

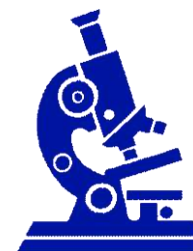
EEE Surveillance and Response, 2019

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Massachusetts State Public Health Laboratory

Department of Public Health
Bureau of Infectious Disease and
Laboratory Sciences



Department of Public Health Responsibilities

- Surveillance
- Laboratory Testing
- Risk Analysis
- Response



Eastern Equine Encephalitis Human Disease

- Rare but severe
- Children disproportionately affected
- Incubation period 3-10 days
- Abrupt onset fever, chills, headache, muscle aches, nausea and vomiting, seizures, coma
- ~30-50% mortality
- ~80% of survivors residual neurological deficits

Eastern Equine Encephalitis 1964-2012



EEE in Massachusetts Residents by Year, 1938-2018

Years not shown had no reported cases

| Year(s) | Number of Confirmed Human Cases | Number of Deaths | Mortality (%) |
|------------------|---------------------------------|------------------|---------------|
| 1938-39 | 35 | 25 | 71 |
| 1955-1965 | 16 | 9 | 56 |
| 1970 | 1 | 0 | 41 |
| 1973-75 | 6* | 4 | |
| 1982-84 | 10** | 3 | |
| 1990 | 3 | 1 | 33 |
| 1992 | 1 | 0 | |
| 1995 | 1 | 1 | |
| 1997 | 1 | 0 | |
| 2000 | 1 | 0 | |
| 2001 | 1 | 0 | 44 |
| 2004-2006 | 13 | 6 | |
| 2008 | 1 | 1 | |
| 2010 | 2*** | 0 | |
| 2011 | 2*** | 1 | |
| 2012 | 7 | 3 | |
| 2013 | 1 | 1 | |
| Total | 100 | 55 | 55 |

* One case in 1973 consistent with exposure in NH

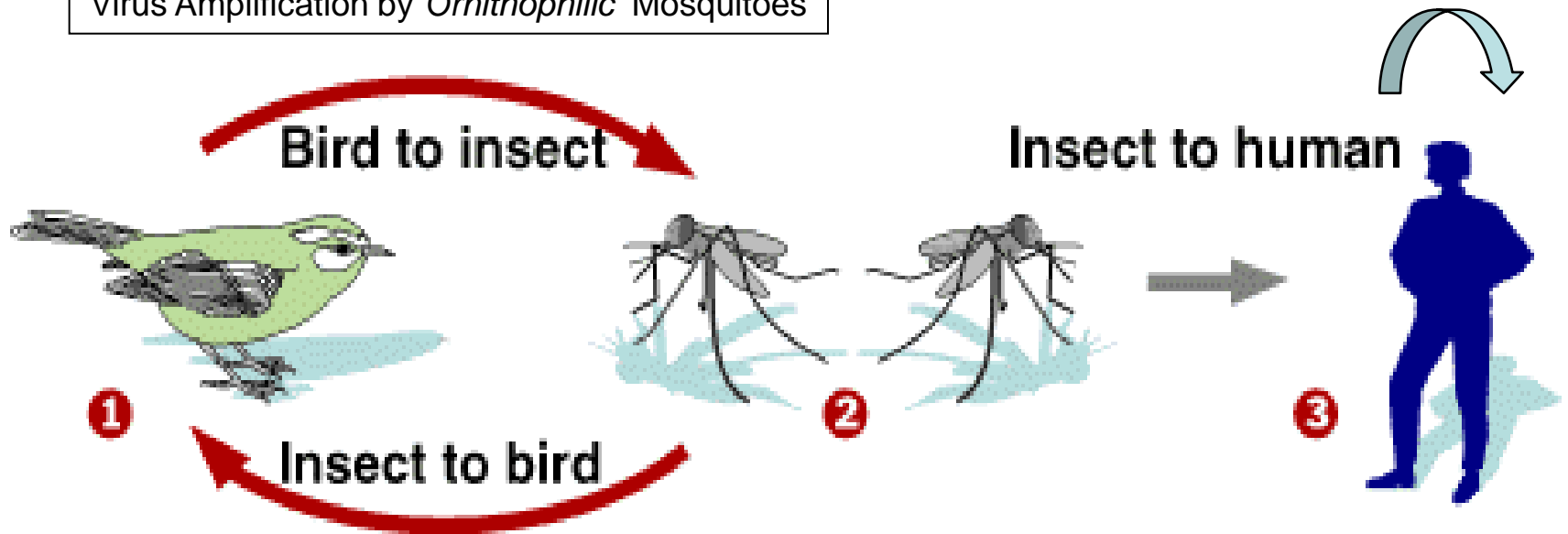
** One case in 1984 consistent with exposure in NJ

*** One case in 2010 and one in 2011 occurred in out-of-state residents

Arbovirus Transmission

Enzootic Cycle:

Virus Amplification by *Ornithophilic* Mosquitoes

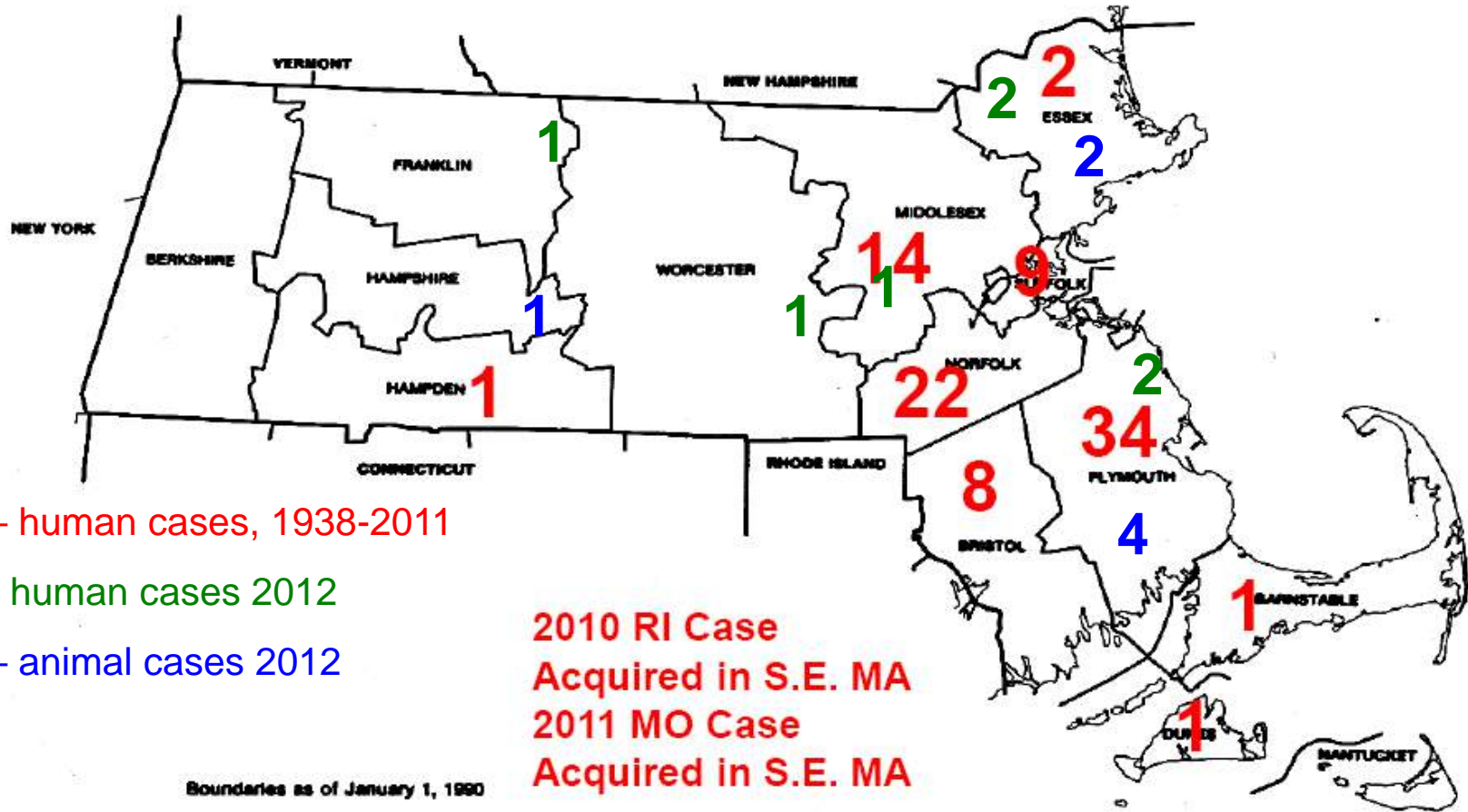


Epizootic Cycle:

Incidental Transmission by Zoophilic Mosquitoes

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

Human Cases by County of Residence 1938-2012



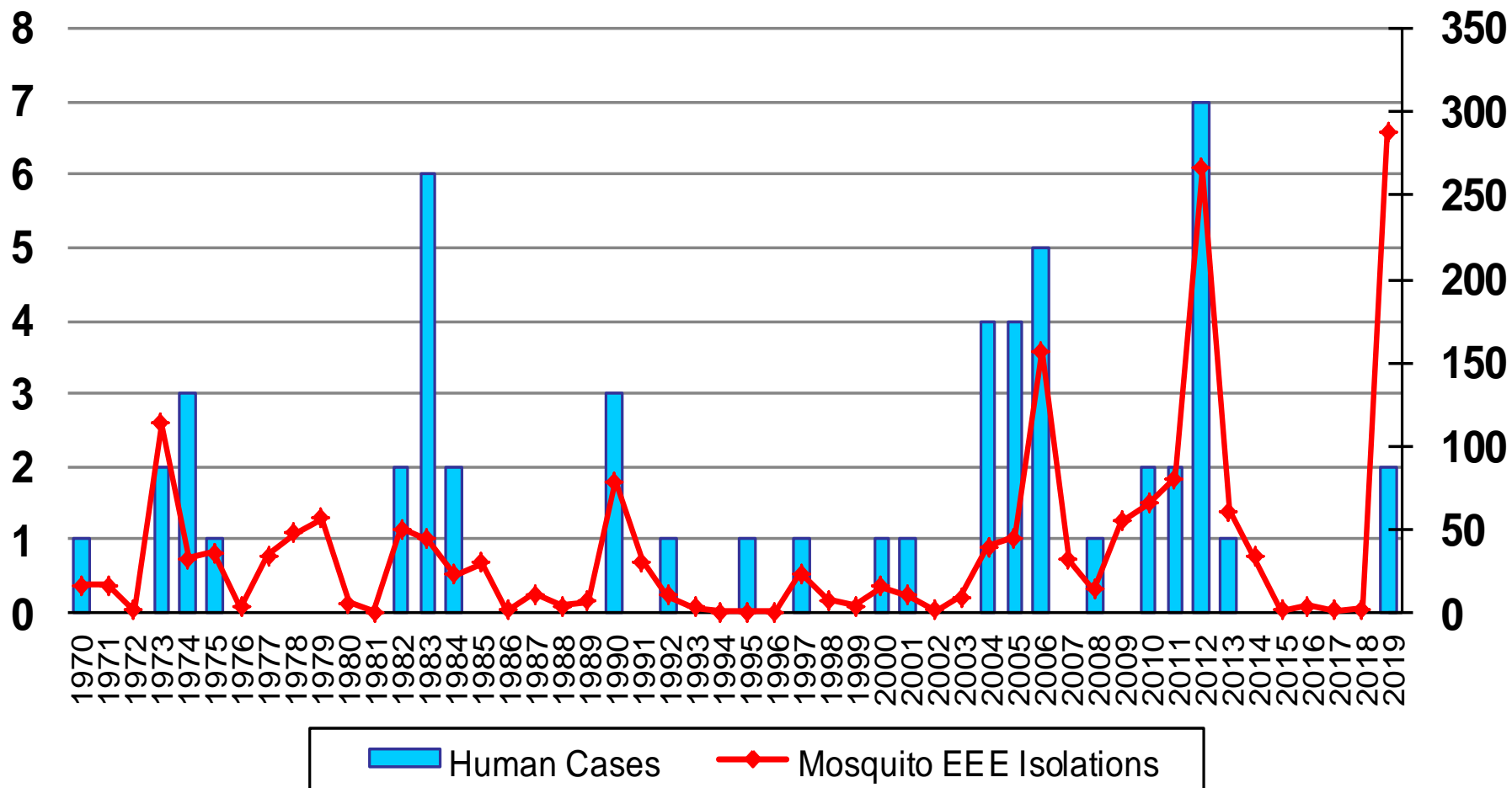
1 – human cases, 1938-2011

1 - human cases 2012

1 – animal cases 2012

Massachusetts 1970-2019

Human EEE and EEEV Mosquito Isolates



MDPH Arbovirus Program Overview

Surveillance

- Set and collect traps from long-term sites in southeastern MA
 - Collaborate supplemental trapping with MCP's

MA State Public Health Laboratory Testing

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

Risk Analysis and Communication

- Identify areas at risk for human disease
- Communicate findings with local health agents, MCP's and the public
- Provide information to guide the control actions to reduce the risk of disease

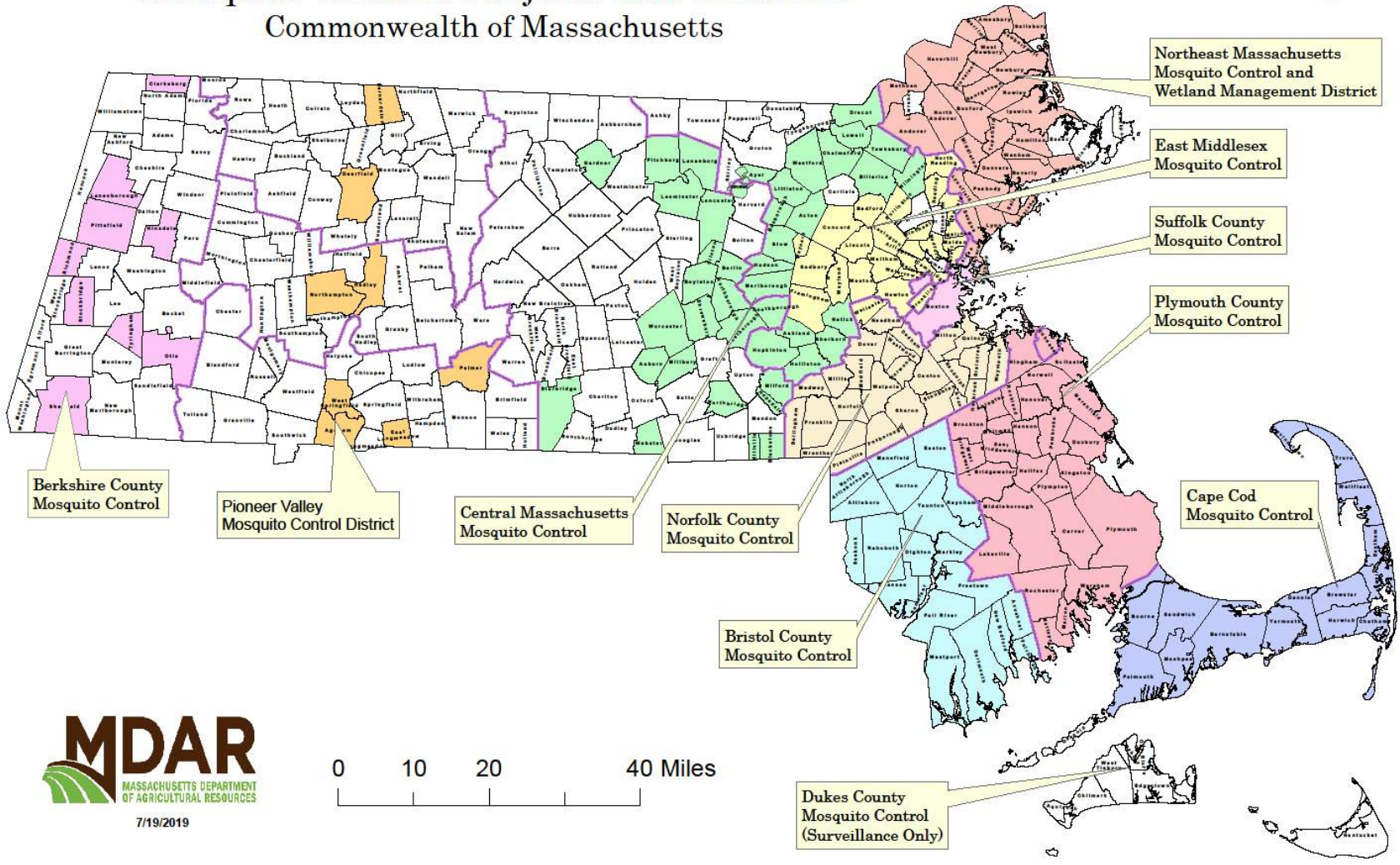
Surveillance – Interagency Effort

- **MDPH**
 - Bureau of Infectious Disease and Laboratory Science
- **State Reclamation and Mosquito Control Board**

Massachusetts Department of Agricultural Resources (MDAR), Department of Conservation and Recreation (DCR), and Department of Environmental Protection (DEP)]
- **Mosquito Control Projects (MCPs)**
 - Berkshire County
 - Bristol County
 - Central Massachusetts
 - Cape Cod
 - East Middlesex
 - Norfolk County
 - Northeast Massachusetts
 - Plymouth County
 - Suffolk County



Mosquito Control Projects and Districts Commonwealth of Massachusetts

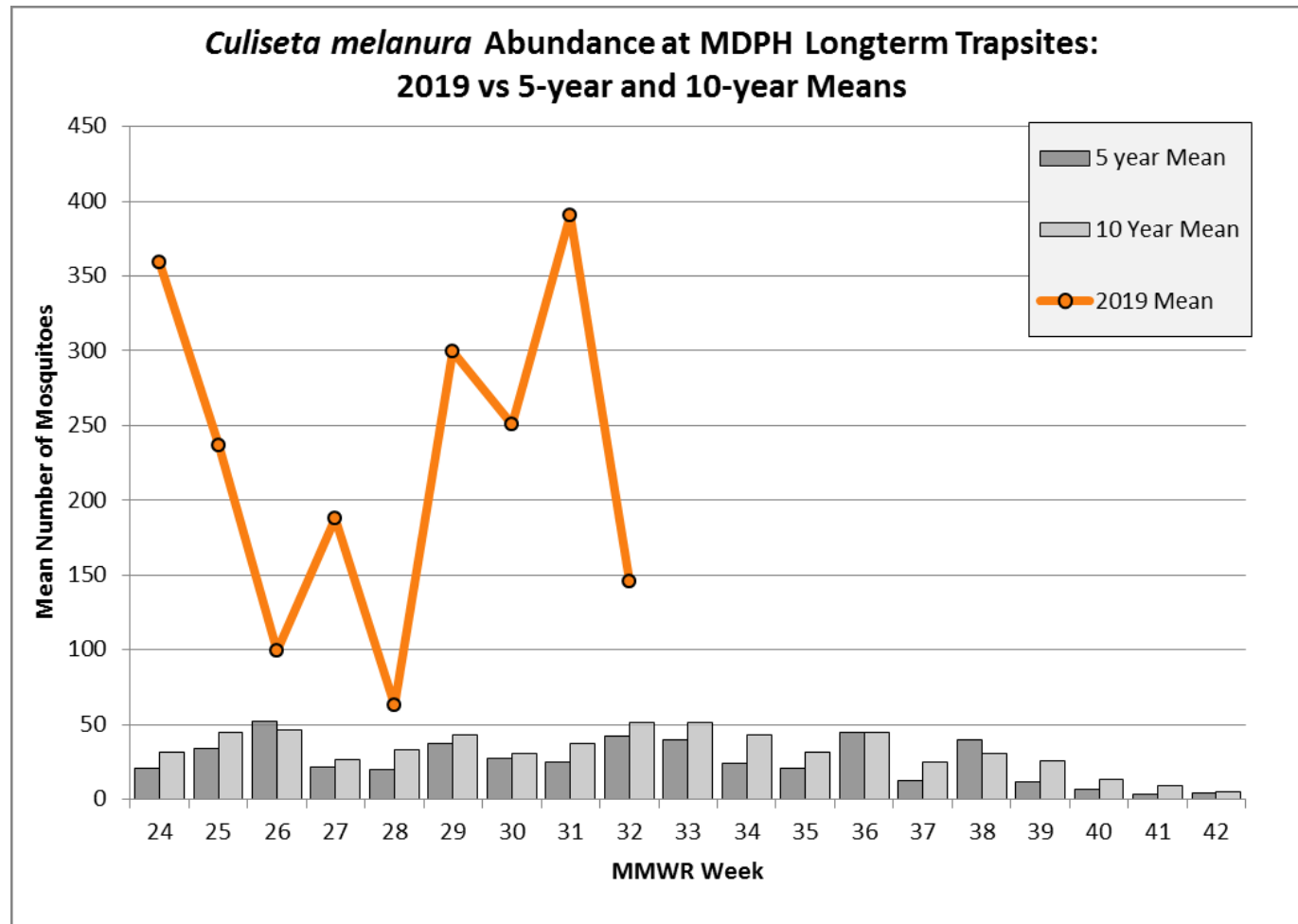


Historical Indicators of Risk

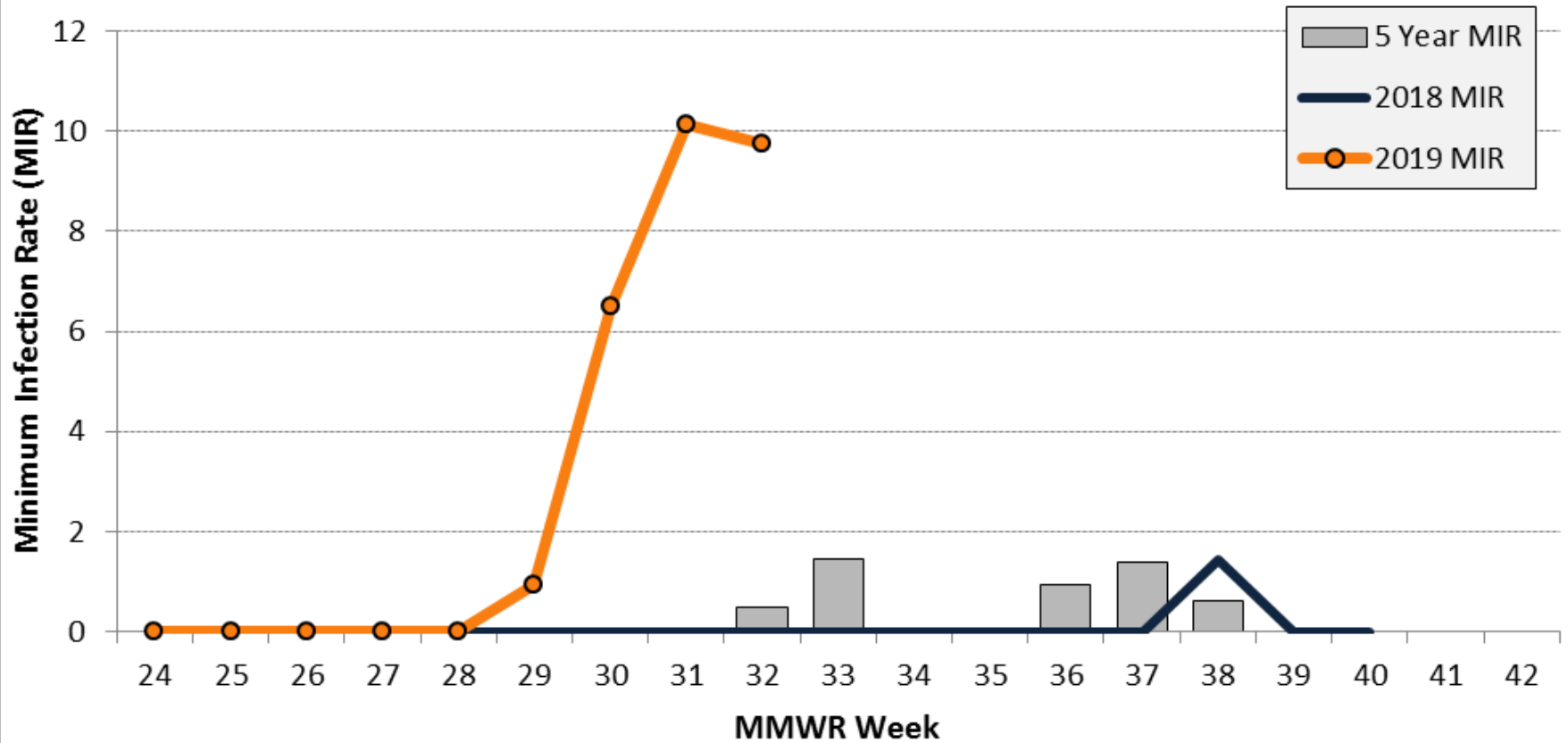
- above average rainfall in the prior fall and spring,
- mild winters with insulating snow cover,
- EEE activity in the previous year,
- any EEE virus isolations from mosquitoes prior to July 1,
- isolation of EEE virus from a mammal-biting species of mosquito,
- infection of a human prior to late August, and
- higher than average summer temperatures which accelerate the mosquito reproductive and development cycle and shorten the time interval between a mosquito becoming infected with EEE virus and when it becomes capable of transmitting the virus.

Information from Mosquito Surveillance

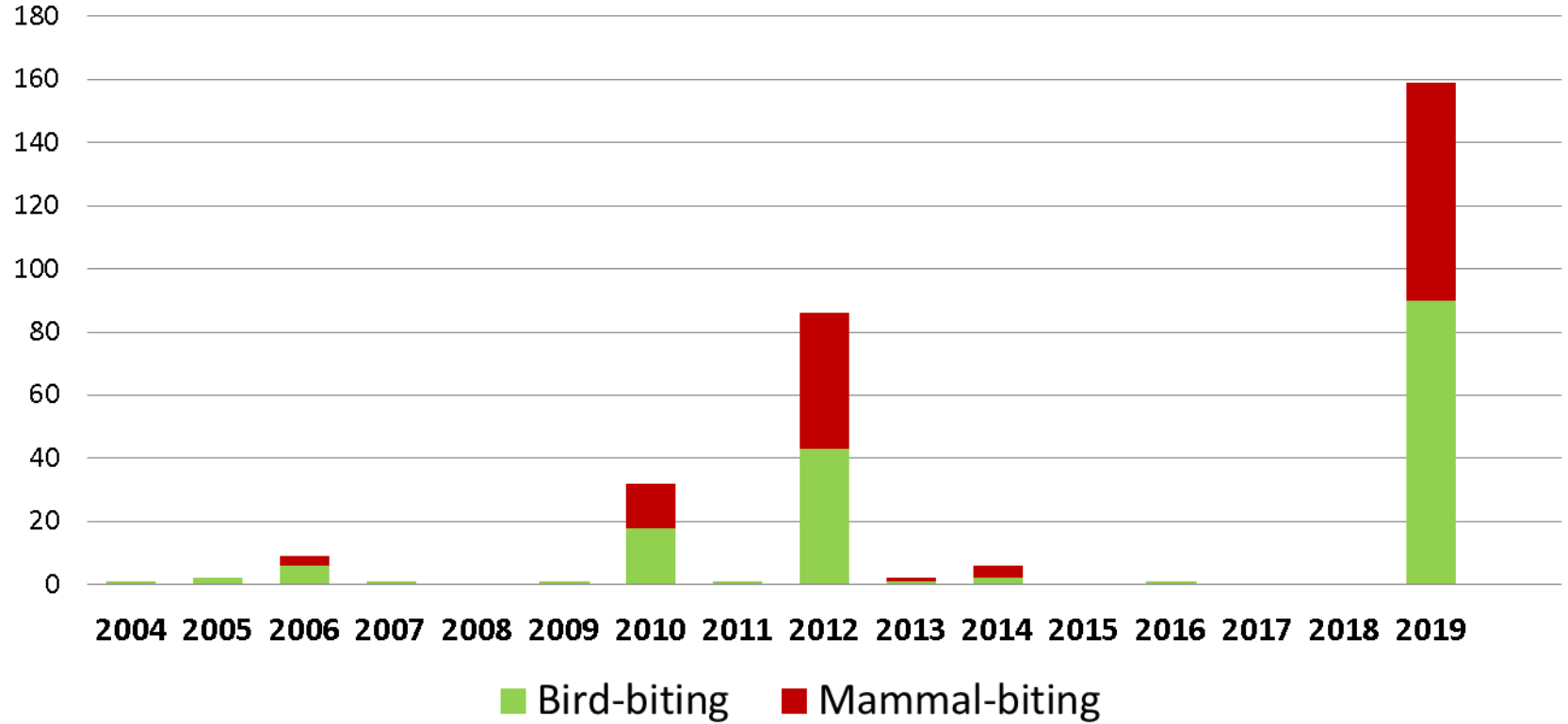
- Numbers of mosquitoes
- Types of mosquitoes – mammal or bird biters
- Percentage infected



2019 vs 2018 & 5 Year Mean *Cs melanura* Minimum Infection Rate (MIR) at MDPH Long Term Trapsites



Number of EEE Positive Mosquito Samples by Type and Year, July



Human Cases:

4

4

5

1

2

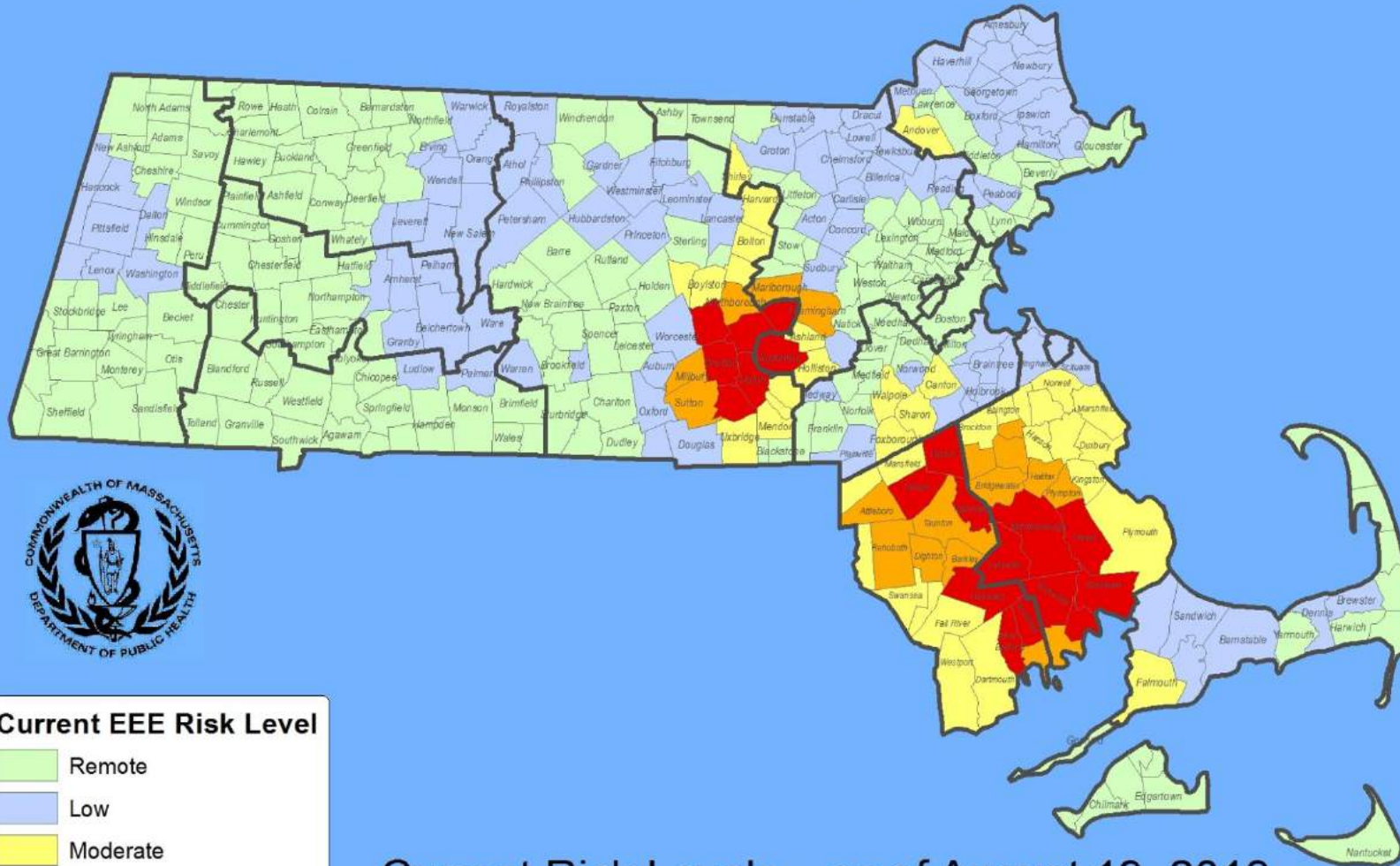
2

7

1

2

Massachusetts EEE Risk Categories



Current EEE Risk Level

- Remote
- Low
- Moderate
- High
- Critical

Current Risk Levels – as of August 19, 2019

Risk Analysis Allows for Phased Response

- Risk Assessment
 - **EEE** has 5 stages: remote to critical
 - **WNV** reduced to 4 stages, low to critical
 - Based on history and current data
 - Provides responsive set of recommendations for agencies and locals

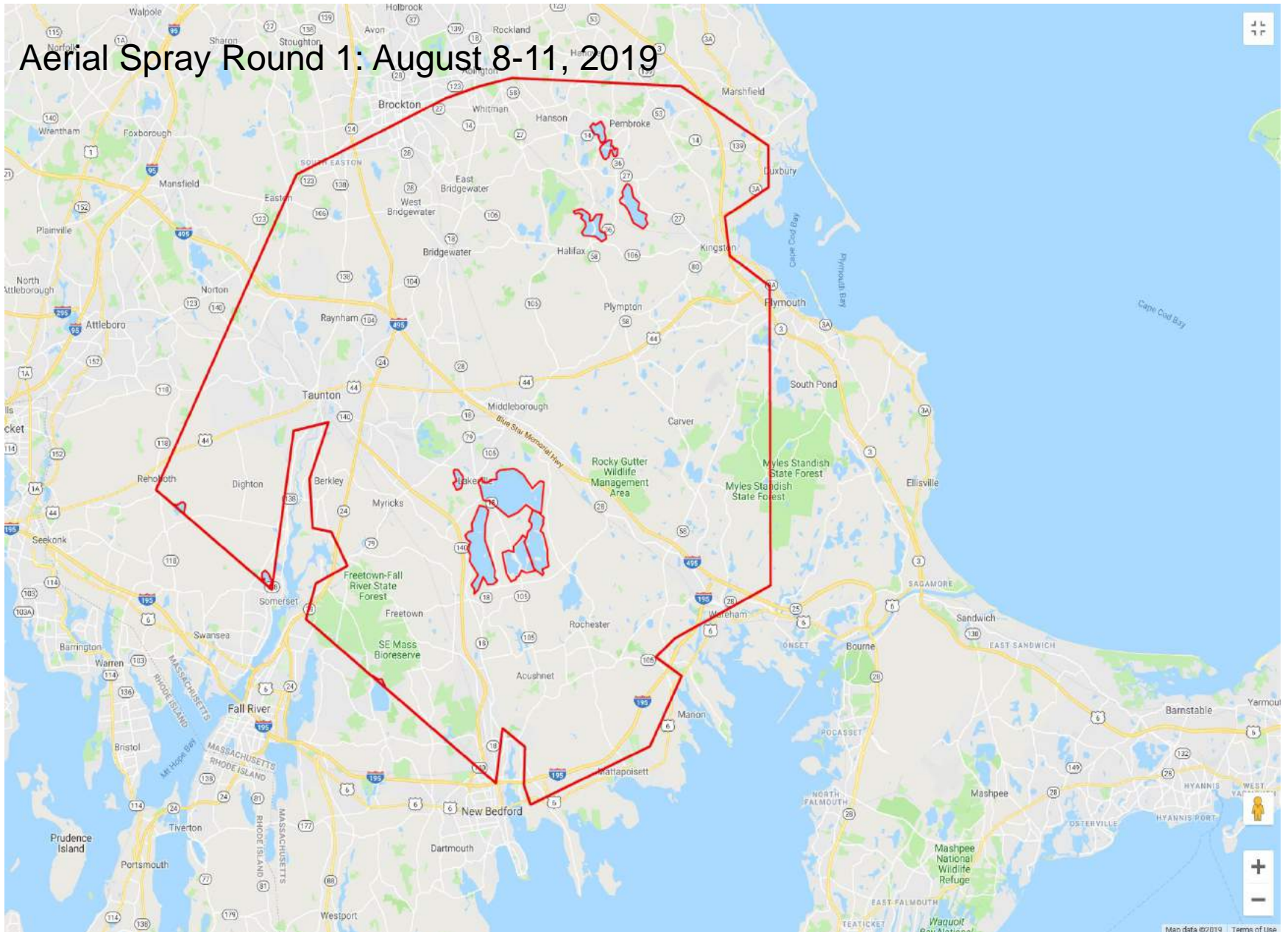
Preparedness and Response Activities

- DPH
 - Inform re: specific areas of risk
 - Public education regarding personal prevention
 - Support local health board activities
- MDAR, SRMCB, and MCPs
 - Early season larvaciding
 - Ground spraying to kill mosquitoes
 - In response to positive results

Response Activities at Elevated EEE Risk

- DPH
 - Inform re: specific areas of risk
 - Emphasize personal prevention
 - Support local health activities
 - **Recommend rescheduling evening outdoor events**
 - **Characterize area of excessive risk**

Aerial Spray Round 1: August 8-11, 2019



APPENDIX 2: RECOMMENDED CANCELLATION TIMES FOR OUTDOOR ACTIVITIES IN AREAS OF HIGH RISK FOR EASTERN EQUINE ENCEPHALITIS (EEE)

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.

July 2019

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

August 2019

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|-----|-----|-----|---------|-----|-----|-----|
| | | | | 1 | 2 | 3 |
| ← | | | 8:00 PM | → | | |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ← | | | 8:00 PM | → | | |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| ← | | | 8:00 PM | → | | |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| ← | | | 7:45 PM | → | | |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| ← | | | 7:30 PM | → | | |

September 2019

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|-----|-----|-----|---------|-----|-----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| ← | | | 7:30 PM | → | | |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| ← | | | 7:15 PM | → | | |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| ← | | | 7:00 PM | → | | |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| ← | | | 6:45 PM | → | | |
| 29 | 30 | | | | | |

Aerial Application of Pesticide

- 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
- Consideration of aerial spraying can include consideration of smaller, more localized applications
- Aerial spraying poses a risk of conveying a false sense of security

Massachusetts Department of Agricultural Resources

- State Reclamation and Mosquito Control Board
 - Contracts with out-of-state vendors for aircraft and pesticide
 - GIS mapping
 - Runs operation

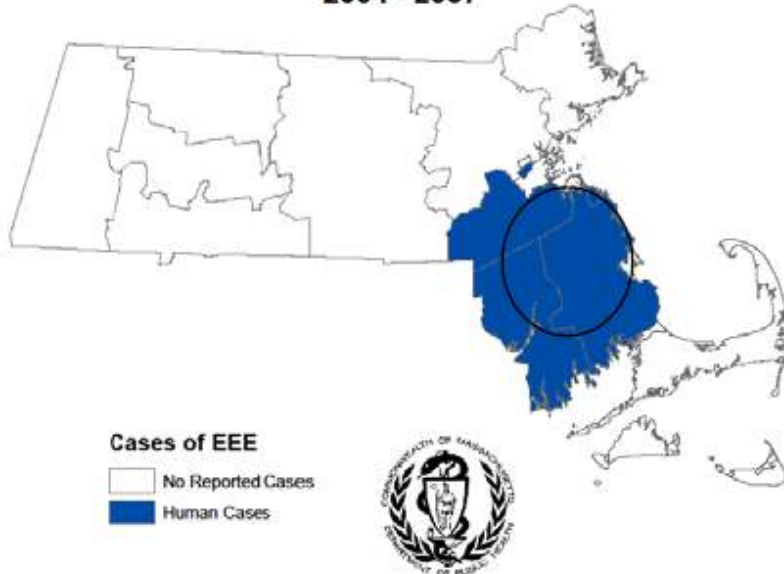
Human Health Effects of Sumethrin and Piperonyl butoxide (PBO)

- There are no health risks expected during or after spraying. There is no evidence that aerial spraying with the product will exacerbate certain health conditions, such as asthma or chemical sensitivity. No special precautions are recommended; however, residents can reduce exposure by staying indoors during spraying.

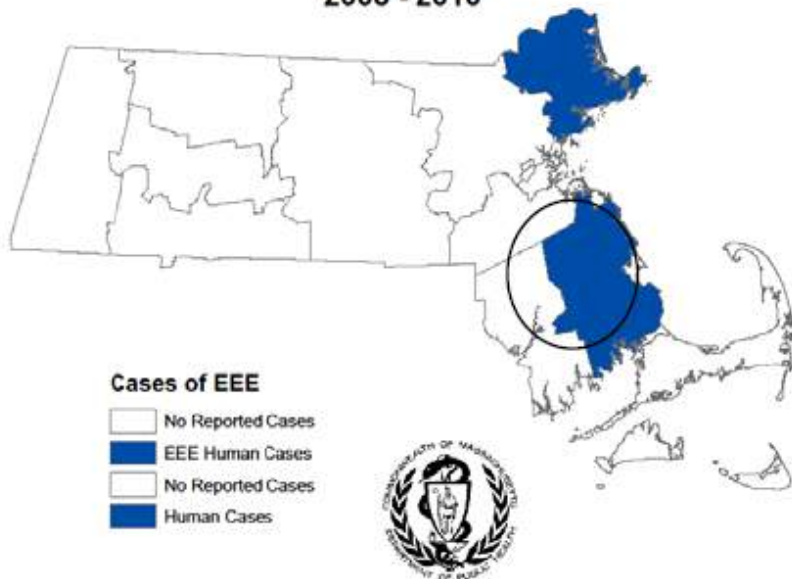
Additional Partners/Stakeholders

- DPH: Bureau of Environmental Health
 - Office of Preparedness and Emergency Management
- State Agencies
 - Department of Environmental Protection
 - Department of Conservation & Recreation
 - Department of Fish and Game
 - MassWildlife
- Local Health Departments/Municipal government
- Citizen groups
 - Environmental advocacy groups
 - Affected families

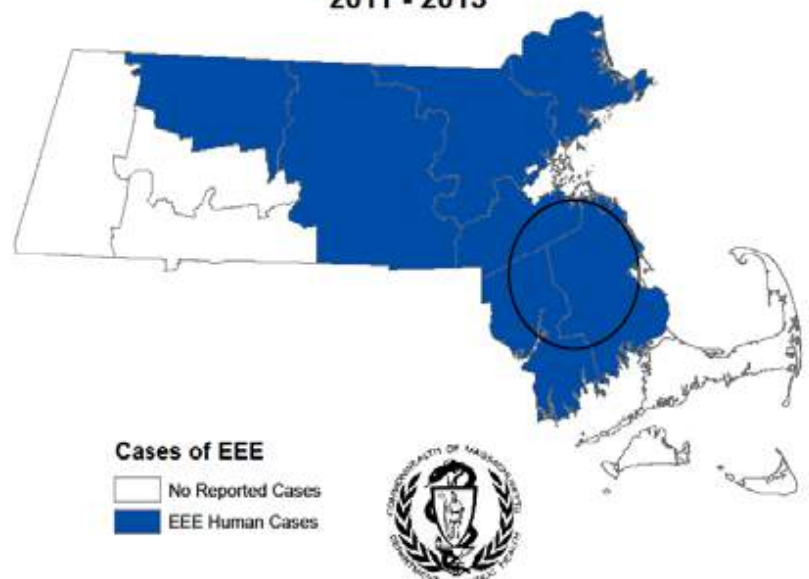
Eastern Equine Encephalitis Human Cases by County 2004 - 2007



Eastern Equine Encephalitis Human Cases by County 2008 - 2010



Eastern Equine Encephalitis Human Cases by County 2011 - 2013



Long term changes likely related to risk

- Changes in land use patterns
 - Wetlands restoration
 - Suburban development
- Increased precipitation events
- Higher temperatures, prolonged mosquito season
- Alterations in songbird populations, migratory timing and/or patterns
- Alterations in mosquito populations
- Northward expansion of additional mosquito vectors

Thank you