MOSQUITO CONTROL IN CENTRAL MASSACHUSETTS

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ORGANIZATIONAL 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 SRMCA
• CMMCP Board of Commission meets monthly on the 2nd Wednesday of each month
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
- Location 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
- 52 species in Mass.
- Vector of several diseases in the Northeast
- Flight range <100 yds. to 25 miles
LARVAL MOSQUITO HABITAT IN MASSACHUSETTS
Habitat Types

- Retention/Detention areas
- Woodland pools & Reflood areas
- White cedar/Red 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*)
Cq. perturbans larvae attached to root system
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*
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. NE Mass. Wetlands Mgmt. & MC District
8. Norfolk County MCP
10. Plymouth County MCP
11. Suffolk County MCP
Services Offered:

1. Surveillance
2. Public Education
3. Ditch Maintenance
4. Larval Control
5. Source Reduction
6. Beaver Mitigation (new)
7. Adult Control
8. Research & Efficacy

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

Adult mosquito surveillance to monitor mosquito-borne diseases, document species diversity and population densities.
Trap types

- Gravid trap
- CDC light trap
- Resting boxes
Surveillance

- Adult mosquito surveillance will be performed in town at least once per week. 675+ traps deployed in our service area.

- 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.)
2019 CMMCP Surveillance

- 2,416 collections tested (6,585 total)
- 56,374 specimens tested (205,265 total)
- 38 viral isolates in mosquitoes
- 28 EEE, 10 WNV detected in 2019
PUBLIC EDUCATION

Education to schools, civic groups, local and state officials about mosquito biology, program services, control techniques and personal protection methods.
Public Education

CENTRAL MASS MOSQUITO CONTROL
www.cmmcp.org

MOSQUITOES and you!!

CENTRAL MASS MOSQUITO CONTROL PROJECT
111 ODIS STREET
NORTHBOROUGH, MA 01532
Tel: (508) 393-3055
Fax: (508) 393-5492

for additional information, please access our website at:
www.cmmcp.org

Mosquito-borne Disease in Central Massachusetts:
How You Can Keep Safe This Summer

Attention: Color Advisory!

SCHOOL PROGRAM

BROCHURE

BOOKMARKS
Public Education

SOCIAL MEDIA

SENIOR PROGRAM
<table>
<thead>
<tr>
<th>Year</th>
<th># students</th>
<th># presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>3,075</td>
<td>93</td>
</tr>
</tbody>
</table>

**SCHOOL PROGRAM**

**TOTAL OUTREACH 2019**

109 presentations to 4,415 people

<table>
<thead>
<tr>
<th>Year</th>
<th># seniors</th>
<th># presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>25</td>
<td>1</td>
</tr>
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</table>

**SENIOR PROGRAM**

<table>
<thead>
<tr>
<th>Year</th>
<th># people</th>
<th># presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>1,315</td>
<td>15</td>
</tr>
</tbody>
</table>

**PUBLIC PRESENTATIONS**
SEASONAL UPDATES

Personal Protection Measures »
Be aware of peak exposure times and places. Exposure to arthropod bites may be reduced if travelers modify their...

Tire Collection Program »
Our tire program is on hiatus while we deal with the EEE issue, but we will take your information and will schedule a...

Dog Heartworm »
Please consult your veterinarian to be sure all vaccinations are up to date, and if a booster is needed during the...

+ VIEW ALL
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

Richard K. Sullivan, Jr., Secretary

May 13, 2013
Date
DITCH MAINTENANCE

Restoring drainage systems to historic flow patterns to allow the free flow of water, reducing larval mosquito development from that area.
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)
Ditch Maintenance (Chelmsford 2010)
Ditch Maintenance (Natick 2010)
LARVAL MOSQUITO CONTROL

Surveys of wetlands to monitor the development of mosquito larvae and perform control techniques to minimize mosquito emergence.
Larval Control Products

- Bacterial
  - *Bti* (*Bacillus thuringiensis israelensis*)
  - *Spinosad* (*Saccharopolyspora spinosa*)
  - Bsph (*Bacillus sphaericus*)
- Insect Growth regulator
  - Methoprene
- Surfactant/Oils (limited use)
  - Oils derived from plant extracts
  - Petroleum based

*organic formulations used at CMMCP*
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
2019 aerial maps
Table 1: Larval Surveillance of Treatment and Control RDS

<table>
<thead>
<tr>
<th>Treatment Sites</th>
<th>Pre-application</th>
<th>Post-application</th>
<th>Observed Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIL116</td>
<td>72</td>
<td>4</td>
<td>-94.44%</td>
</tr>
<tr>
<td>BIL112</td>
<td>78</td>
<td>3</td>
<td>-96.15%</td>
</tr>
<tr>
<td>BIL408</td>
<td>93</td>
<td>3</td>
<td>-96.77%</td>
</tr>
<tr>
<td>BOX44</td>
<td>29</td>
<td>2</td>
<td>-93.10%</td>
</tr>
<tr>
<td>BOX116</td>
<td>24</td>
<td>3</td>
<td>-87.50%</td>
</tr>
<tr>
<td>CHM82</td>
<td>31</td>
<td>5</td>
<td>-83.87%</td>
</tr>
<tr>
<td>CHM279</td>
<td>29</td>
<td>1</td>
<td>-86.55%</td>
</tr>
<tr>
<td>CHM236</td>
<td>57</td>
<td>33</td>
<td>-42.11%</td>
</tr>
<tr>
<td><strong>Overall:</strong></td>
<td><strong>413</strong></td>
<td><strong>54</strong></td>
<td><strong>-86.92%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Sites</th>
<th>Pre-application</th>
<th>Post-application</th>
<th>Observed Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIL227</td>
<td>84</td>
<td>84</td>
<td>0.00%</td>
</tr>
<tr>
<td>ACT41</td>
<td>56</td>
<td>86</td>
<td>53.57%</td>
</tr>
<tr>
<td>CHM146</td>
<td>74</td>
<td>94</td>
<td>27.03%</td>
</tr>
<tr>
<td><strong>Overall:</strong></td>
<td><strong>214</strong></td>
<td><strong>264</strong></td>
<td><strong>23.36%</strong></td>
</tr>
</tbody>
</table>

2019 aerial results
SOURCE REDUCTION

Tire recycling to eliminate larval mosquito habitat and reduce risk from mosquito-borne diseases.
Source Reduction

- Program began in 2010
- Operates off initial grant, now in operating budget
- 32,060 tires recycled to date in 39 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.
TIRE COLLECTIONS IN CENTRAL MASS.

YEAR OF COLLECTION

# TIRES

2009: 612
2010: 3000
2011: 2207
2012: 3263
2013: 2444
2014: 2646
2015: 2821
2016: 4831
2017: 3488
2018: 3431
2019: 3230
ASHLAND, MA
1,300+ tires
ASHLAND, MA
0 tires

AFTER
TIRE PILE LOCATIONS CLEANED UP
MassRecycle 
presents the 2011 

BRONZE 
Institution & Nonprofit Award 
to 
Central Mass Mosquito Control Project 
for 
Outstanding efforts to increase recycling and reduce waste

Dmitry Nikolayev, President
November 15, 2011
Our tire program was recognized in 2014 by the EPA – Region 1

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.”
2017 Certificate of Achievement

WasteWise

The U.S. Environmental Protection Agency’s National Sustainable Materials Management Program commends

Central Massachusetts Mosquito Control

for your demonstrated commitment to improving sustainable waste management practices since becoming a participant in 2011.

[Signature]

DEBORAH A. SZARO,
ACTING REGIONAL ADMINISTRATOR
EPA REGION 1

Sustainable Materials Management

ReThink

[Logo]
BEAVER MITIGATION

Proper management of beaver populations to reduce potential negative aspects of beaver activity.
Beaver Mitigation

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

Pond Drain Pipe
Incline the pipe so that the incline is underwater when there is flow through the device.

Minimum length 30'
Flow
Steel Posts
3' minimum

The Clemson Beaver Pond Leveler

PVWS Flexible Leveler

Note:
Spaces for beaver to swim

DAM
Chicken Wire Cylinder
(=optional if pipe is well buried in the dam)
HOLLISTON, MA – Upper Charles River watershed
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HOLLISTON, MA – Upper Charles River watershed
ADULT MOSQUITO CONTROL

Targeted applications to control adult mosquitoes and reduce risk from mosquito-borne diseases.
Adult Control Product

- **Etofenprox**, a reduced risk* synthetic pyrethroid
- Not a residual product, rapid decomposition in the environment
- Low toxicity to humans, pets, etc.

*as classified by the EPA
Application rates

<table>
<thead>
<tr>
<th>Application rate</th>
<th>Flow rates</th>
<th>Vehicle Speed</th>
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<tbody>
<tr>
<td>pound A.I. per acre</td>
<td>Oz/Acre</td>
<td>Oz/Minute</td>
</tr>
<tr>
<td>0.00175</td>
<td>2.25</td>
<td>7.00</td>
</tr>
<tr>
<td>0.00350</td>
<td>1.5</td>
<td>4.50</td>
</tr>
<tr>
<td>0.00700</td>
<td>3.0</td>
<td>9.00</td>
</tr>
</tbody>
</table>

The red box are the application rates of the 4% solution of etofenprox 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

Here is a common pet product for topical (skin) applications using the same pesticide we use, but at higher rates (55% vs. 4%)
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.
Adult Control

- Website redesign to allow electronic notifications before spray applications.
- New GPS tracking system in place, includes Windows® tablets.
- Spray areas are detailed in new report system showing exact locations and time of spray.
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 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.
Landing Rates

- Landing rates >1 per min.*
- 321 landing rates in 2019** (181 with no application 56%)

*from the Mass. Mosquito Generic Environmental Impact Report

** Landing rates were suspended after confirmation of virus on July 15
RESEARCH & EFFICACY

To check the efficacy of our products and techniques, and perform research in new or advanced control methods.
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 14 years, no resistance noted in area
Equipment used as part of the resistance management study
Resistance management
Rotator light traps used in the adulticide efficacy study & host seeking activity study
CMMCP weather station to monitor wind, rain & temperatures
2019 Mass. Rainfall Data vs. 39 Year Average

*source: http://www.nrcc.cornell.edu/regional/tables/tables.html
2019 CMMCP Weekly Rainfall vs. 14 Year Average

*source: CMMCP weather station Northborough, MA
MOSQUITO-BORNE DISEASES IN MASS.
ARBOVIRUS TRANSMISSION CYCLE

MOSQUITO (VECTOR)

INCIDENTAL INFECTIONS

BIRD (RESERVOIR)

“ARBOVIRUS” - arthropod-borne virus. A mosquito (vector) picks up a virus from a bird (reservoir), lays eggs and transmit the virus to another bird - this is called amplification. Incidental infections occur when an infected mosquito bites a susceptible mammal.
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
917 human cases reported – 5 in Mass.
51 deaths nationwide – 0 in Mass.
MA WNV Surveillance Summary
2019

Mosquito Pools Positive  87
Horses Positive         0
Humans Positive         5
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 of residence, 2009–2018

Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention
MA EEEV Surveillance Summary
2019

Mosquito Pools Positive 428
Horses Positive 8
Humans Positive 12
Massachusetts EEE Risk Categories

Current Risk Levels – as of October 16, 2019
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

<table>
<thead>
<tr>
<th>DEET%:</th>
<th>4.75%</th>
<th>6.65%</th>
<th>20%</th>
<th>23.8%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection time in hours:</td>
<td>1 ½</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

*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
CONTACT INFORMATION
Central Mass Mosquito Control Project
111 Otis St. Northborough, MA 01532
(508) 393-3055
www.cmmcp.org

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