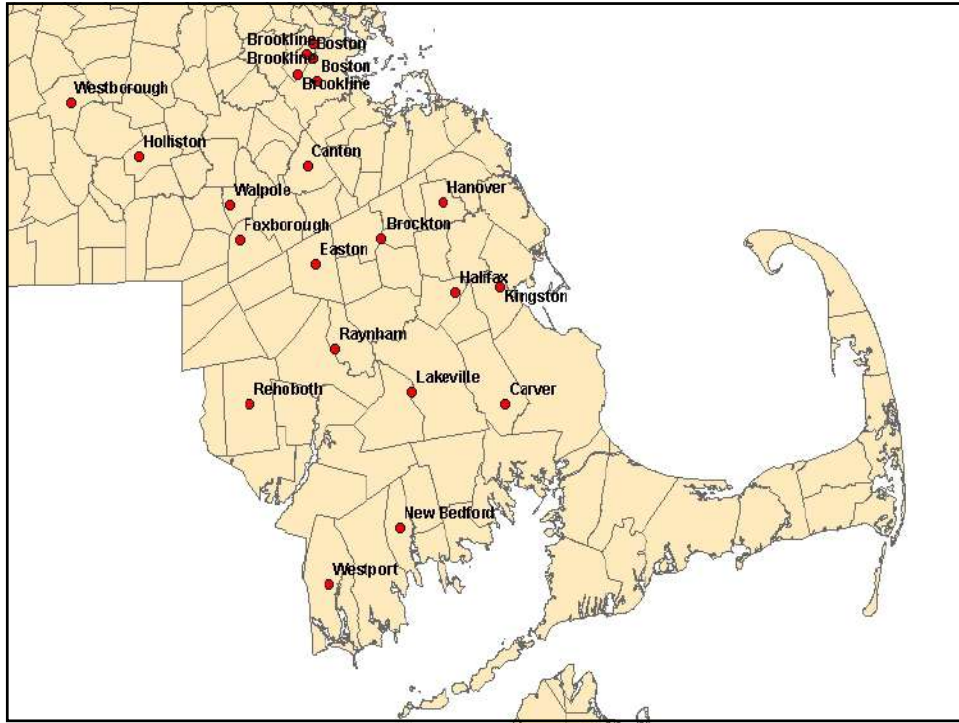
## Human EEE Cases by County of Residence, 1938-2011



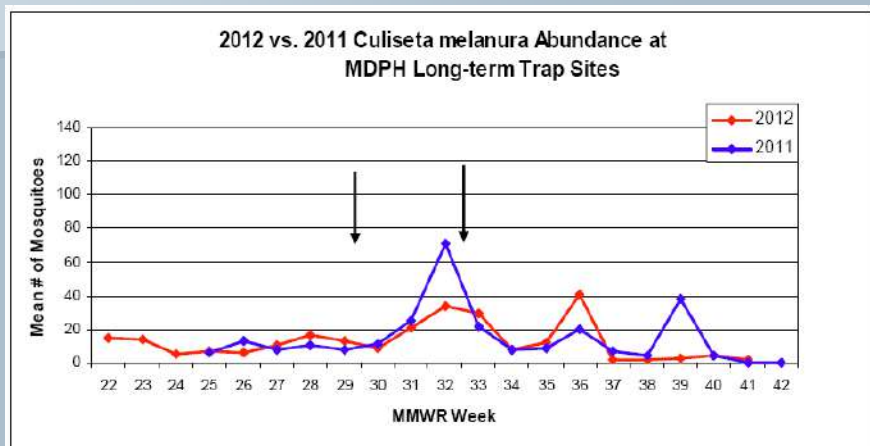
## Overall Progression During Mosquito Season





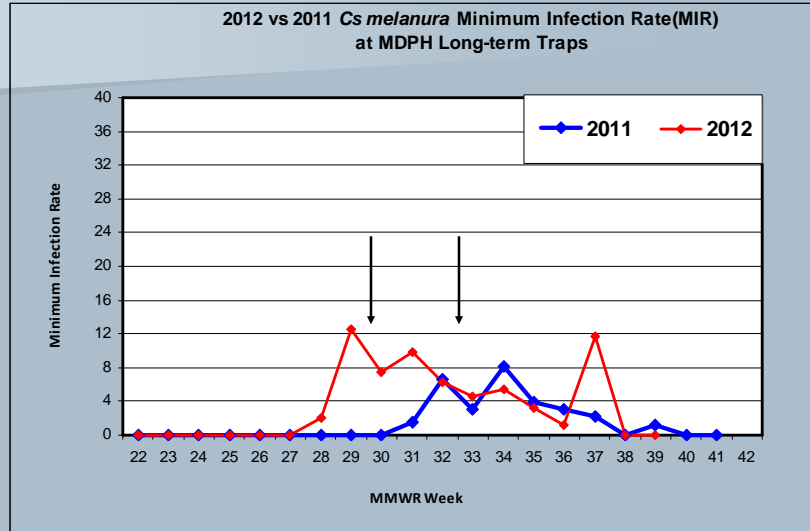


### *Culiseta melanura* Population



Notes: First arrow indicates aerial adulticide application, July 20-22.  
 Second arrow indicates aerial adulticide application, August 13.

## EEE Infection Rate in Mosquitoes



Notes: First arrow indicates aerial adulticide application, July 20-22.  
Second arrow indicates aerial adulticide application, August 13.

## Arbovirus Surveillance and Response Plan

VECTOR CONTROL PLAN TO PREVENT

VECTOR CONTROL PLAN TO PREVENT  
EASTERN (EQUINE) ENCEPHALITIS

A Joint Program of the  
Executive Offices of Health and Human Services  
and Environmental Affairs

COMMONWEALTH OF MASSACHUSETTS

RISK CATEGORIES

(1) LOW - A LOW LEVEL OF EEE RISK may exist if all of the following conditions are met:

Current Season

1. EEE virus isolates in *Cs.melanura* <5
2. Population of *Cs.melanura* below long-term mean

Previous Season

1. No human or horse cases
2. *Cs. melanura* below long-term mean
3. EEE virus isolates <20

(2) MODERATE - A MODERATE LEVEL OF EEE RISK may exist if any of the following conditions exist:

Current Season

1. EEE virus isolates from *Cs. melanura*  $\geq 5$
2. *Cs. melanura* populations approaching long-term mean
3. Clinically presumptive horse cases

Previous Season

1. 1 human case or horse case
2. *Cs.melanura* population above the long-term mean
3. EEE virus isolates from *Cs. melanura* >20

(3) HIGH - A HIGH LEVEL OF EEE RISK may exist if any of the following conditions exist:

Current Season

1. Confirmation of 1 human case
2. Multiple horse cases
3. EEE virus isolates in bridge vector species

Previous Season

1. 2 or more confirmed human or horse cases

(4) PUBLIC HEALTH EMERGENCY -DPH will forward a recommendation to the Governor's Office to declare a PUBLIC HEALTH EMERGENCY in the event that any of the following conditions exist:

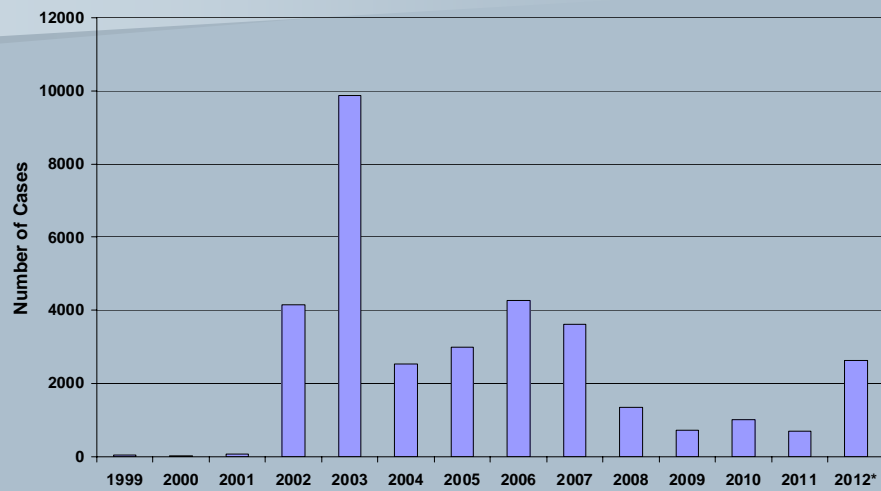
Current Season

1. 2 human cases are confirmed
2. Surveillance data indicating that multiple human cases of EEE will occur without intervention

### EEE RISK LEVELS AND RESPONSE ACTIONS

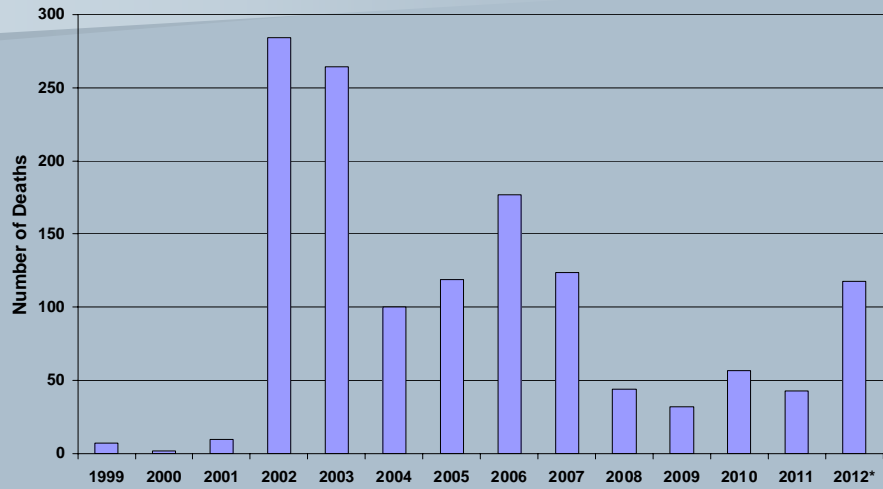
Risk Level	Response	Public Education	Vector Control
Low	Routine surveillance	Information sent to health care providers, health officers, camps, campgrounds and libraries	Routine IPM
Moderate	Increased surveillance of bridge vector populations; targeted	Intensified public education campaign including press advisories on EEE risk and prevention	Targeted ground larviciding and/or adulticiding of bridge vectors
High	supplemental trapping	Intensified public education campaign including radio and television announcements	Targeted aerial larviciding and/or adulticiding
Public Health Emergency	Declaration of a Public Health Emergency	Intensified public education campaign utilizing all media outlets	Wide area aerial adulticiding

### West Nile Virus Disease Reported in the U.S. (as of 9/11/2012\*)

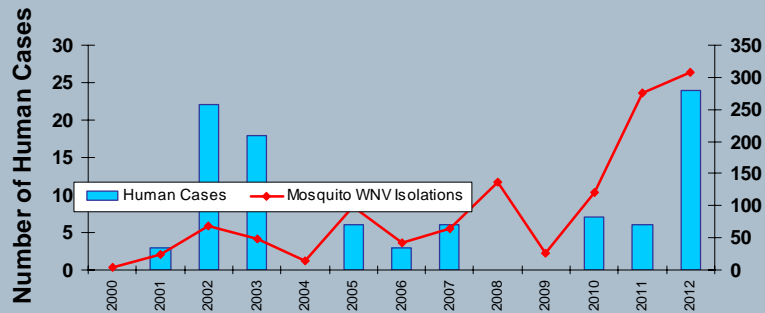




### West Nile Virus Disease Fatalities Reported in the U.S. (as of 9/11/2012)



### Massachusetts 2000-2012 Human WNV and WNV Mosquito Isolates

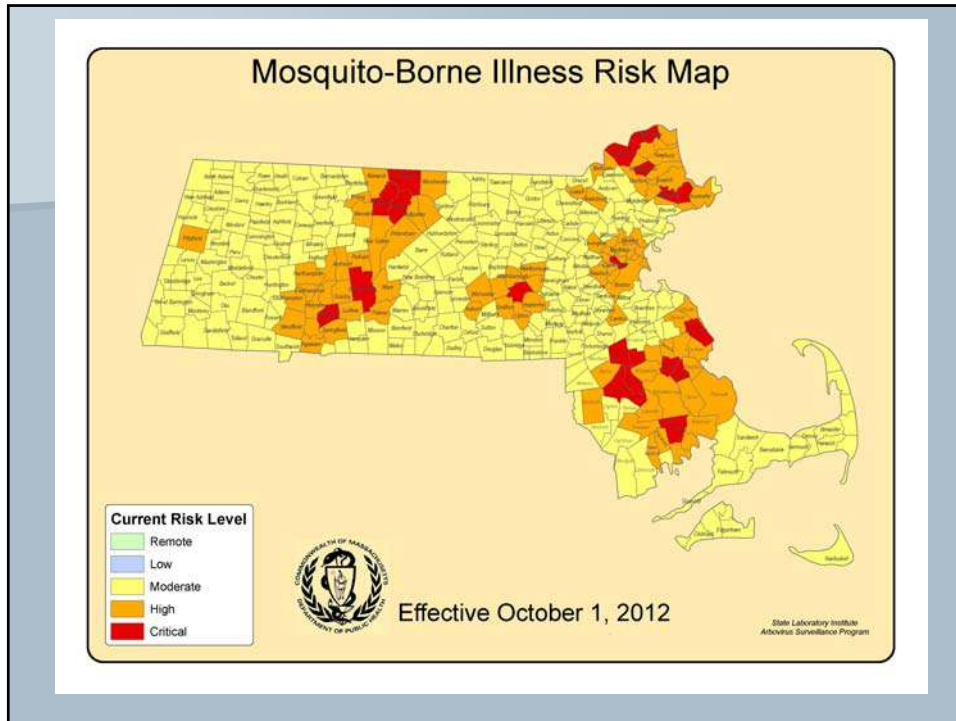


# Massachusetts Department of Public Health

## 2012 Massachusetts Arbovirus Surveillance and Response Plan

Table 1. Guidelines for Phased Response to WNV Surveillance Data

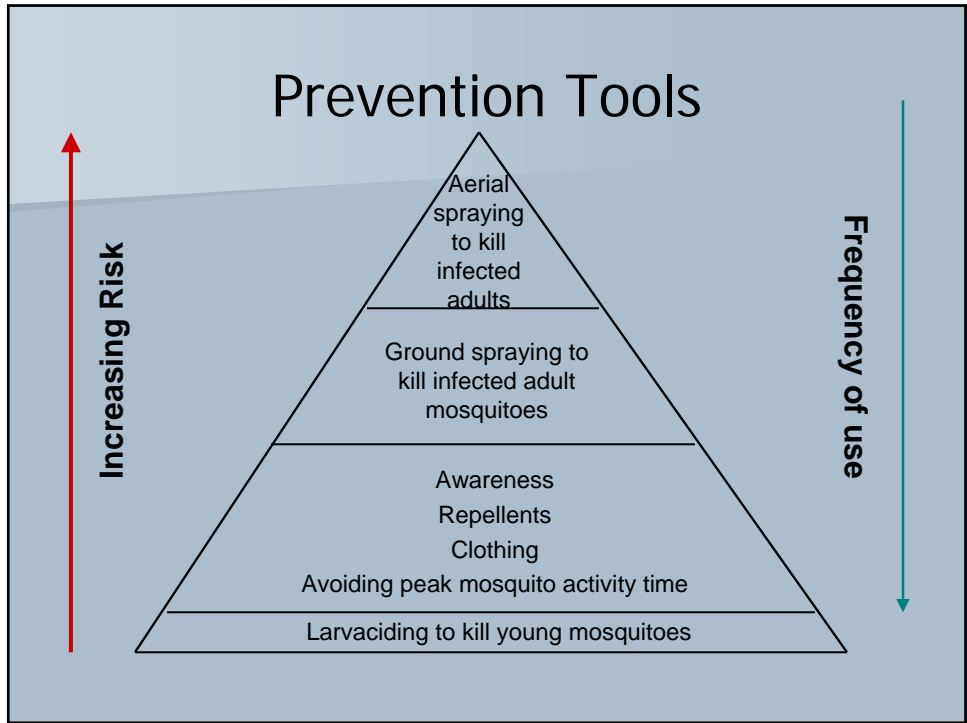
Risk Category	Probability of locally acquired human disease	Definition of Risk Category for a Focal Area <sup>1</sup>	Recommended Response
1	Remote	<p>All of the following conditions must be met:</p> <p><u>Prior Year</u> No prior year WNV activity detected in the focal area.</p> <p>And</p> <p><u>Current Year</u> No current surveillance findings indicating WNV activity in mosquitoes in the focal area</p> <p>And</p> <p>No animal or human cases.</p>	<ol style="list-style-type: none"> <li>MDPH staff provides educational materials and clinical specimen submission protocols to targeted groups involved in arbovirus surveillance, including, but not limited to, local boards of health, physicians, veterinarians, animal control officers, and stable owners.</li> <li>Educational efforts directed to the general public on personal prevention steps and source reduction, particularly to those populations at higher risk for severe disease (e.g., the elderly).</li> <li>MDPH provides recorded information on WNV/EEE disease, and disposal of dead birds via MDPH WNV information line (1-866-MASS-WNV).</li> <li>Assess mosquito populations, monitor larval and adult mosquito density.</li> <li>Routine collection and testing of mosquitoes.</li> <li>Initiate source reduction: use larvicides at specific sites identified by entomologic survey. In making a decision to use larvicide consider the abundance of <i>Culex</i> larvae, intensity of prior virus activity and weather.</li> <li>Locally determined, standard, adult mosquito control activities are implemented. No specific supplemental control efforts are recommended.</li> <li>Passive human and horse surveillance.</li> <li>Emphasize the need for schools to comply with MA requirements for filing outdoor IPM plans.</li> </ol>




## Phased Response

- Risk Assessment
  - Five stages: remote to critical
  - Based on history and current data
  - Provides evolving set of recommendations for agencies and locals

Risk	What to Monitor	What to Recommend Do
Remote	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.
Low	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.
Moderate	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.
High	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.
Critical	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.	• Monitor for any cases of mosquito-borne illness in the area. • Monitor for any mosquito activity in the area.




The Commonwealth of Massachusetts



**2011 OPERATIONAL RESPONSE PLAN TO REDUCE THE RISK OF MOSQUITO-BORNE DISEASE IN MASSACHUSETTS**

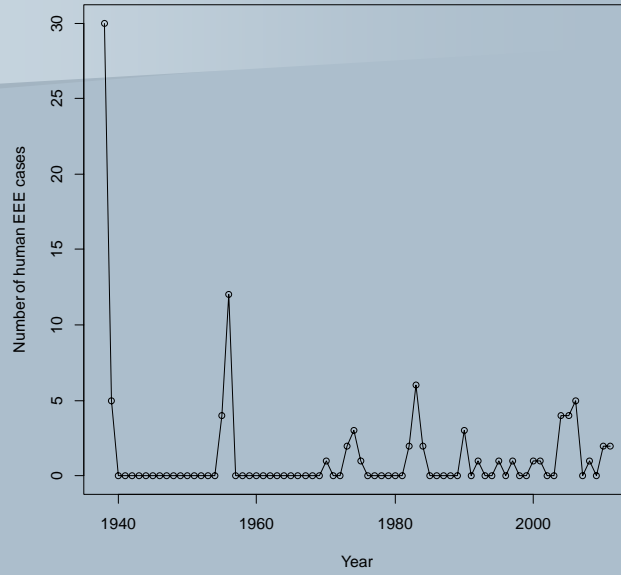
July 1, 2011

This document is open to continual review and evaluation and can be modified, if and when appropriate

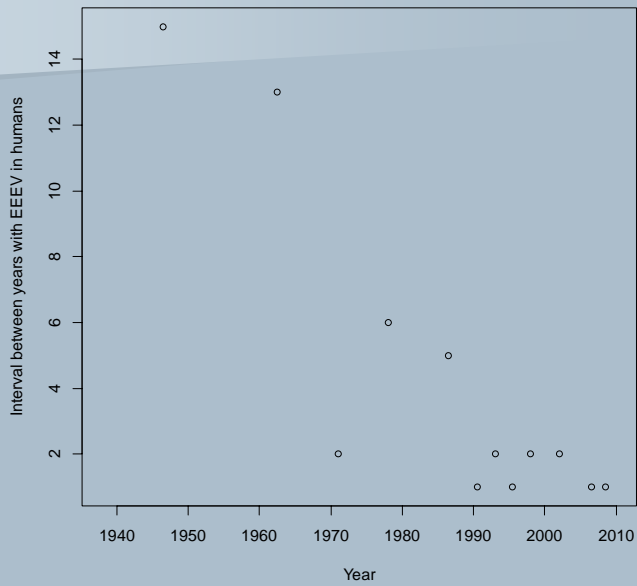


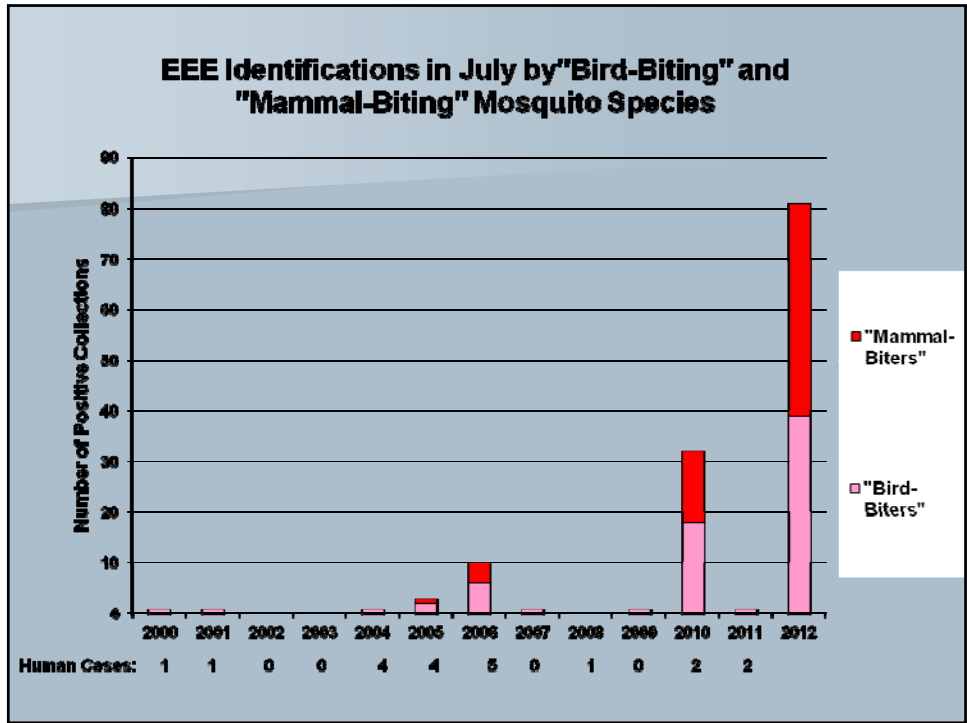
State Reclamation and Mosquito Control Board  
Massachusetts Department of Agricultural Resources  
251 Causeway Street, Suite 500  
Boston, MA 02114-2151  
<http://www.mass.gov/agr/mosquito/index.htm>

**Number of EEE Human Cases By Year, 1938-2011**



**Intervals (in years) between years with any human EEE cases.  
Position of circle on x-axis is the midpoint between years with cases.**





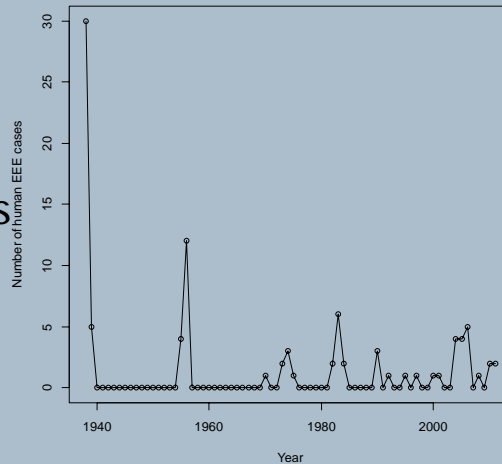
## Panel Composition

- Experts in the fields of
- mosquito control
  - toxicology,
  - ecology,
  - climate change,
  - public health
  - infectious disease were invited to participate.

Panelists were chosen specifically because they were not already involved in the Massachusetts arbovirus surveillance and mosquito control processes, and could be expected to provide fresh perspectives.

## Question 1

- Is there evidence that the historical EEE cycle in Massachusetts has changed; i.e. has there been an increase in the frequency of human cases?



## Question 2

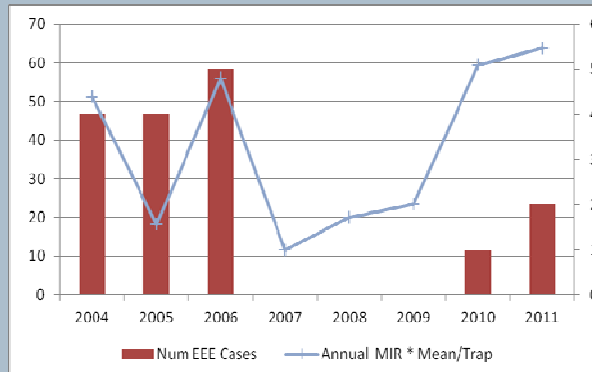
If there has been a change, is it attributable to anything specific, such as climate change?

- Land use changes
- Changes in predominant bird species
- Changes in average temperatures and precipitation events related to climate change.
- Changes in mosquito abundance, types of mosquitoes or movement behavior.

## Question 3

Are there other factors indicating human risk?

- Horses and other animals may be less useful
- Calculating new measure that combines a measure of how many mosquitoes are out there with how many of them are infected



## Historical indicators which continue to be evaluated

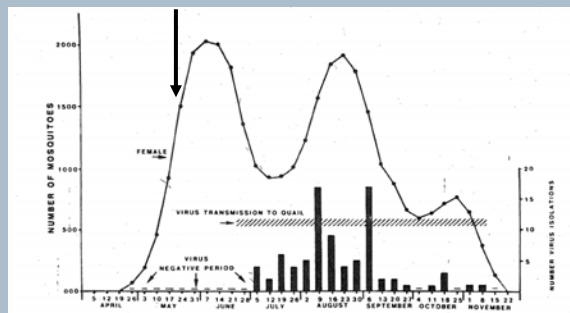
- above average rainfall in the prior fall and spring,
- mild winters with insulating snow cover,
- EEE activity in the previous year,
- any EEE virus isolations from mosquitoes prior to July 1,
- isolation of EEE virus from a mammal-biting species of mosquito,
- infection of an animal or person prior to late August, and
- higher than average summer temperatures



## Question 4

Is there the possibility of an early season intervention?

- Few effective products currently available for swamps
- Timing conflicts with night-time weather
- Newer products possible in the future



## Question 5

What factors should trigger an aerial spray?

- Not possible to prevent every single case of EEE
- Aerial applications are one tool that can be employed to reduce, but not eliminate, risk
- Personal prevention should form the basis of all risk reduction efforts; Aerial spraying poses a risk of conveying a false sense of security



## Question 5 continued

- Threshold for consideration of aerial spraying should be lowered
- Consider options for focal area aerial spraying as an alternative to full regional spraying; explore potential local assets/airplane-based equipment to support more rapid and focused spray actions

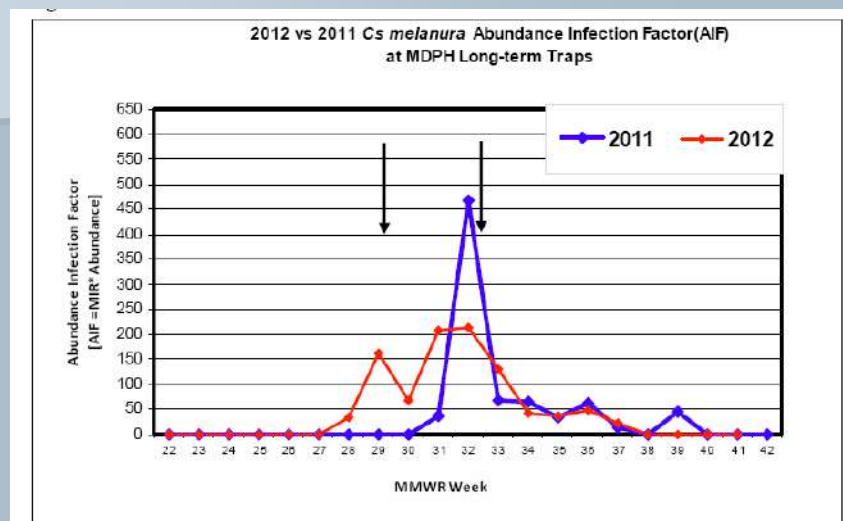
## Human Health Effects of Sumethrin and Piperonyl butoxide (PBO)

- When applied in a manner consistent with its' labeling, the panel agreed the data suggest that aerial application should not result in negative health effects for the general public.
- DPH recommends precautions be taken to avoid any opportunity for exposure.
- During 2006 and 2010 aerial applications, individuals who reported health impacts to DPH after aerial applications were among those who did not take precautions (e.g., were outside during actual application and/or left windows open during application).

## Ecological Health Effects of Sumethrin and Piperonyl butoxide

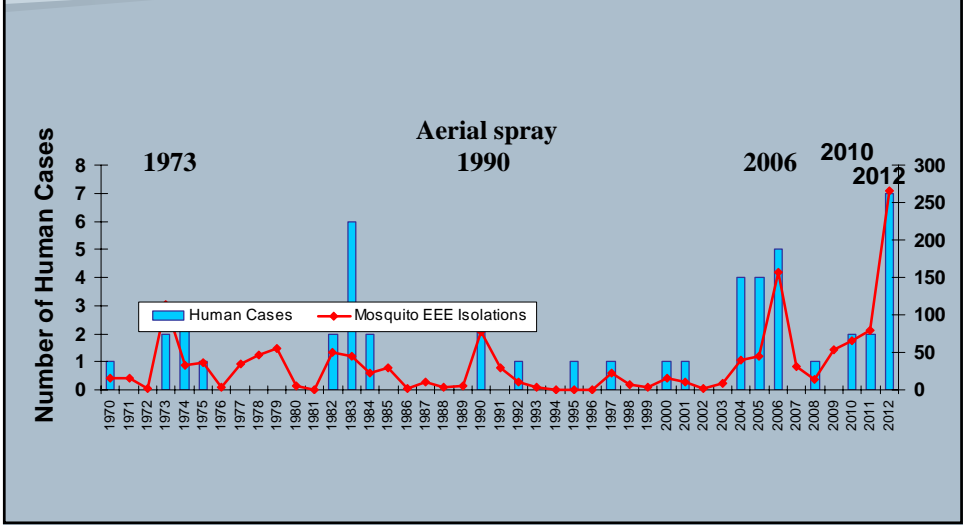
- Studies indicate that there are effects on non-target insects associated with these ingredients. The panel agreed that widespread adulticiding for disease risk mitigation should be limited to public health emergencies.

### Abundance Infection Factor



Notes: First arrow indicates aerial adulticide application, July 20-22.  
Second arrow indicates aerial adulticide application, August 13.

# Massachusetts 1970-2012 Human EEE and EEEV Mosquito Isolates

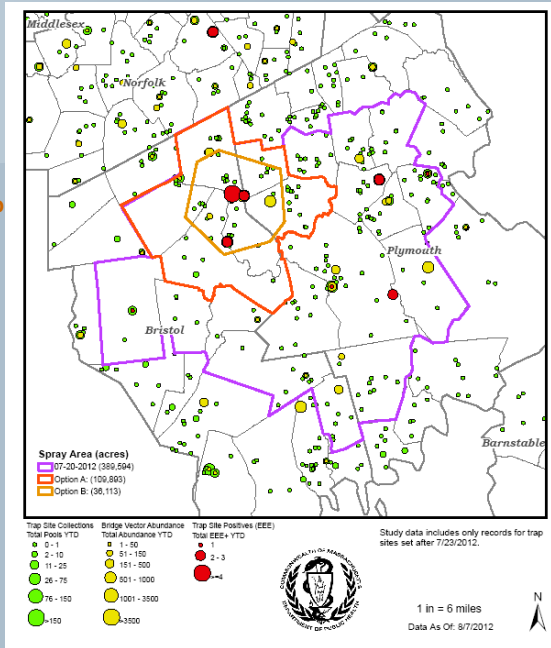


## Aerial Spray for EEE, 2012

First spray – 21 communities

Persistent risk – Hockomock Swamp

Second spray – 6 communities



## Cases of EEE by County of Residence 1938-2012

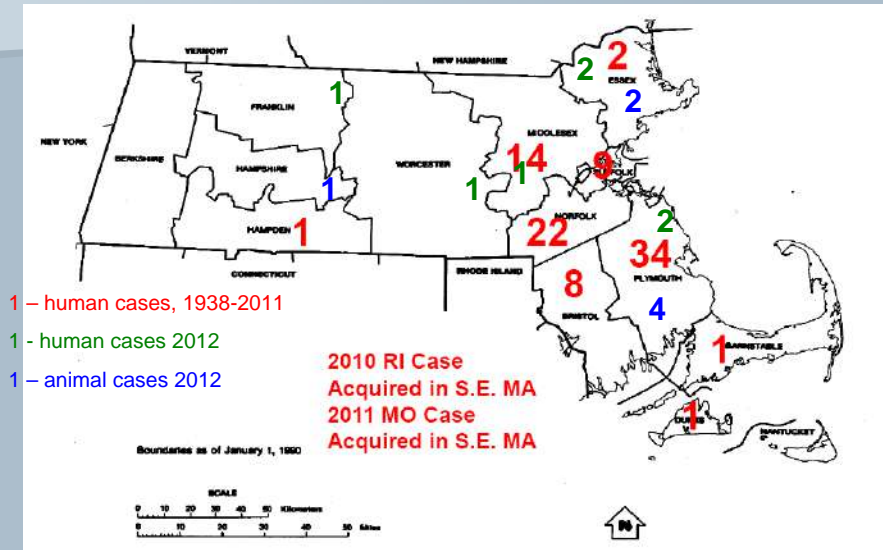
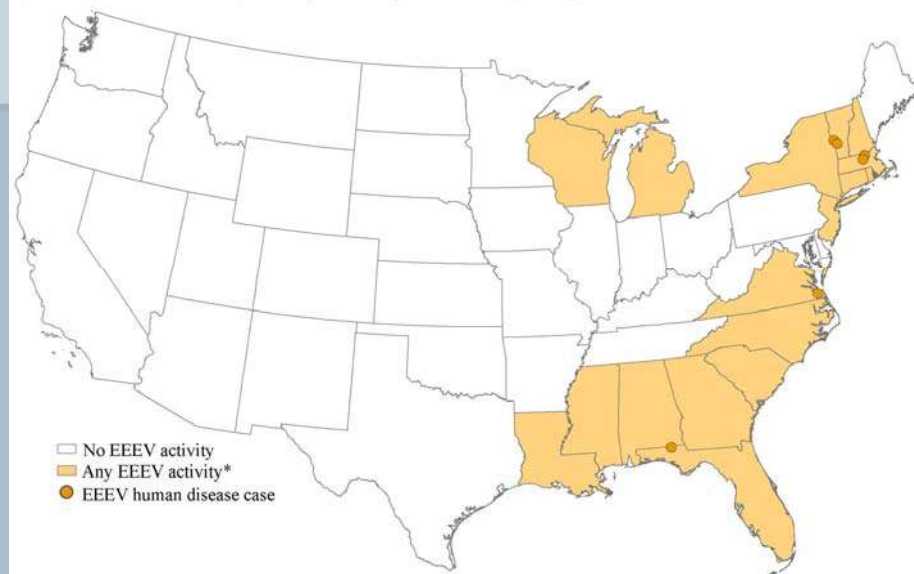
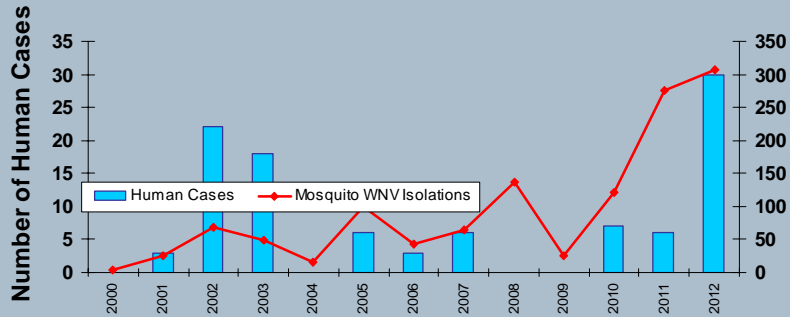


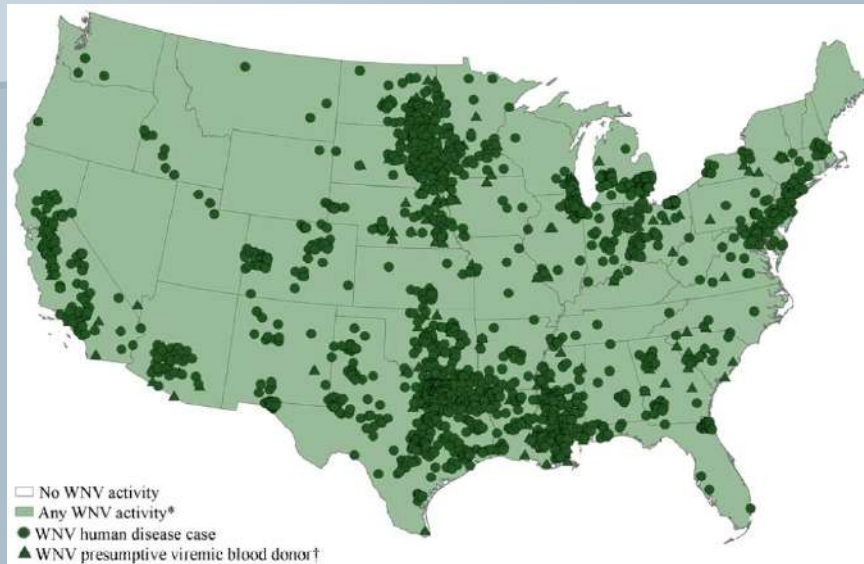
Figure 5. Eastern equine encephalitis virus (EEEV) activity reported to ArboNET, by state, United States, 2012 (as of September 11, 2012)



## Massachusetts 2000-2012 Human WNV and WNV Mosquito Isolates



**Figure 1. West Nile virus (WNV) activity reported to ArboNET, by state, United States, 2012 (as of September 11, 2012)**



## Areas for Improvement

- Combined risk map
- Risk levels and response recommendations for WNV
- Localizing WNV risk
- Predicting EEE risk outside of southeast MA

## Successes

- Evidence of increased EEE risk in SE Mass detected promptly
- Rapid response time
- Improved coordination with LHDs over cancellation of evening events

Thank you!