

CENTRAL MASS. MOSQUITO CONTROL

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# MOSQUITO CONTROL IN CENTRAL MASSACHUSETTS

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# ORGANIZATION STRUCTURE



- Mosquito control in Mass. is organized through M.G.L. Chapter 252
- Each district has its own enabling legislation: Chapter 583 of the Acts of 1973



- Districts operate under the authority of the State Reclamation & Mosquito Control Board (SRMCB)
- SRMCB has members from MDAR, DCR & MassDEP



- Districts have important partnerships



- Districts are overseen by a Board of Commission appointed by SRMCB
- CMMCP Board of Commission meets monthly on the 2<sup>nd</sup> Wednesday of each month



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# MOSQUITO BIOLOGY



## 4 stages of development

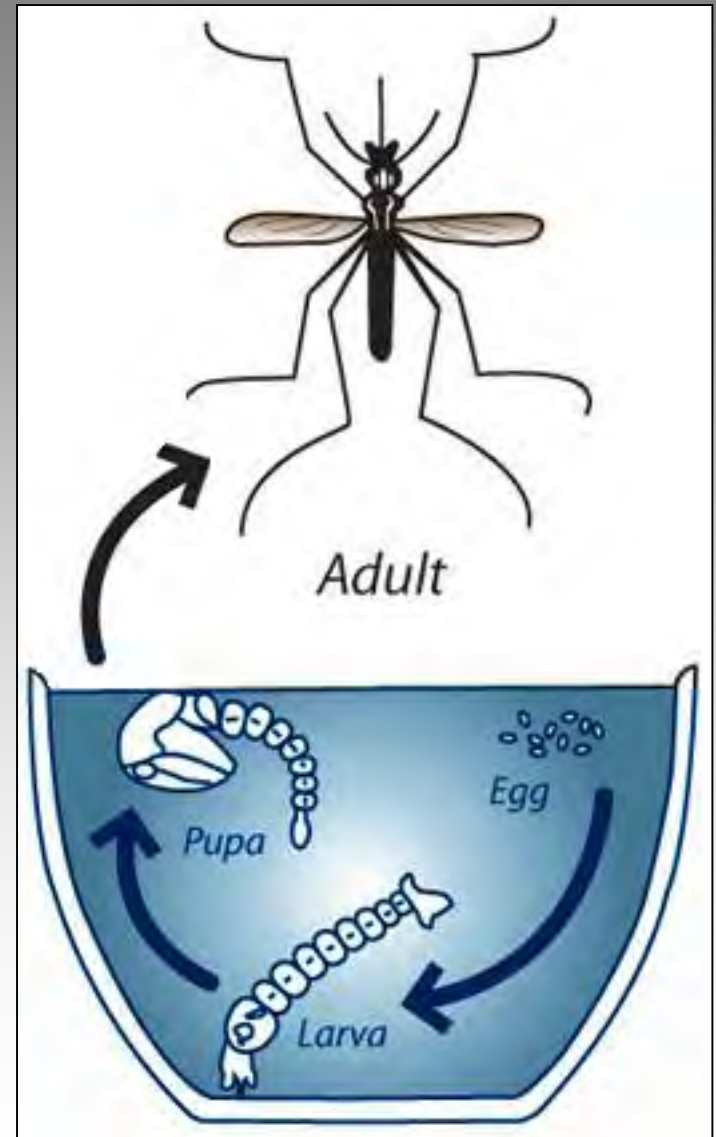
- Egg
- Larvae
- Pupae
- Adult





## First 3 stages are aquatic

- Egg
- Larvae
- Pupae



## Mosquito Eggs

- Damp soil
- Containers
- Permanent water
- Emergent vegetation
- Dependent on species



## Mosquito Larvae

- 4 stages called “instars”
- 1/8” – 1/4” long
- Breathes air
- Can develop in as few as 5 days into pupae



## Mosquito Pupae

- Does not eat
- Breathes air like larvae
- Fully developed mosquito inside
- Final stage before adult



## Mosquito Adult

- 2,600 species, ~162 in USA
- 51 species in Mass.
- Vector of several diseases in the Northeast
- Flight range <100 yds. to 25 miles





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# LARVAL MOSQUITO HABITAT IN MASSACHUSETTS



## Habitat Types

- Retention/Detention areas
- Woodland pools & Reflood areas
- Cedar/Maple swamps
- Permanent water
- Degraded ditches
- Artificial containers
- Salt marsh



## Retention/Detention areas

- Mandated by Stormwater Phase II

## Common Mosquito Species:

- *Cq. perturbans* (w/emergent vegetation)
- *Ae. vexans*
- *Anopheles spp.*
- *Culex spp.*









## Common Woodland Pool Species:

- *Oc. excrucians*\*
- *Oc. abserratus*\*
- *Oc. canadensis*
- *Ae. vexans*

\*Requires a freeze/thaw cycle  
(cold-conditioning)









## Reflood areas

- Floodplains
- Areas with poor drainage
- Will flood after significant rain events





## Cedar/Maple swamps

- Common in the Northeast
- Habitat for *Cs. melanura* – amplification vector of EEE in birds
- Difficult to sample & control as larvae due to subterranean habits







## Permanent water

- Emergent vegetation – *Cq. perturbans*
- Difficult to sample & control as larvae due to unique breathing habits – will attach to roots of vegetation & breathe through the vascular system of the plant







CATTAIL MARSH - *Typha* spp.

(*T. latifolia*, *T. angustifolia*, *T. glauca*, *T. domingensis*)



## Degraded Ditch systems

- *Culex spp.* if pollution evident
- *Anopheles spp.*
- Will contribute to reflood areas  
(*Ae. vexans* & *Ae. cinereus*)









## Container habitats

- Treeholes, rock holes in stream beds
- *Oc. triseriatus*, *Oc. japonicus* & *Culex spp.*

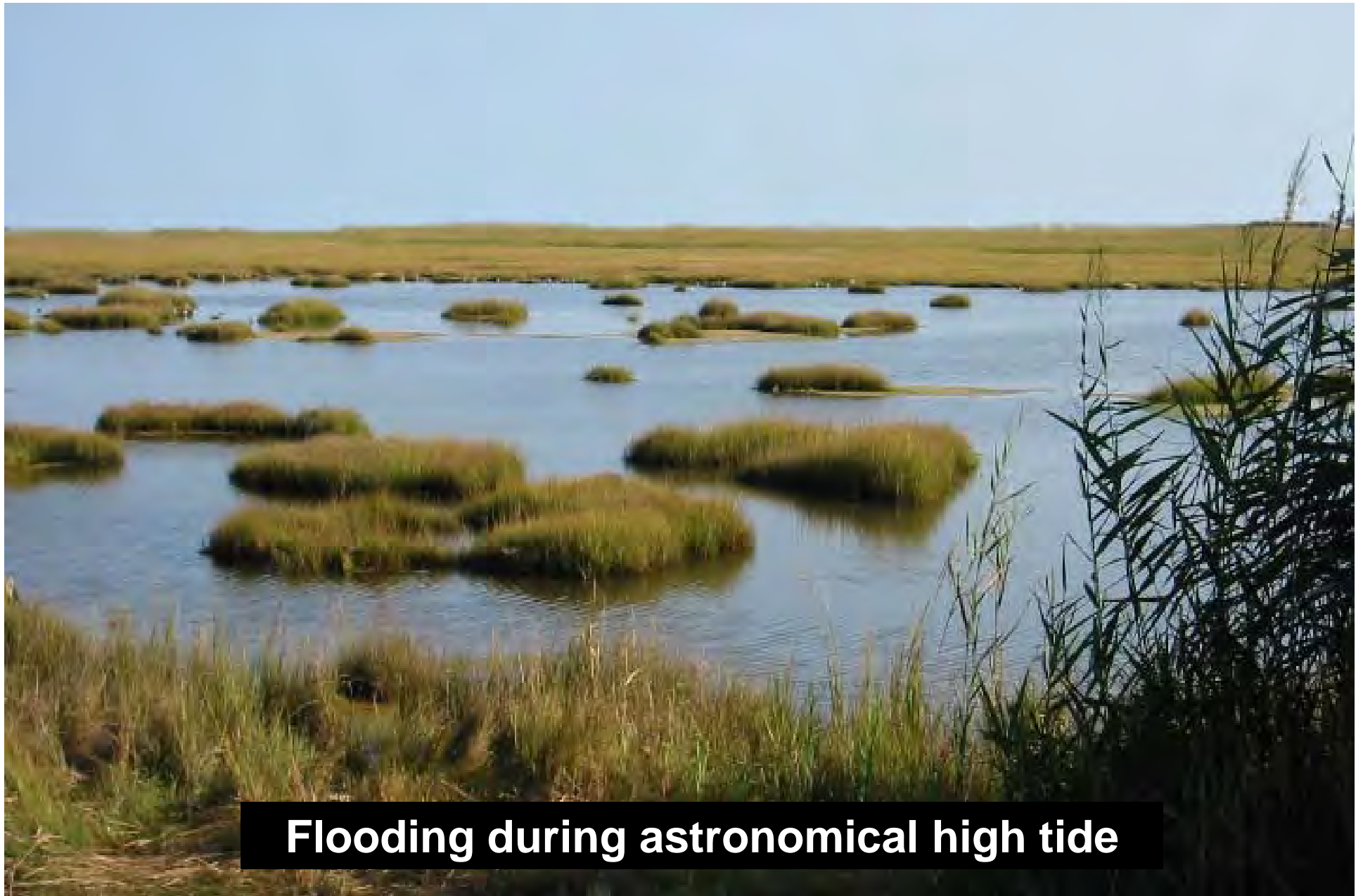




## Salt Marsh species

- *Oc. taeniorhynchus*
- *Oc. cantator*
- *Oc. sollicitans*





**Flooding during astronomical high tide**



## Invasive plant species

- Alter the biodiversity of a habitat
- Can introduce mosquito species to an area dependant on emergent vegetation (*Cq. perturbans*).







PURPLE LOOSTRIFE - *Lythrum salicaria*





THE COMMON REED - *Phragmites australis* or *Phragmites communis*



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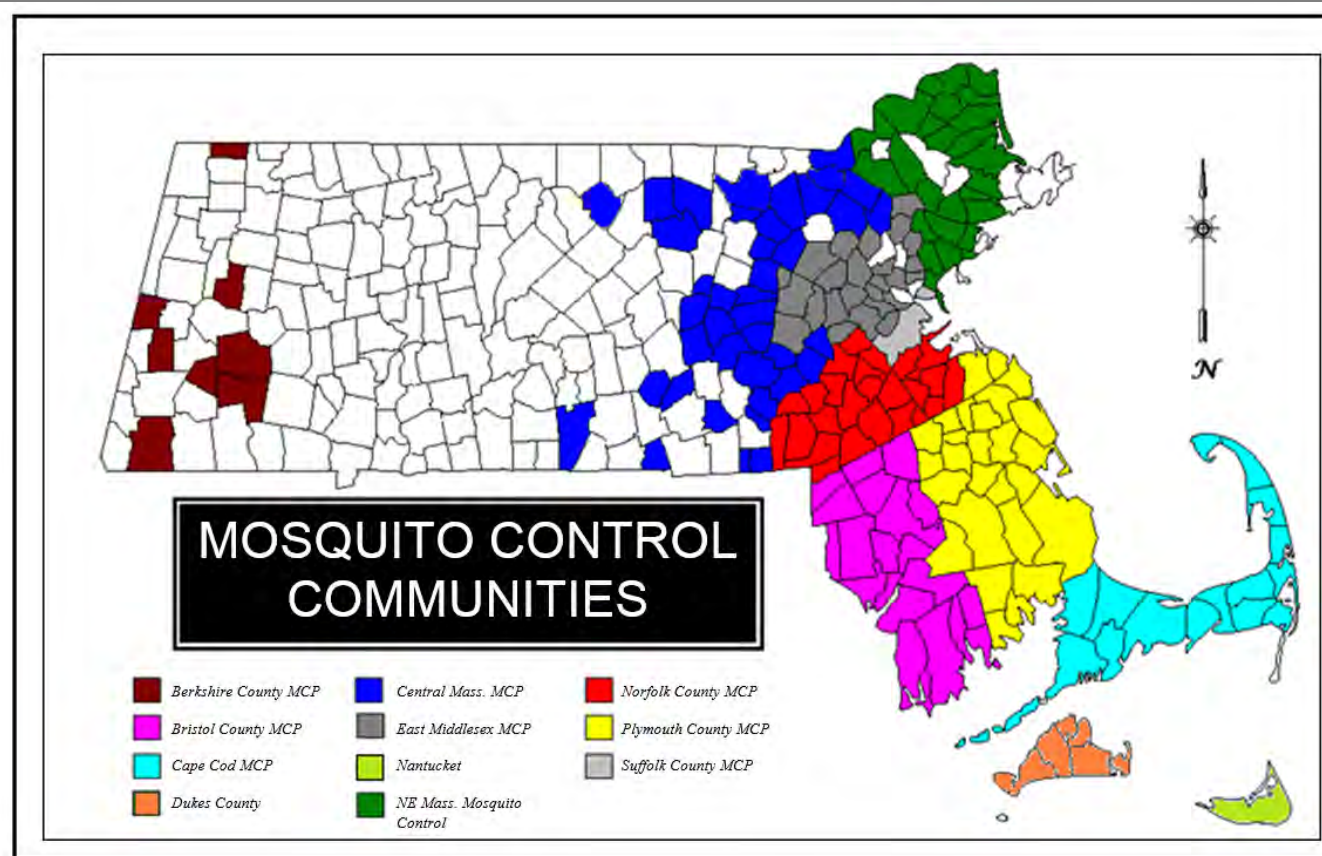
# MOSQUITO CONTROL IN MASSACHUSETTS



# 11 Mosquito Districts in Mass.

1. Berkshire County MCP
2. Bristol County MCP
3. Cape Cod MCP
4. **Central Mass. MCP**
5. East Middlesex MCP
6. Martha's Vineyard (new in 2013)
7. Nantucket (new in 2014)
8. NE Mass. Wetlands Mgmt. & MC District
9. Norfolk County MCP
10. Plymouth County MCP
11. Suffolk County MCP



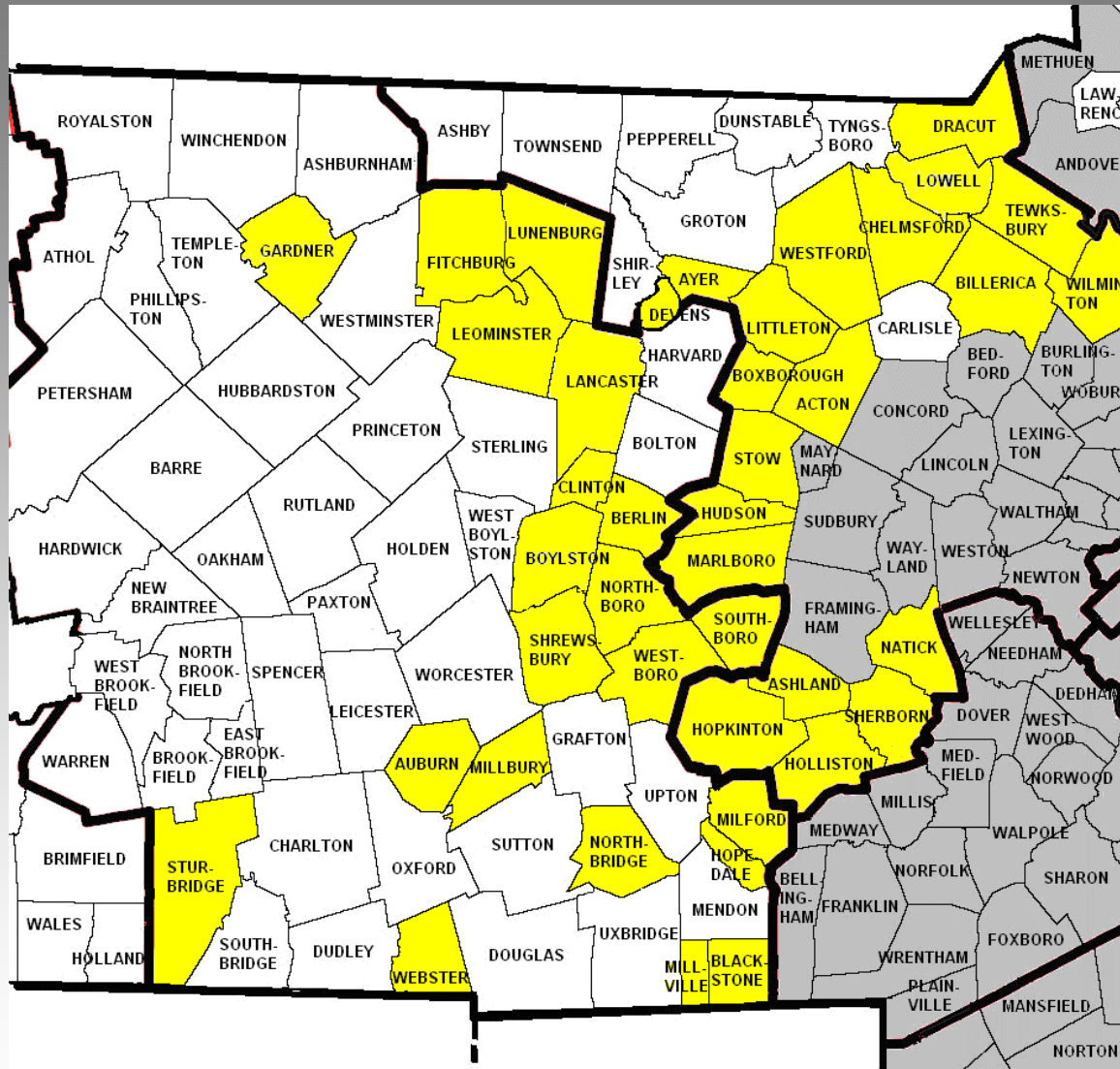


## Mosquito Districts in Mass.






## CENTRAL MASS. MOSQUITO CONTROL

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### LEGEND

-  Yellow – CMMCP towns
-  Gray – other Mosquito Districts
-  White – No control program

# CMMCP Service Area 2017



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# **CMMCP SUITE OF SERVICES**





## Services Offered:

- 1. Surveillance**
- 2. Public Education**
- 3. Ditch Maintenance**
- 4. Larval Control**
- 5. Source Reduction**
- 6. Beaver Mitigation (new)**

**PROACTIVE**

- 7. Adult Control**

**REACTIVE\***

- 8. Research & Efficacy**

**CHECKS & BALANCES**

\*Adult control can be considered proactive by reducing certain species before they can transmit virus



*CENTRAL MASS. MOSQUITO CONTROL*

*[www.cmmcp.org](http://www.cmmcp.org)*

# MOSQUITO SURVEILLANCE



# Trap types

**Gravid trap**



**CDC light trap**



**Resting boxes**



## Surveillance

- Adult mosquito surveillance will be performed in town at least once per week.
- If virus is identified, then additional traps will be placed in that area – intervention options will be discussed with the Board of Health.



## Arbovirus Testing

Adult mosquito samples sent to Mass. Dept. of Public Health each week, tested for:

- West Nile Virus
- Eastern Encephalitis
- Other diseases (Highlands J, SLE, La Crosse, etc.)





## 2016 CMMCP Surveillance

- 1,345 collections tested (1,769 total)
- 35,861 specimens tested (77,870 total)
- 16 viral isolates in mosquitoes, all WNV
  - 14 *Culex*, 2 *Cq. perturbans*
- No EEE detected



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# **PUBLIC EDUCATION**



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# Public Education

## MOSQUITOES and you!!



### CENTRAL MASS MOSQUITO CONTROL PROJECT

111 OTIS STREET  
NORTHBOROUGH, MA 01532

Tel: (508) 393-3055

Fax: (508) 393-8492

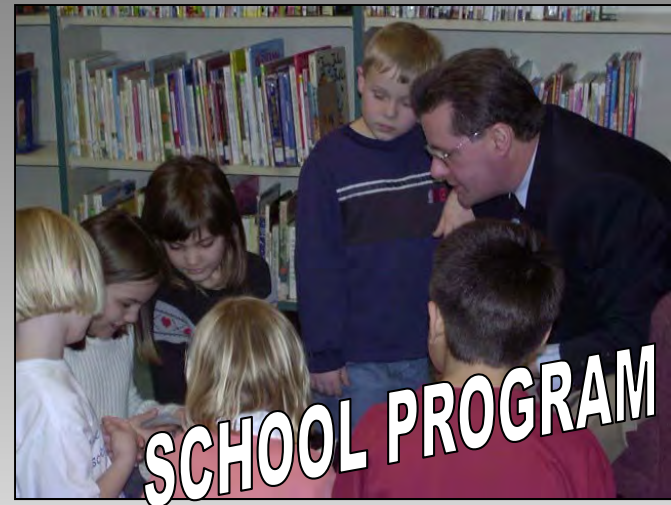
for additional information, please  
access our website at  
[www.cmmcp.org](http://www.cmmcp.org)



BROCHURE



BOOKMARKS



SCHOOL PROGRAM





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# Public Education

follow us on  
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SOCIAL MEDIA



SENIOR PROGRAM

## SCHOOL PROGRAM

Year	# students	# presentations
<b>2016</b>	<b>3,150</b>	<b>78</b>

## TOTAL OUTREACH 2016

**89 presentations  
to 3,990 people**

## SENIOR PROGRAM

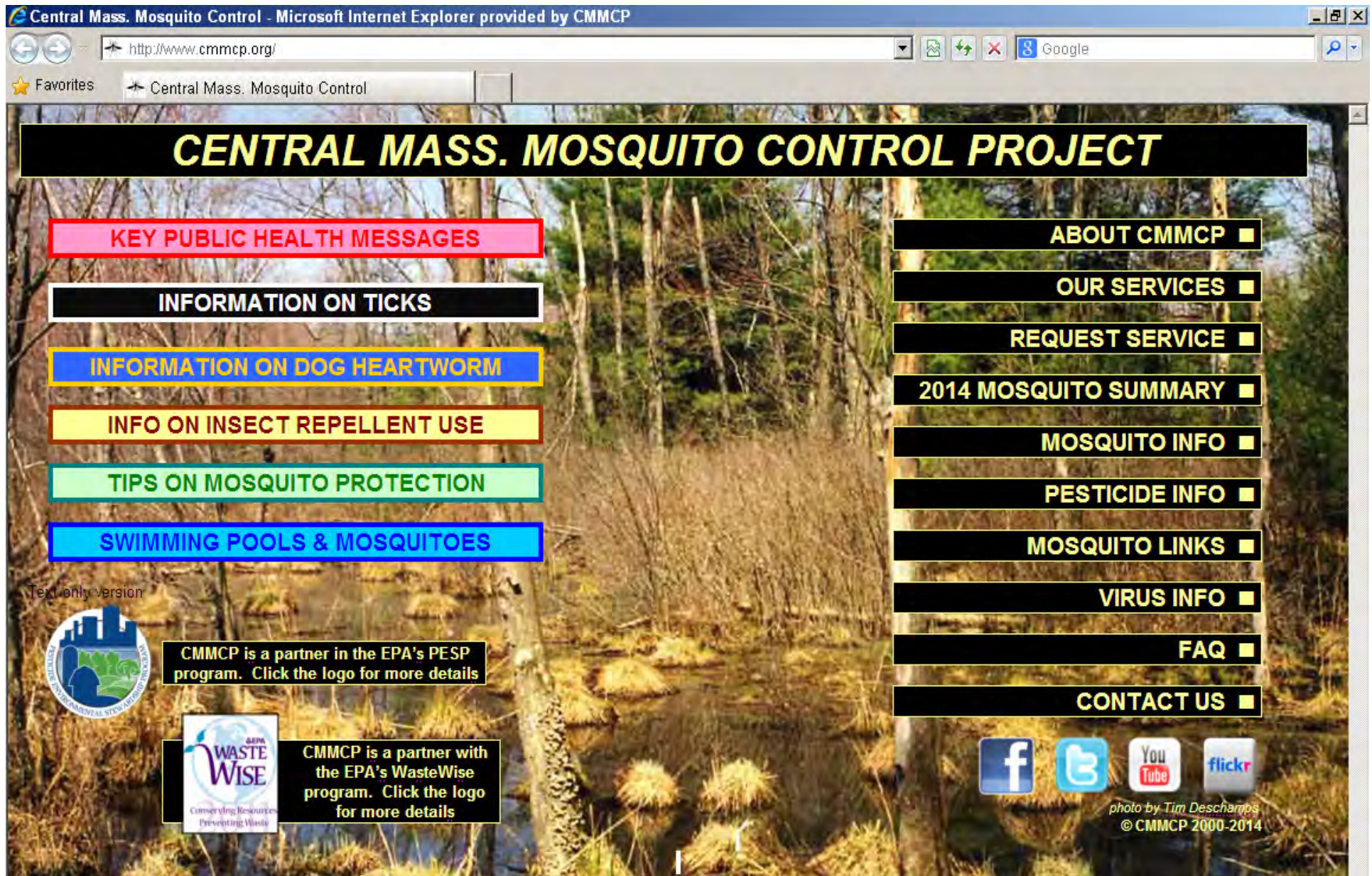
Year	# seniors	# presentations
<b>2016</b>	<b>50</b>	<b>3</b>

## PUBLIC PRESENTATIONS

Year	# people	# presentations
<b>2016</b>	<b>790</b>	<b>8</b>







**CMMCP website – [www.cmmcp.org](http://www.cmmcp.org)**





**Commonwealth of Massachusetts**  
Executive Office of Energy and Environmental Affairs  
2013 Secretary's Award for Excellence  
in Energy and Environmental Education



***Certificate of Excellence***

**Central Massachusetts Mosquito Control Project**

***CMMCP Education Programs***

*In recognition for your dedication, commitment  
and contributions to environmental education*

A blue ink signature of Richard K. Sullivan, Jr.

Richard K. Sullivan, Jr., Secretary

May 13, 2013

Date

**Our educational programs were recognized in 2013 by the  
Secretary of EOEEA**



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# DITCH MAINTENANCE



## Ditch Maintenance

- All proposed work is assessed by a wetland scientist on staff (a former Conservation Agent)
- Most work is low impact using hand/power tools
- More extensive projects using low ground pressure equipment requires more site evaluation
- Work is done after receipt of property owner permission



# Ditch Maintenance (Hopedale 1999)



← BEFORE

AFTER →





# Ditch Maintenance (Shrewsbury 2004)



← BEFORE

AFTER →





**Ditch Maintenance** (Chelmsford 2010)





## **Ditch Maintenance (Natick 2010)**



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# LARVAL MOSQUITO CONTROL



## Larval Control Products

- Bacterial (wetlands)
  - Bti (*Bacillus thuringiensis israelensis*)
  - Spinosad (*Saccharopolyspora spinosa*)
- Bacterial (swimming pools)
  - Bs (*Bacillus sphaericus*)
- Insect Growth regulator (catch basins)
  - Methoprene (Altosid®)
- Surfactant/Oils (limited use)
  - Oil derived from plant extracts
  - Petroleum based



# Aerial Larval Control\*



**\*NOTE:** this is the only program that is done with supplemental funding provided by member communities.



## Aerial Larval Control (cont.)

- 3 towns in program, Chelmsford (~700 acres), Billerica (~600 acres) and Boxborough (~900 acres)
- Aimed at reducing dependence on the spray program and reducing spring species, as well as possible vector species.
- Can be done in summer also



Bti granules



in wetlands

in catch basins



Altosid® pellets

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# SOURCE REDUCTION





## Source Reduction

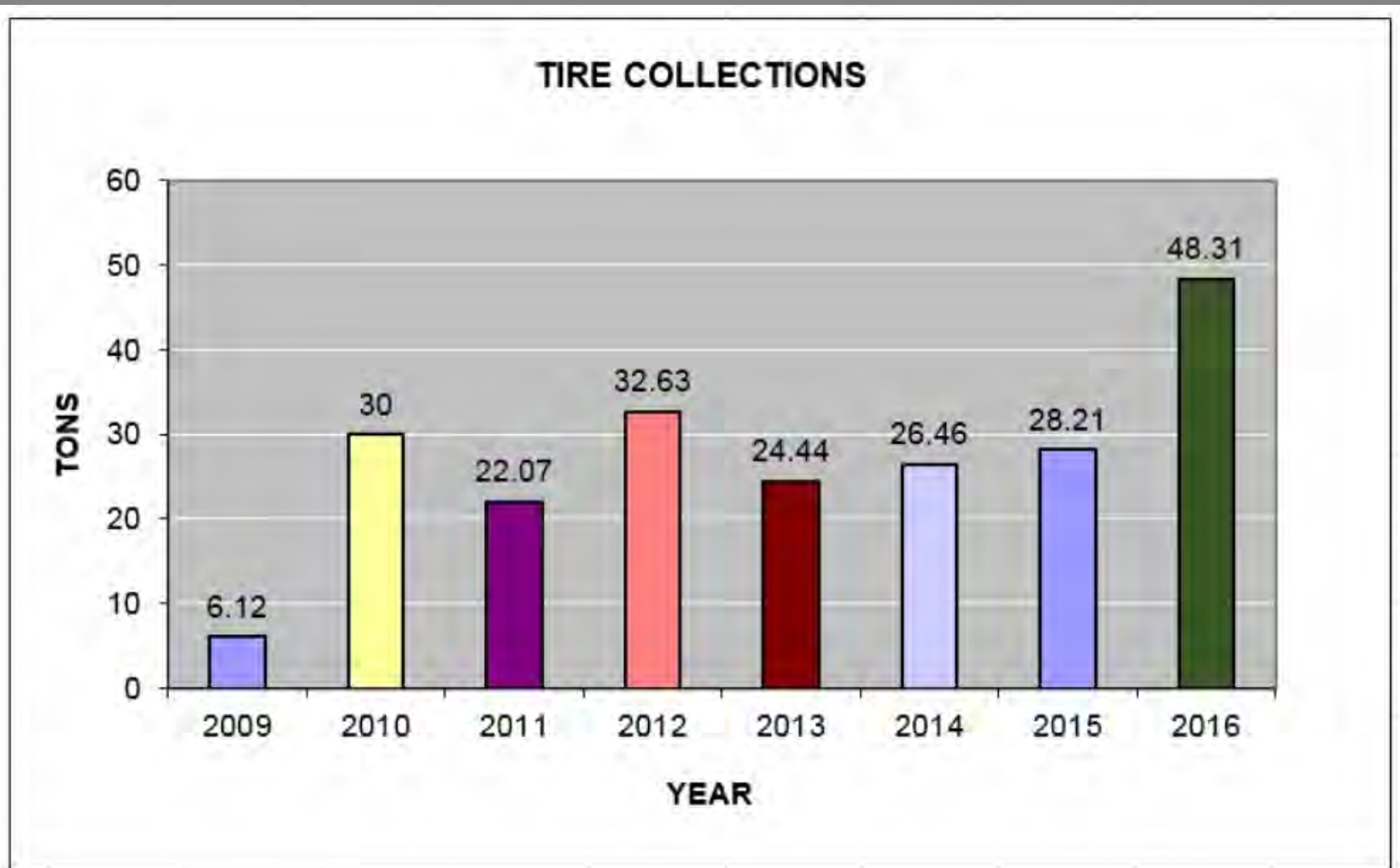
- Program began in 2010
- Operates off grants & operating budget
- 22,011+ tires recycled to date in 38 member cities & towns

**Tires in the environment are the preferred larval habitat of several species of mosquitoes, some that transmit West Nile Virus**



## Source Reduction

- Clean-up of large waste tire dumping sites that we have databased;
- Residential waste tire removal (curb-side);
- Removal of waste tires discarded on the side of the road; and
- Coordination with communities during recycle events, hazardous waste collections, river cleanups, etc.





**ASHLAND, MA**

**1,300+ tires**

**BEFORE**





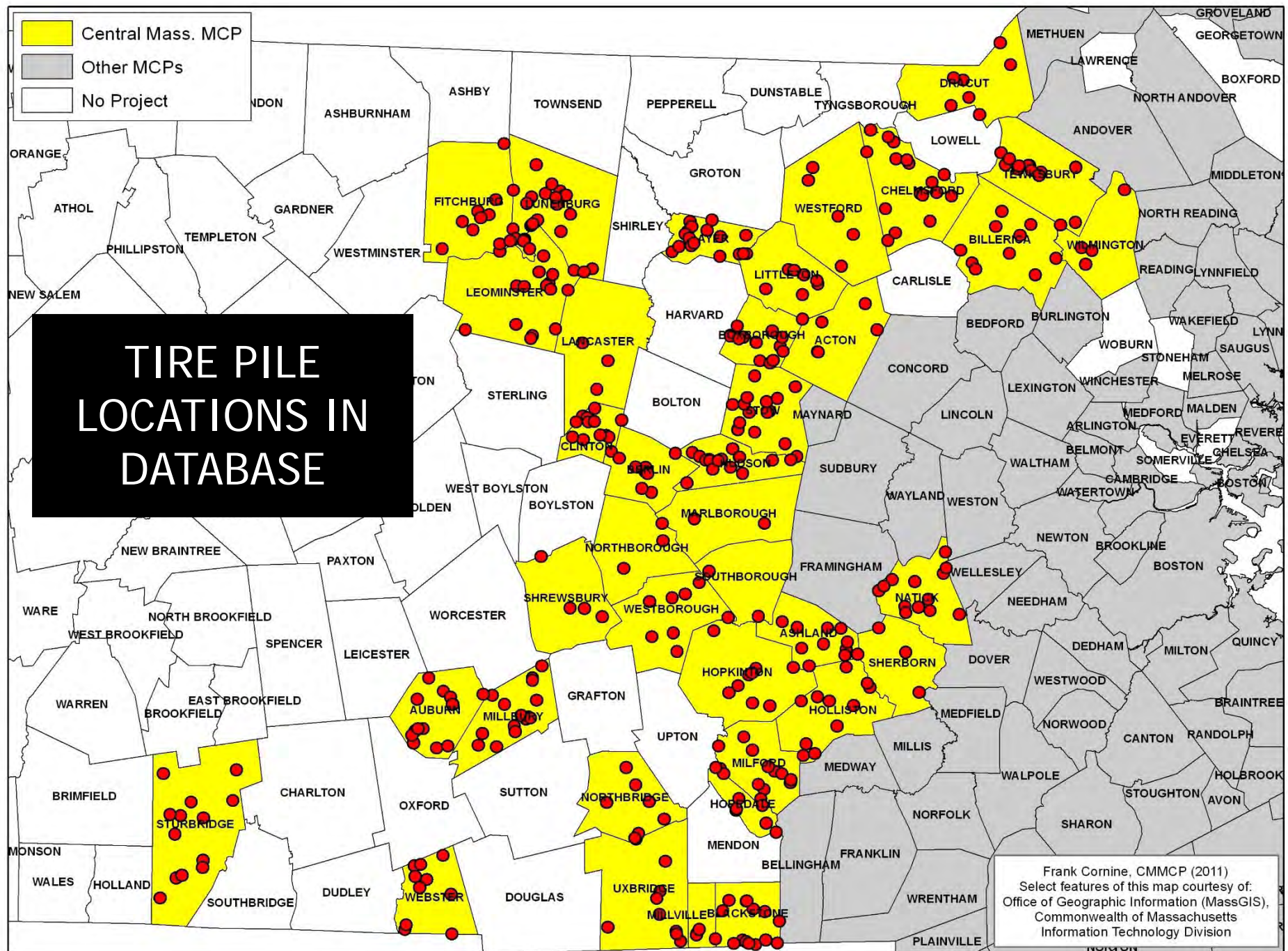
**ASHLAND, MA**

**0 tires**

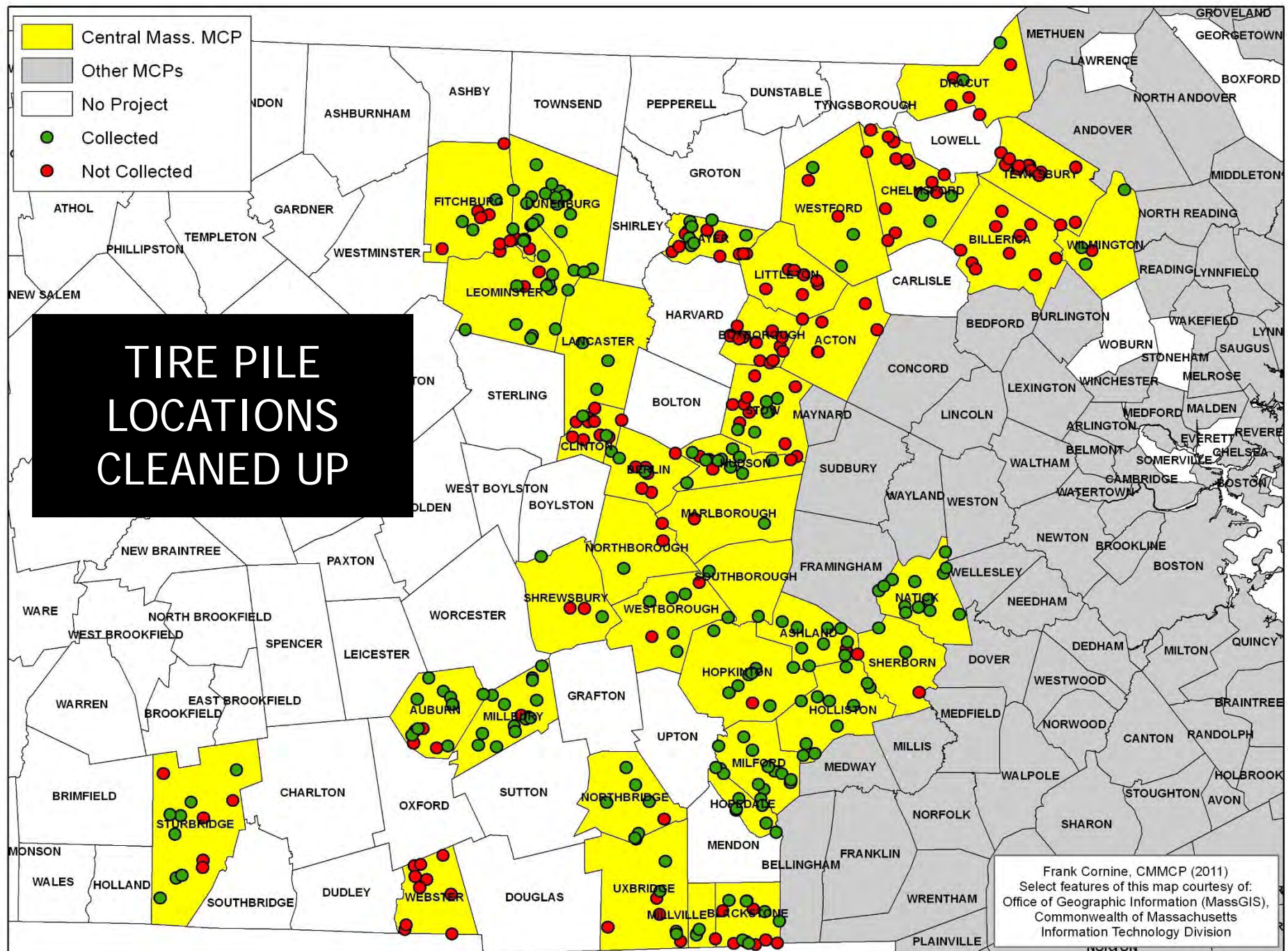
**AFTER**















**Our tire program was recognized in 2011 by MassRecycle**



From the EPA awards:

*"Through this project, the organization has recycled 11,500 tires, which saved 192 staff hours in monitoring larval habitats, and resulted in usage of 720 pounds less of pesticides."*

**Our tire program was recognized in 2014 by the EPA**



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# BEAVER MITIGATION

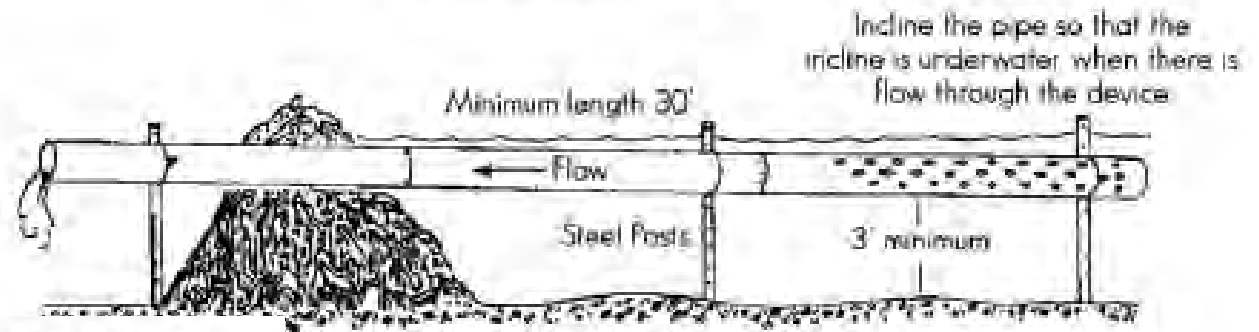


## Beaver Mitigation

- New program for CMMCP (2014)
- Working under emergency permits through BOH & ConCom
- Installation of WLCD
- Dam breaching
- Licensed trappers on staff

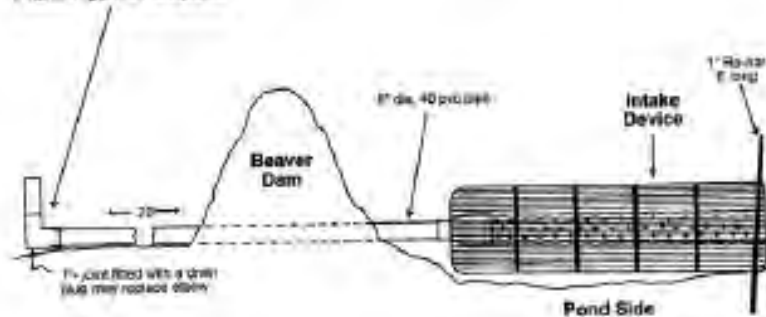


## Pond Drain Pipe



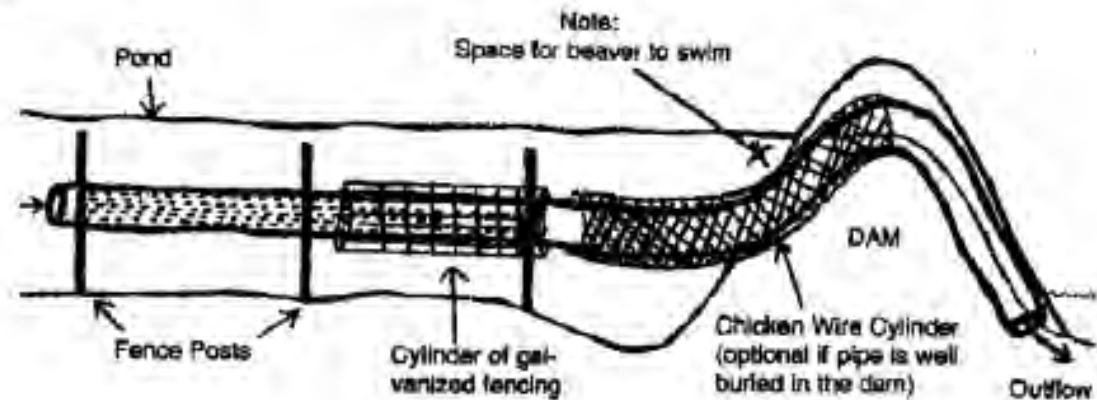
## The Clemson Beaver Pond Leveler

Elbow and stand pipe are optional. Needed only to manage water level if maintaining pond is an objective.



## WLCD EXAMPLES

## PVWV Flexible Leveler







**HOLLISTON, MA – Upper Charles River watershed**



**HOLLISTON, MA – Upper Charles River watershed**



**HOLLISTON, MA – Upper Charles River watershed**



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# ADULT MOSQUITO CONTROL



## Adult Control Product

- Sumithrin (d-phenothrin), a synthetic pyrethroid
- Not a residual product, rapid decomposition in the environment
- Low toxicity to humans, pets, etc.



# Application rates

## GROUND ULV APPLICATION

Apply ANVIL 10+10 ULV through a standard ULV cold aerosol or non-thermal aerosol (cold fog) generator. Consult the following table for examples of various dosage rates using a swath width of 300 feet for acreage calculations.

Dosage Rate	Fl. oz. ANVIL	Flow Rates in fluid oz./minute at truck speeds of:			
Lbs Sumithrin®/acre	10+10 ULV per Acre	5MPH	10MPH	15MPH	20MPH
0.0036	0.62	1.9 oz.	3.8 oz	5.7 oz	7.6 oz
0.0024	0.42	1.3 oz	2.5 oz	3.8 oz	5.1 oz
0.0012	0.21	0.6 oz	1.3 oz	1.9 oz	2.5 oz

The red box are the application rates of the 10% solution of sumithrin over the area the size of an acre – 43,560 sq. ft.

The green box is the typical application rate we use





## Pyrethroids

- Animal Products (flea spray, flea shampoos)
- Restaurant applications
- Food & grain storage
- Available to homeowners as Yard Guard®, Repel®, etc.





## Pyrethroids in Pet Products

### ACTIVE INGREDIENTS:

Phenothrin	85.7%
(S)-Methoprene	2.3%

OTHER INGREDIENTS: . . . 12.0%

TOTAL . . . . . 100.0%

Here is a common pet product using the same pesticides we use, but at higher rates

## Adult Control

- If no service requests are received from residents, then no spraying will be done. Other work like larval control, landing counts, etc. may be performed in town on the scheduled day/evening
- If spraying is done for virus control, it will be done only after consultation with local and state officials





## Exclusion properties (No Sprays)

- Register through MDAR under new process
- Detailed list sent with all pesticide applicators & on GPS units in spray vehicles



## Spray Notifications

- Monthly schedules sent to all Boards of Health, City/Town Clerks & Police Dept. 2 weeks prior to start of each month
- Street listings on CMMCP phone system after 3:30pm each day
- Street listing on CMMCP website after 3:30pm each day.
- Detailed listing given to Police Dept. each afternoon



## Landing Rates

- Landing rates >1 per min.\*
- 51 landing rates in 2016\*\*

\*from the Mass. Mosquito Generic Environmental Impact Report

\*\* Landing rates are suspended after confirmation of virus – July 16, 2015.





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# RESEARCH & EFFICACY



## Research & Efficacy

- Department began in 2007 – includes GIS capabilities
- Provides checks & balances
- Past studies:
  - Mosquito bloodmeal analysis
  - Pesticide resistance testing
  - Adulticide program efficacy evaluation
  - Host-seeking activity
  - Resident survey

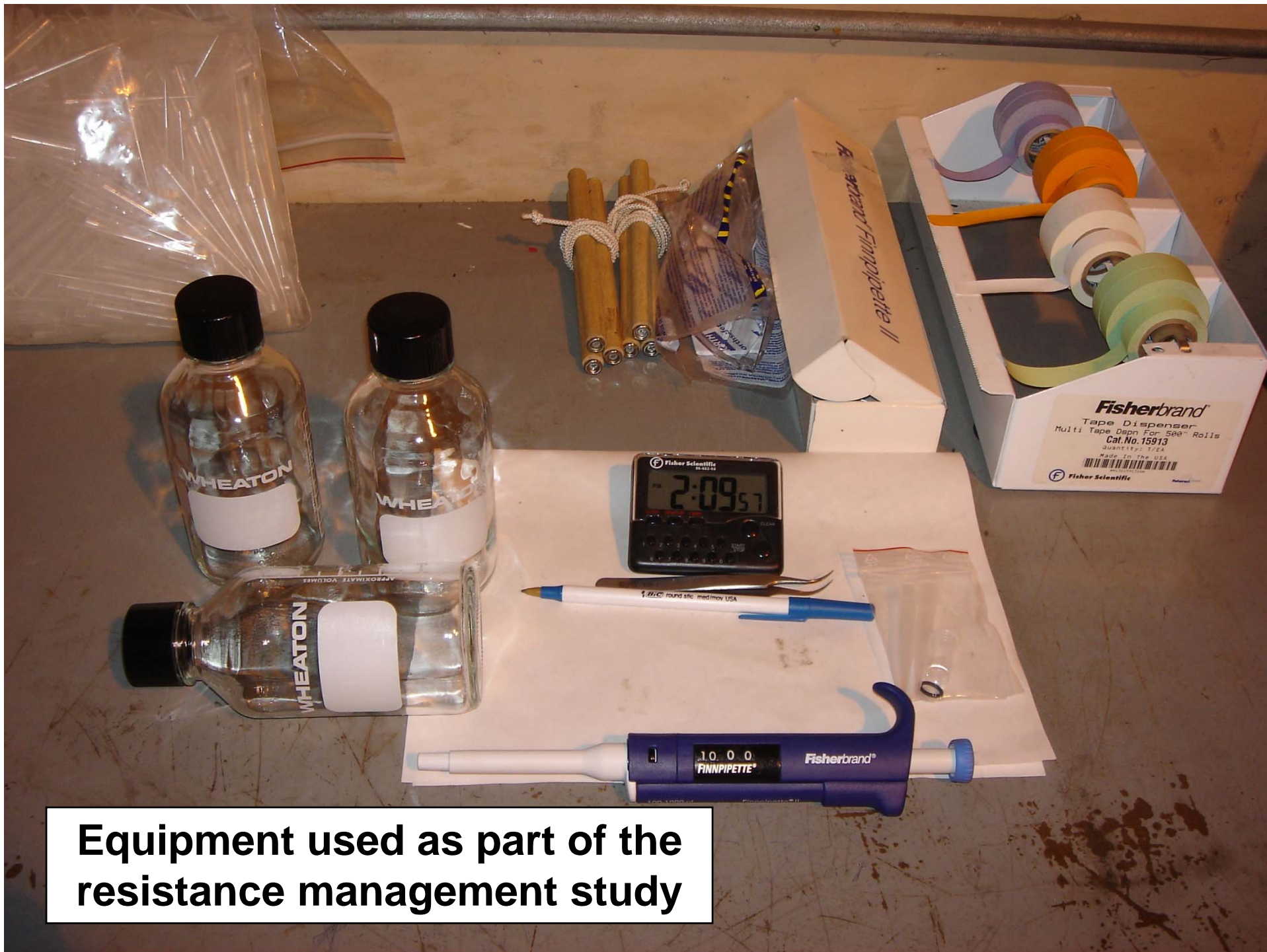


## Research & Efficacy (cont.)

### Pesticide resistance (sumithrin/resmethrin)

- Using CDC protocols
- Done for past 7 years, no resistance noted in area







**Rotator light traps  
used in the adulticide  
efficacy study & host  
seeking activity study**





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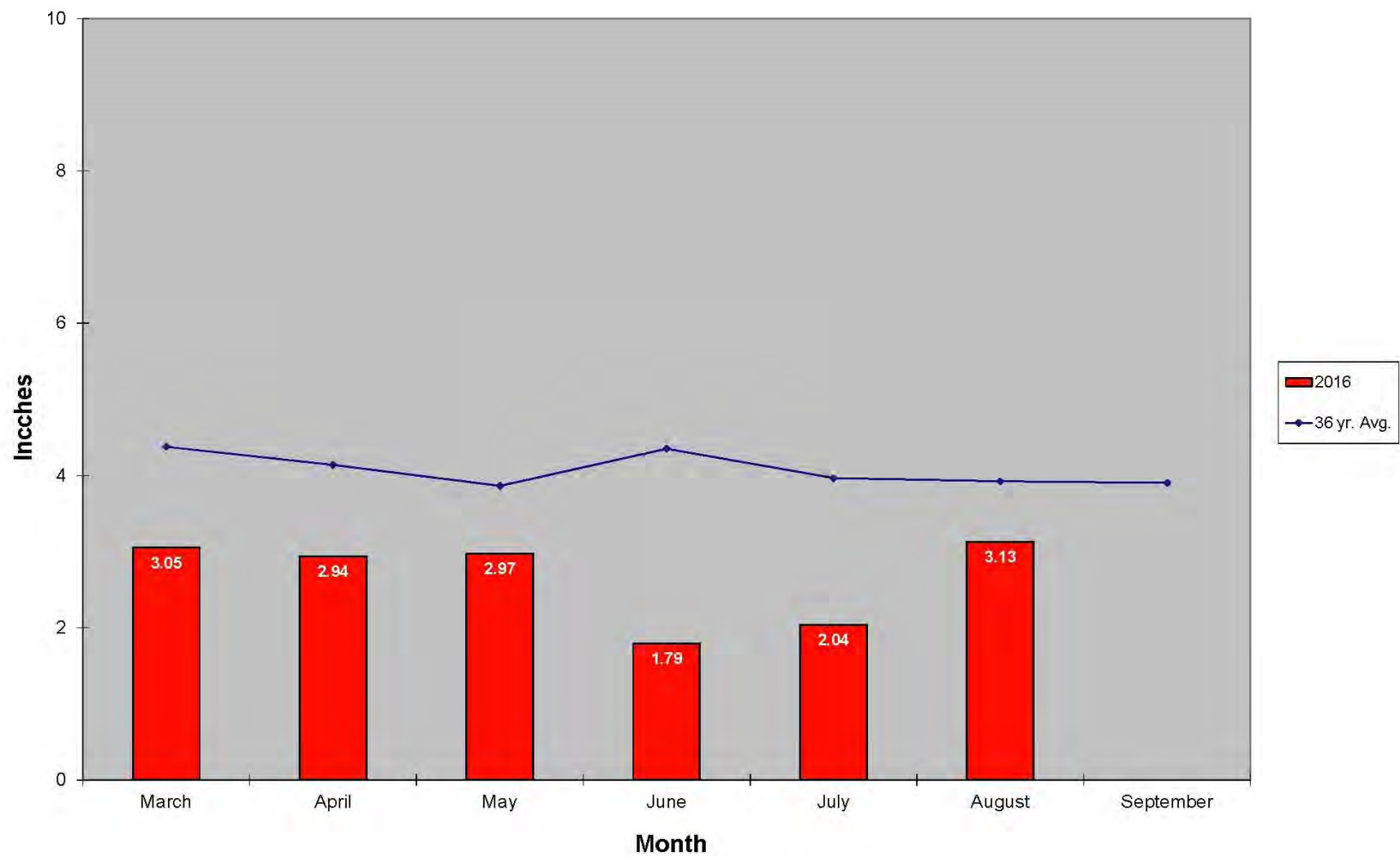
[www.cmmcp.org](http://www.cmmcp.org)

**CMMCP weather  
station to monitor  
wind, rain &  
temperatures**



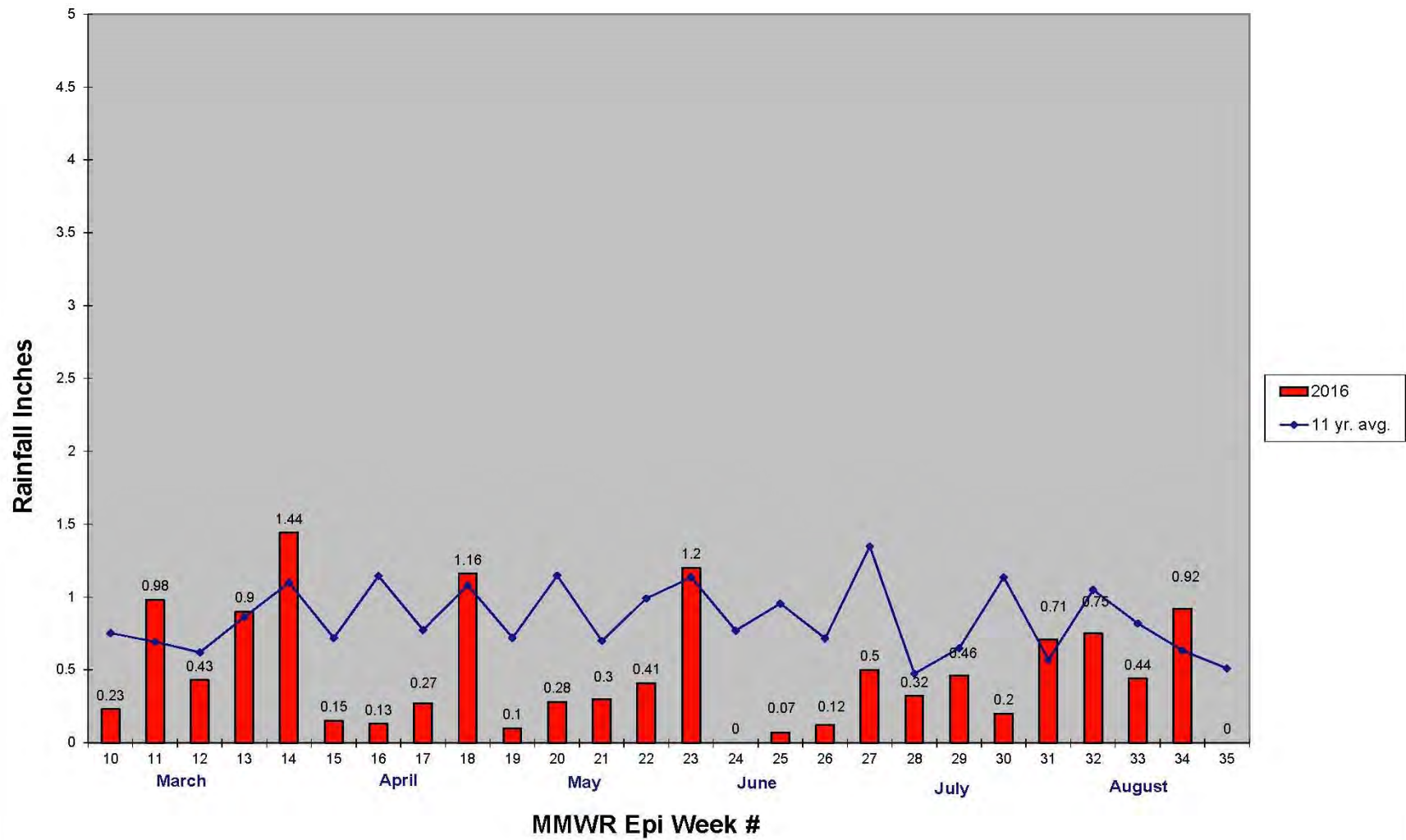


**2016 Mass. Rainfall Data vs. 36 Year Average\***



\*source: <http://www.nrcc.cornell.edu/regional/tables/tables.html>

2016 CMMCP Weekly Rainfall vs. 11 Year Average\*



\*source: CMMCP weather station Northborough, MA

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# MOSQUITO-BORNE DISEASES IN MASS.





# ARBOVIRUS DISEASE TRANSMISSION CYCLE



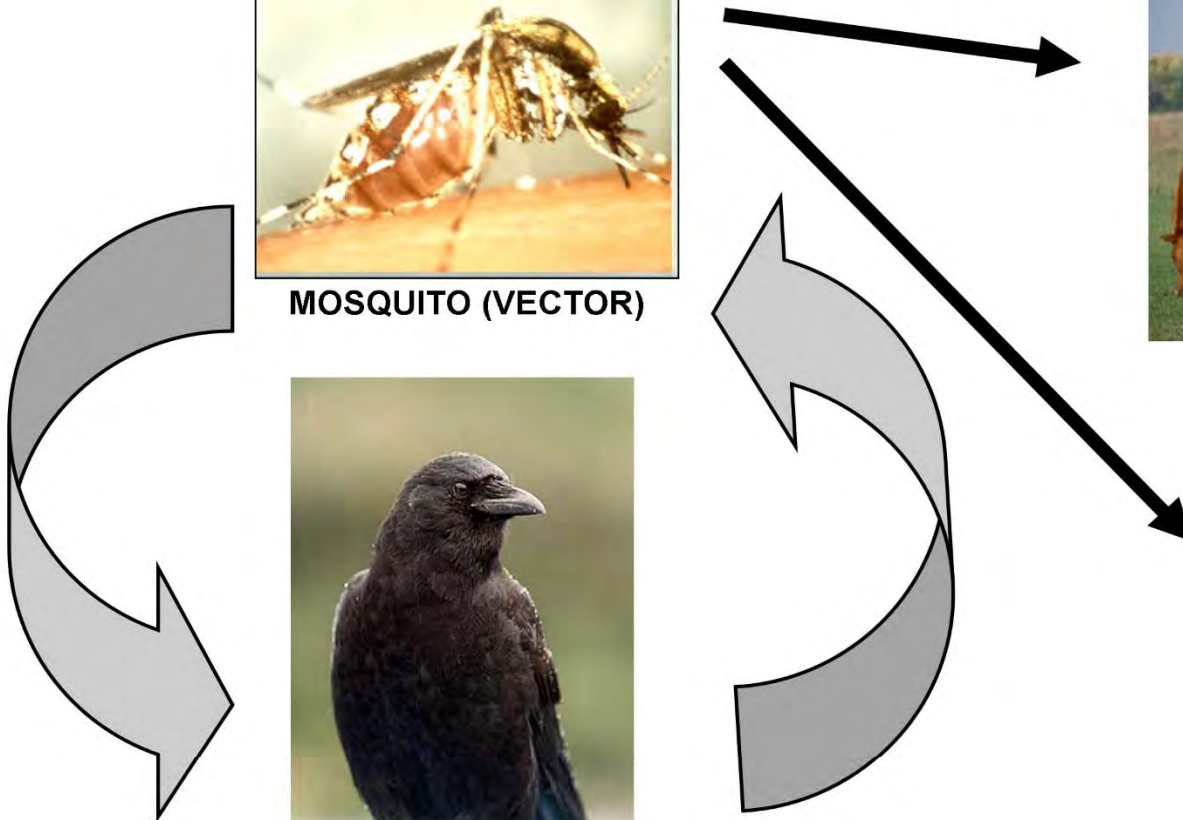
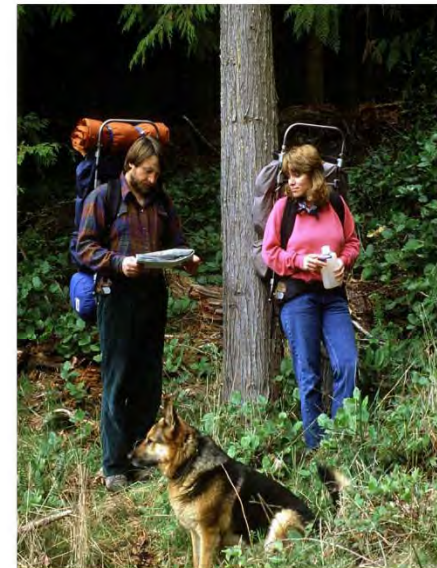
**MOSQUITO (VECTOR)**



**BIRD (RESERVOIR)**



**INCIDENTAL INFECTIONS**



## West Nile Virus

- Discovered in USA in New York in 1999
- Discovered in Mass. in 2000
- Firmly established in the nation with sporadic, localized outbreaks



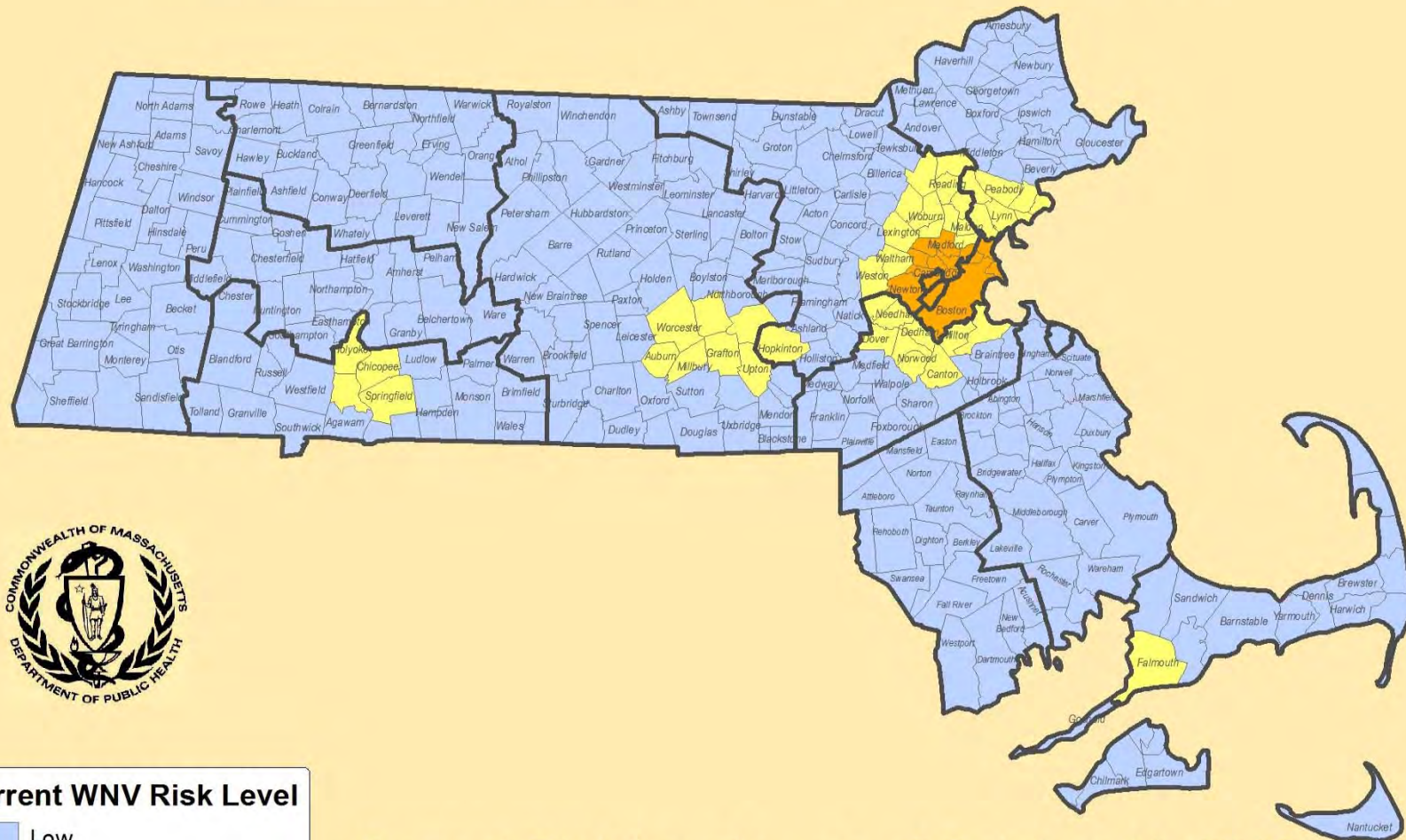
# 2016 WNV - Nationwide



**2,038 human cases reported – 16 in Mass.  
94 deaths nationwide – 0 in Mass.  
Sept. 15, 2015**



# Massachusetts WNV Risk Categories



## Current WNV Risk Level

- Low
- Moderate
- High
- Critical

Current Risk Levels – as of October 11, 2016

# MA WNV Surveillance Summary 2016

Mosquito Pools Positive	189
Horses Positive	0
Humans Positive	16



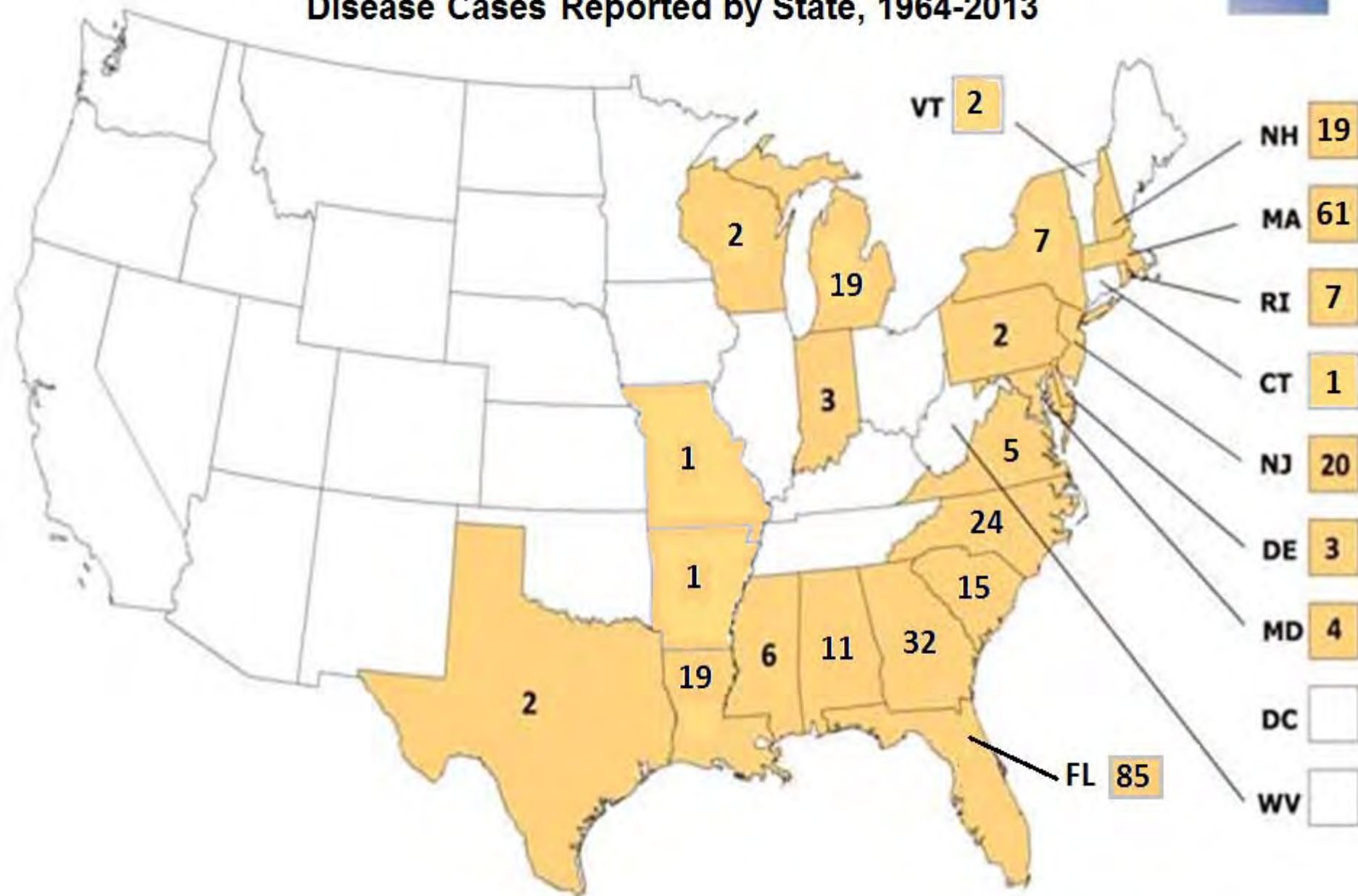
# Eastern Equine Encephalitis

- 30-50% mortality
- Of the survivors, most have severe permanent neurological damage
- Most common in SE Mass. but may be moving west/north





# Eastern Equine Encephalitis Virus Neuroinvasive Disease Cases Reported by State, 1964-2013

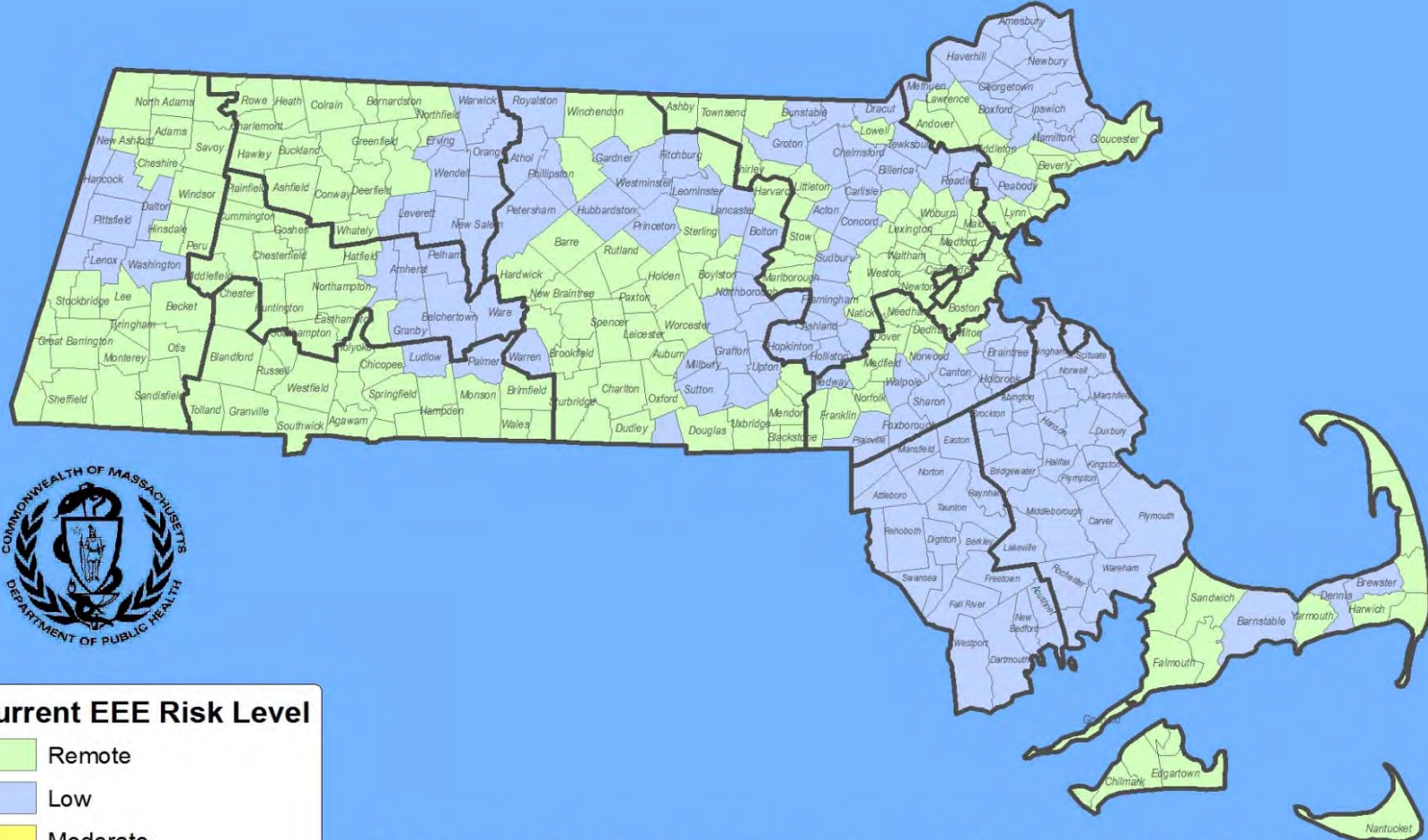


# MA EEEV Surveillance Summary 2016

Mosquito Pools Positive	4
Horses Positive	0
Humans Positive	0



# Massachusetts EEE Risk Categories



## Current EEE Risk Level

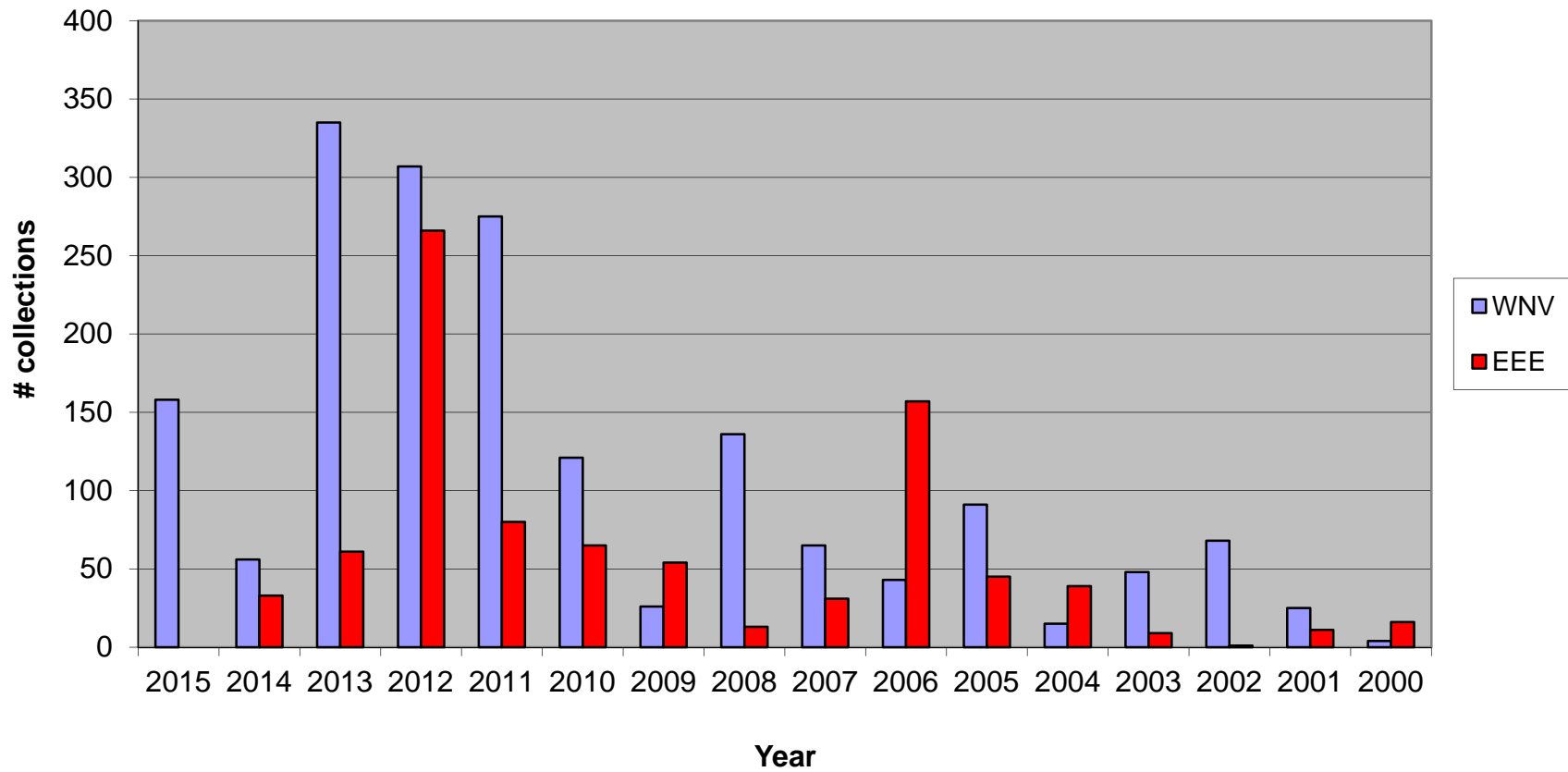
- Remote
- Low
- Moderate
- High
- Critical

Current Risk Levels – as of October 11, 2016

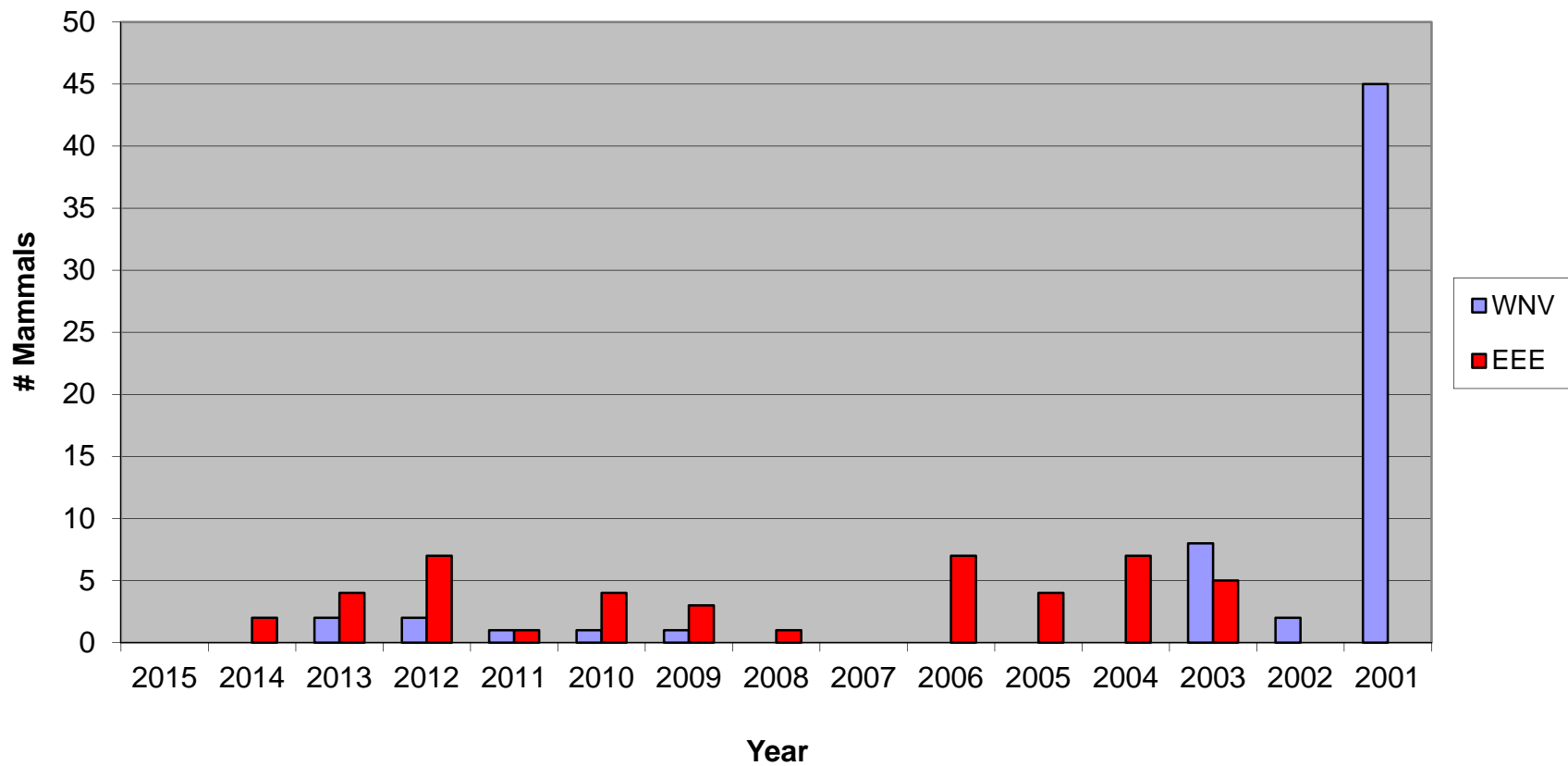
Massachusetts State Public Health Laboratory  
Arbovirus Surveillance Program



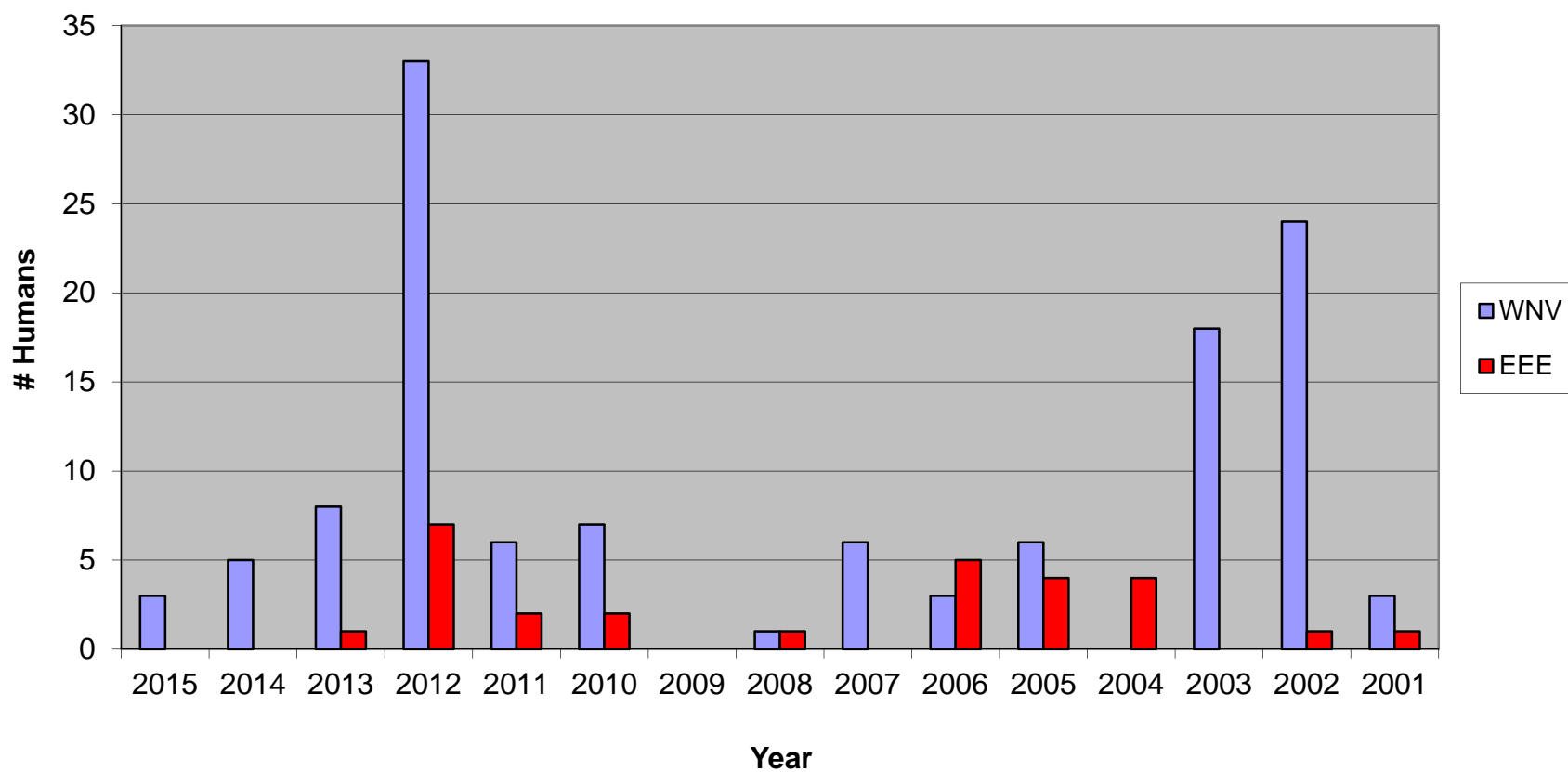
## Statewide Mosquito Collections 2000-2015



## Statewide Mammal Cases 2001-2015

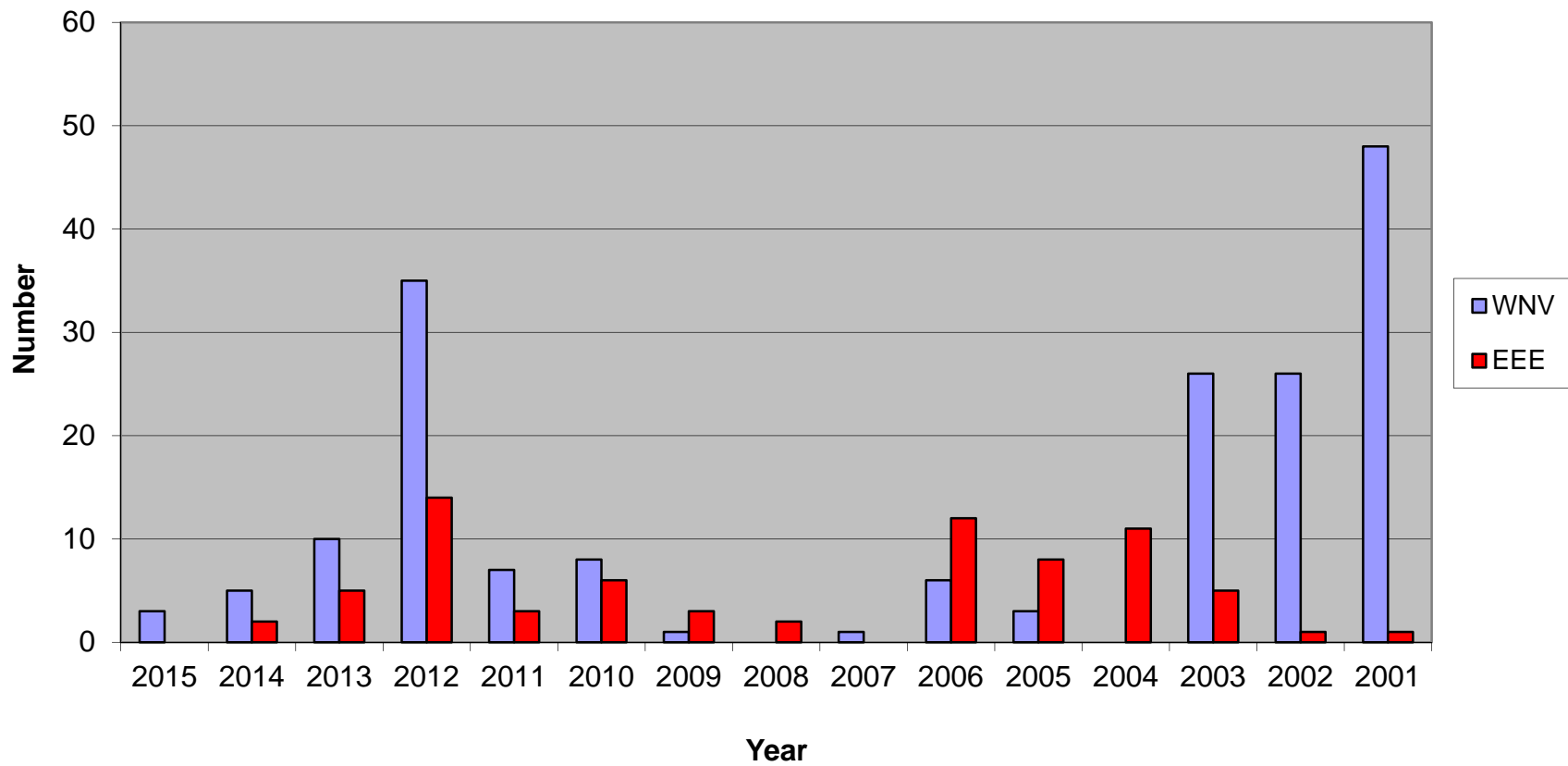


## Statewide Human Cases 2000-2015





## Mammal & Human Cases Statewide 2001 - 2015

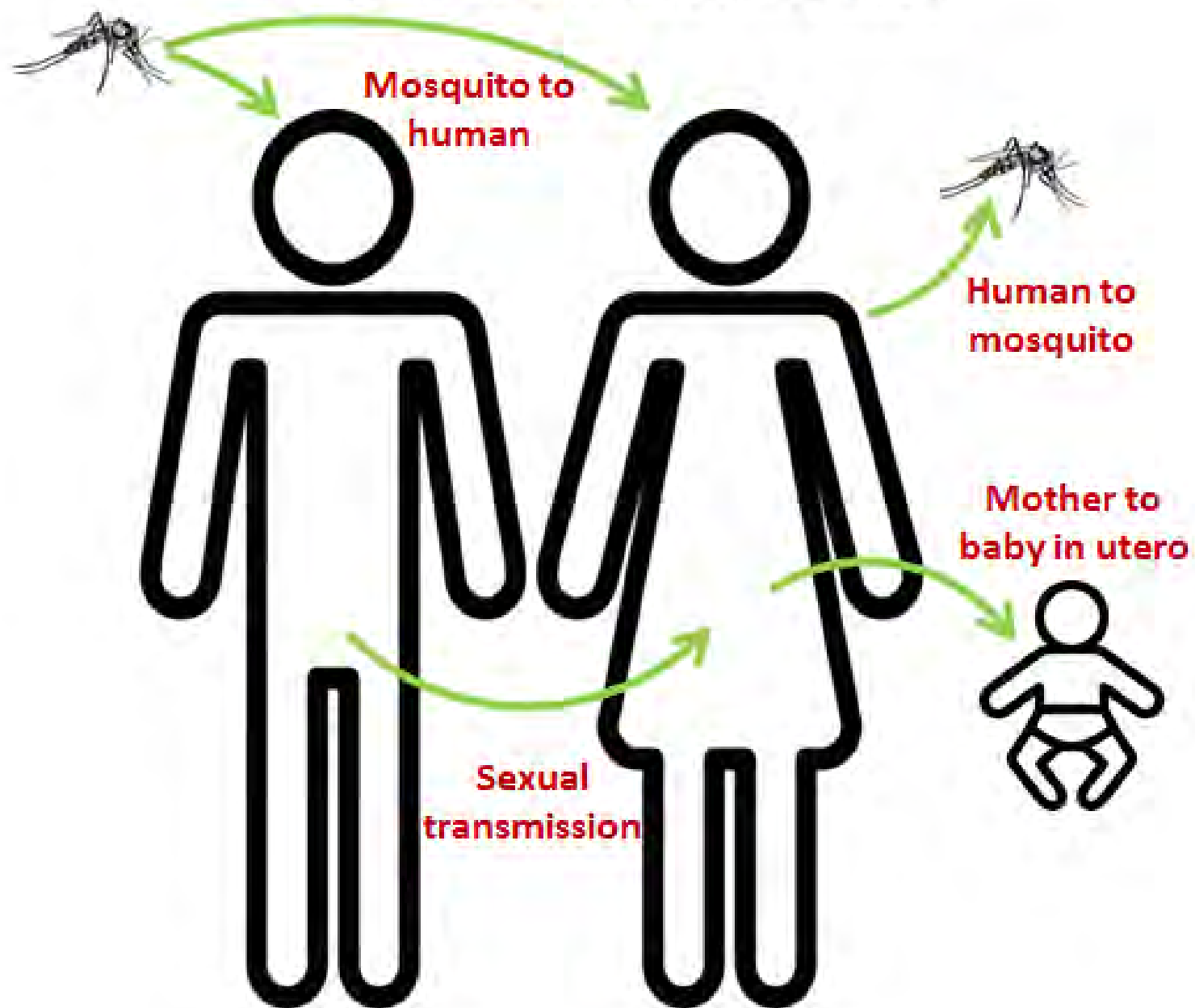


## Zika Virus

- Before 2013 considered a mild, rare disease
- Virus may have mutated, now causes severe complications, esp. in pregnant women
- South, Central & Latin America
- Possibility for issues in the South

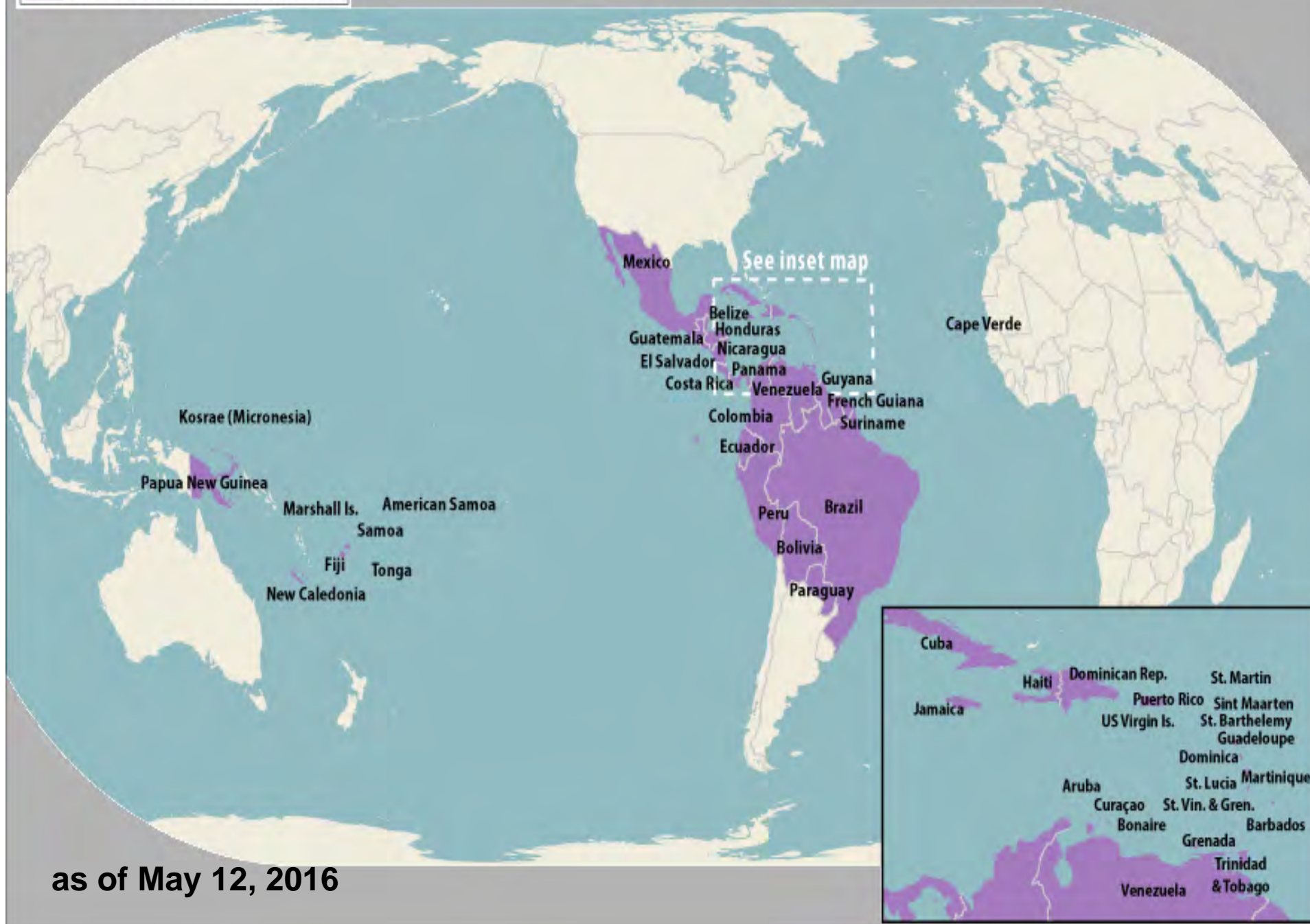


## 4 Zika Transmission Routes





Reported active transmission



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# PERSONAL PROTECTION MEASURES



## Repellents

- DEET
- Permethrin\*
- Picaridin
- Oil of Lemon Eucalyptus (PMD)

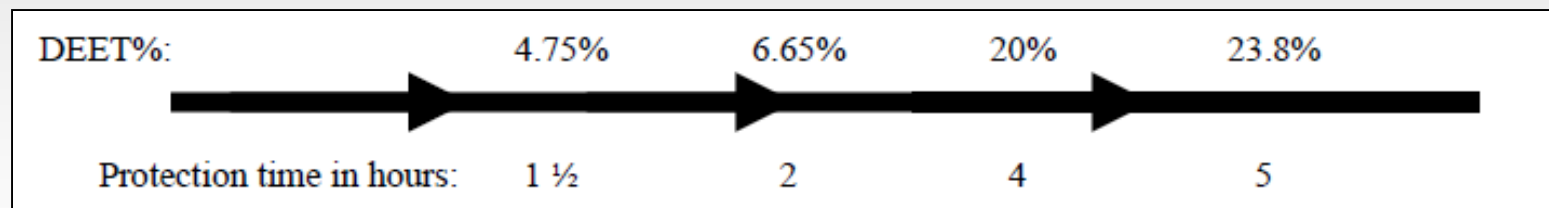
\*clothing only





## DEET\*

- The “Gold Standard” since 1946 (military use – 1957 civilian use)
- **READ THE LABEL** – under 30% recommended for children >2 months
- Not recommended for infants



\*N,N-Diethyl-*m*-toluamide

## Permethrin

- Contact insecticide
- Intended for use on clothing, bed nets, shoes, camping gear – **NOT ON SKIN**
- Follow label instructions
- Very effective against mosquitoes, ticks & other biting insects

**READ THE LABEL**



## Picaridin & PMD

- Shorter effectiveness (comparable to low concentrations of DEET)
- Newer products, less data available
- Don't use PMD (oil of lemon eucalyptus) on children under 3 years of age

**READ THE LABEL**





## Natural Repellents

- Limited data available of effectiveness and toxicity
- Look for products with an EPA registration number
- Just because it's "natural" doesn't mean it works or is safer than alternatives

**READ THE LABEL**



## Application of Repellents

- Don't use repellents under clothing
- Don't use on cuts or irritated skin
- Don't use repellents near the mouth or eyes and use them sparingly around the ears. When using spray products, spray the product onto your hands first, and then apply it to your face.



## Ticks

- Repellents
- Tick checks
- Increase sunlight & wind
- Remove underbrush & leaves
- Information on website:

<http://www.cmmcp.org/tickcontrol.htm>





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# CONTACT INFORMATION

Central Mass Mosquito Control Project

111 Otis St. Northborough, MA 01532

(508) 393-3055

[www.cmmcp.org](http://www.cmmcp.org)

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