

Mosquitoes & the Diseases they Transmit: How You Can Protect Yourself



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Why be Concerned about Mosquitoes?

- Their bite:



Why be Concerned about Mosquitoes?

■ Their bite:

- Causes mild to severe inflammatory response
- Severe itching & scratching
 - Secondary bacterial infections
 - Significant blood loss, especially to livestock
- Significant economic loss:
 - Outdoor work can be significantly curtailed
 - Tourism in areas with huge stretches of wetlands and salt marshes

Why be Concerned about Mosquitoes?

- The diseases they transmit in North America:
 - Malaria
 - Dengue
 - “Arthropod-borne Encephalitis”:
 - in Massachusetts their agents are:
 - West Nile Virus
 - Eastern Equine Encephalitis Virus

Why the Concerned for Arboviruses?

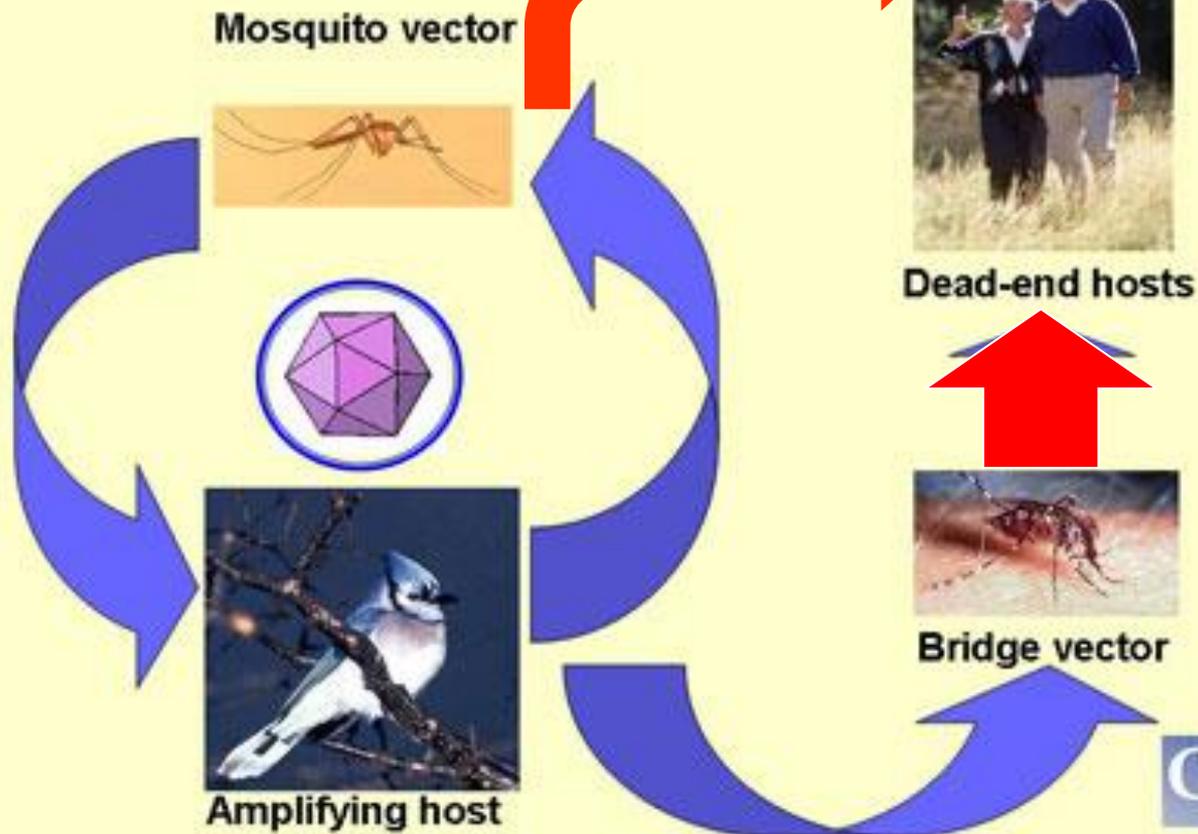
- Severity of Illnesses they cause:
 - Infirmary and Mortalities
 - Extended (& incomplete) Convalescence
- Those most infected are most vulnerable
- Infections occur when one is engaged in normal outdoor summer activities
- Medical care may be extensive & expensive
- No vaccine available

***EASTERN EQUINE
ENCEPHALITIS VIRUS
(EEEV)***

EEEV

- Mosquito-borne “bird” virus
- Number of Cases:
 - Cases / year in USA (1964-2011): 0 to 21
 - 2005: 7 in NH
 - MA: (1938-2010): 91 cases with 51 deaths
 - 35 cases with 25 deaths in 1938-39
 - 16 cases with 9 deaths in 1955-56
 - Lead to formation of Mosquito Control Projects in MA
- Two major foci in MA:
 - Historical: Southeast MA (Hockomock Swamp)
 - Newly-emerged (?): Northeast MA (MA-NH border)

**Transmission cycle of EEEV
(and for WNV as well)**



Symptoms of EEEV in Humans:

- Symptoms displayed (3 -10 days after infection):
 - high fever, stiff neck, headache of increasing severity, & lack of energy
- Most dangerous symptom: Inflammation and swelling of the brain (encephalitis):
 - some become comatose & die within a week after onset
- % of infected persons asymptomatic is not known
- 35% of surviving symptomatic cases exhibit mild to severe neurological disease
- Case Fatality Rate OVERALL is 35% (up to 50% in endemic areas)

Humans at Risk for EEEV:

- Residents in & visitors to endemic areas
- People regularly engaged in outdoor work & recreation (especially in endemic areas)
- People younger than 15 and over 50 are at greatest risk for more serious disease

***WEST NILE
ENCEPHALITIS VIRUS
(WNEV or WNV)***

Symptoms of WNV in Humans (3 to 14 days after infection):

- "Mild infections" manifested as fever, headache, body aches, some skin rash & swollen lymph glands
- "More severe" symptoms include: severe headaches & high fever for longer periods; stiff neck, stupor & disorientation, uncontrollable nervous tremors & convulsions; muscle weakness to paralysis; coma & death
- Case Fatality Rate of 1-5% (depending on location)
- CDC differentiates "More Severe" symptoms into two classes:
 - West Nile Fever ("benign")
 - West Nile Neuroinvasive Disease ("malignant"/"virulent")

West Nile Neuroinvasive Disease:

■ Meningitis and encephalitis:

- 20% of encephalitis survivors cannot properly eat, walk, dress, bath after 1 year
- after 1 year, 39% clinically depressed, over 50% difficulty in speaking

■ Acute asymptomatic paralysis & poliomyelitis:

- Affect 12% of all WNV neuroinvasive patients
- 1/3 of such patients exhibit little to no recovery after 1 year

Humans at Risk for WNV:

- Children under the age of 5
- Adults over the age of 70
- “Weakened” or “Compromised” Immune Systems
- Additional risk factors:
 - history of alcohol abuse
 - respiratory failure
 - stroke

WNV Infections in Human Populations

- ~75% of all infections are asymptomatic
- ~25% of all infections exhibit "West Nile Fever" (but may even be higher!)
- ~1% of all infections exhibit neuroinvasive disease
- ~1% result in death

WNV in USA: 1999-2011

(as of 13 Dec 2011)

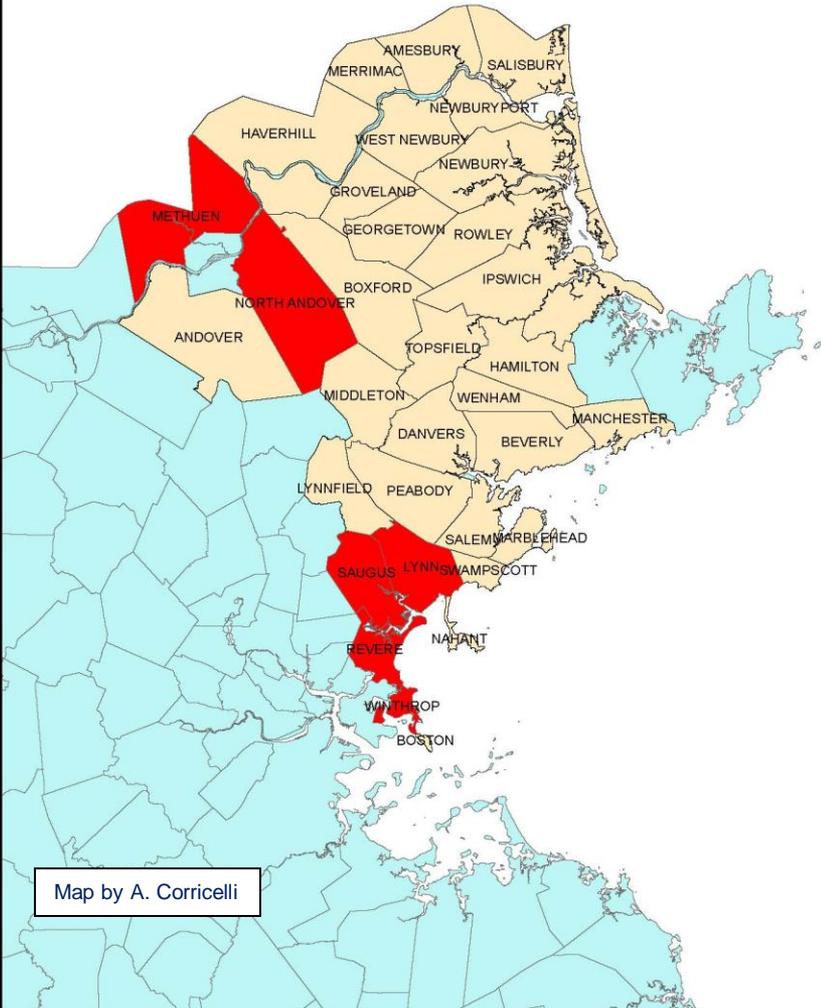
- 13,213 cases w' Neuroinvasive illness (42%)
- 17,386 cases of "West Nile Fever" (55%)
 - 1,238 deaths

WNV in MA: 2000-2011

- 71 total cases:
 - 17 with “West Nile Fever”
 - 54 with Neuroinvasive disease
 - 8 Deaths

- Middleton:
 - Bird “Isolations”: 2000-2002
 - Infected Mosquito samples (“pools”): 0
 - 0 Deaths (?)

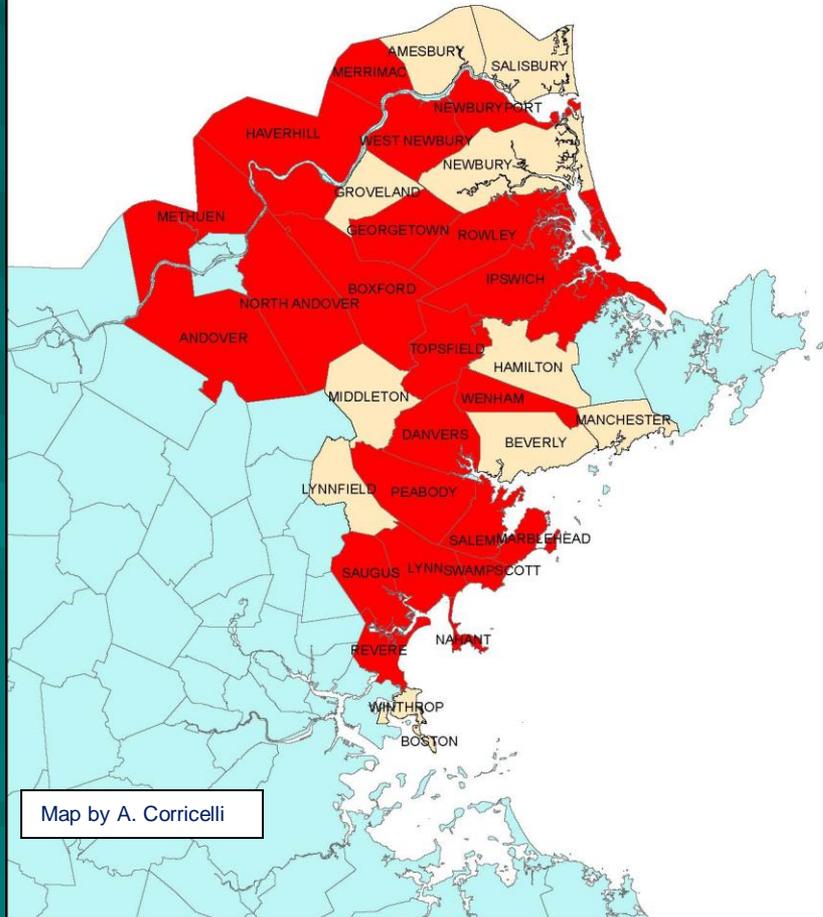
NE MA MCD Municipalities reporting one or more WNV-infected mosquito pools in 2010 ("infected" towns in RED).



Map by A. Corricelli

2010

NE MA MCD Municipalities reporting one or more WNV-infected mosquito pools in 2011 ("infected" towns in RED).



Map by A. Corricelli

2011

Costs of WNV Infections:

Costs to individuals & families:

- Emotional:
 - Suffering
 - Confusion &/or fear as to why there is no rapid recovery
 - Medical care & attention required
- Economic to both individual & to family:
 - Lost earning power
 - Health-care costs

Costs to Society:

- Emotional: Fear to society at large
- Economic:
 - Lost earning / tax-paying power
 - Enormous health-care costs

“West Nile Complacency Syndrome”

- Developing in the public & government agencies:
 - “Not that severe” & “not that dangerous”
 - “Only affects old people, so who cares!”
- Irrational hope that WNV is going away
- Ignores biology of arboviruses
 - No obvious patterns of appearances
 - Changes in their genetics; i.e., virulence
- Threatens to neutralize the political will to maintain the public health infrastructure painfully built over past ten years!

(CDC: PHIL: 1769)



(CDC: PHIL: 1771)



(A. Corricelli)

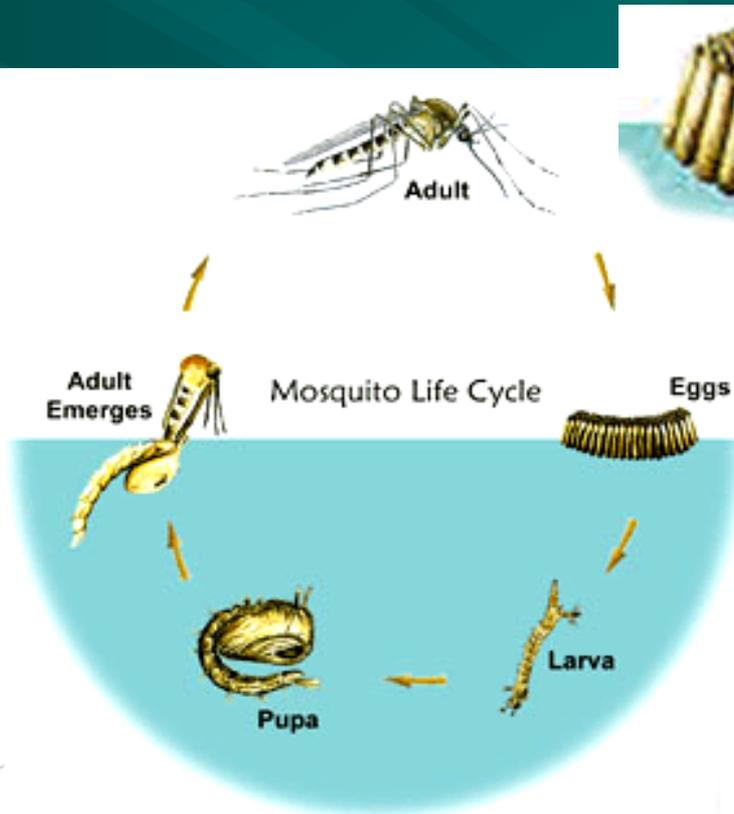
Life Cycle of Mosquitoes:

Example: WNV vector *Culex pipiens*



Adult

Pupa



Eggs



Larva



Minimizing the Risks of Infection (How Do We Protect Ourselves?)

Three types of protection:

■ **Personal:**

– On your person

■ **“Property”:**

– Homes & yards

■ **“Peripheral”:**

– From neighbor’s yard to your neighborhood to your entire town

Personal Protection

■ How to protect yourself from contact with mosquitoes?:

– Avoid going outside when they are most active

– When outside during peak “biting-time”, wear insect repellent:

■ For WNV vectors, biting time is late afternoon to mid-evening

– If you do not like repellent:

■ Go “fully clothed”

■ Wear net-hat



“Property Protection”

How?:

- Reduce their presence on your property
- Eliminate mosquito breeding; how?:
 - Scout for breeding sites
 - Eliminate containers holding water
 - Preventing larvae from developing in permanent structures

“Property Protection”

- Reduce their presence on your property:
 - Screen your windows & porches
(Be sure there are no holes in screens!)



“Property Protection”

■ *Reduce their presence on your property:*

– “Mosquito Magnets” (maybe?)

- *“Mosquito Magnets work, they work very well, but they do not solve your mosquito problems!” Why not?*
- **Attract ALL the mosquitoes in your neighborhood**
- **Ideal use: everyone in your neighborhood with one**
- **Best Use: place at corners away from home, keep “on” for several days before event, then shut off during event**

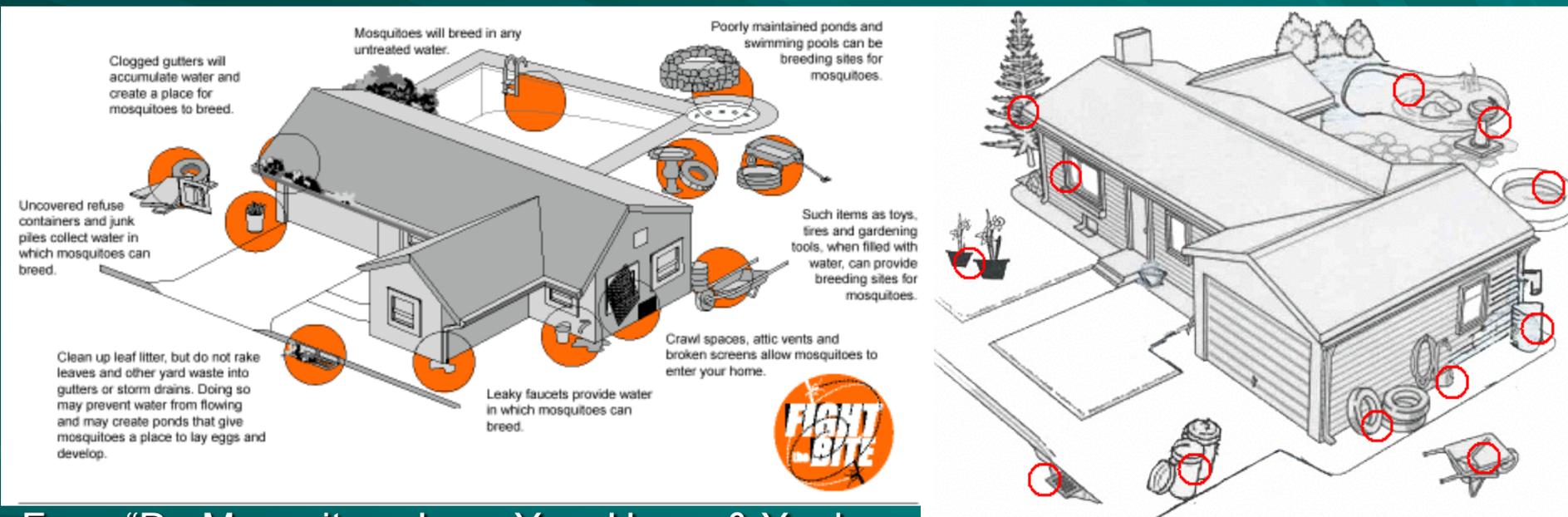


Range: \$250-\$700
Also accessories

“Property Protection” continued

■ Eliminate mosquito breeding:

- Scout carefully around your property for breeding sites



From “Do Mosquitoes Love Your Home & Yard:
www.health.state.ny.us

“Property Protection” continued

- *Eliminate mosquito breeding:*
 - Eliminate regularly standing water from permanent receptacles:
 - bird baths, urns, inactive fountains, gutters, unused swimming pools







Even under pool covers!

“Property Protection” continued

- *Eliminate mosquito breeding:*
 - Drain standing water from grounds
 - Remove obstacles preventing water from flowing
 - Drain water from tree holes



**Standing Water
from Irrigation Leak**

Joe Boggs





(CDC: PHIL: 6951)



(CDC: PHIL: 3813)







“Property Protection” continued

■ Eliminate mosquito breeding:

– Eliminate any container that can hold water:

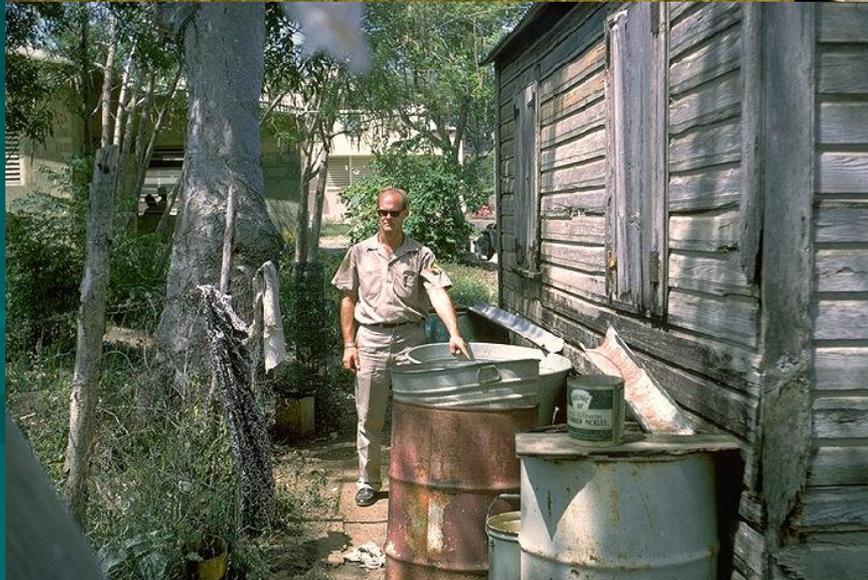
- Jars
- Bottles
- Cans
- Discarded tires
- Kiddy pools
- Pool covers



(CDC: PHIL: 2087)



(CDC: PHIL: 2085)



(CDC: PHIL: 678)



“Property Protection” continued

■ Eliminate mosquito breeding:

– Search, drain, and clean any structures “accidentally” holding water:

■ uncovered/stored boats

■ rain gutters





“Property Protection” continued

- *Eliminate mosquito breeding:*
 - Preventing larvae from developing in structures:
 - Keep fountains active:
 - mosquitoes do not breed in moving water
 - Keep fish ponds well stocked WITH FISH!!
 - Add commercially available biological agents that kill only mosquito larvae (“Mosquito Dunks”)
 - Add regularly to:
 - Bird baths
 - Rain barrels



“Peripheral Protection”

(Protection beyond your property)

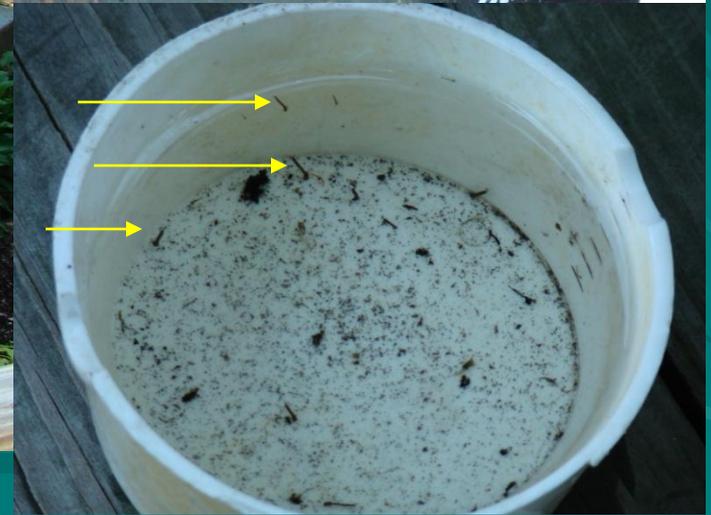
- Because no matter how well you have your property under control
 - You have little control of what is going on:
 - from the street in front of your house
 - to your neighbor’s yard
 - to your community
 - Areas of concern:
 - junkyards and tire piles
 - foreclosed homes (w’ abandoned swimming pools)
 - retention ponds
 - catch basins
- Therefore you need help from professionals, i.e., **Mosquito Control** (Public or Private)

Northeast MA Mosquito Control District

- Keeping track of “what’s out there”:
 - Offer property inspection services
 - Active Surveillance program:
 - Bi-weekly collections
 - All mosquitoes ID’ed, tallied, & trends monitored
 - Unusual trends detected
 - Recommendations based on data
 - Vector species sent to DPH for testing:
 - Recommendations to WNV &/or EEEV isolations made to the BoH

Abandoned Property in Methuen







Surveillance Traps Employed



CO₂-baited
New Jersey
Trap



Northeast MA Mosquito Control

(continued)

- Larviciding:
 - Selected freshwater wetlands
 - Salt marsh (Aerial with helicopter)
 - Catch Basins, Retention ponds, etc.
- Adulticiding (ground-based/truck spraying):
 - Primarily in response to WNV and EEEV isolations
 - Approval of local Board of Health
 - Applications from neighborhoods to entire town

Catch basins are a principal source for breeding mosquitoes that transmit West Nile Virus

(www.dcwasa.com)



(www.chagrinvalleypaving.com)



(www2.burlingame.org)



(www.storm-drain-structures.com)



(oaklandpark.govoffice2.com)

Ancient Truck Spraying



Modern truck spraying with ULV



**Fine mist released (particulate size 15-20 microns)
Less than one fluid ounce covers an acre
Applications done at night**

Take Home Messages:

- Remember that we are invaders/squatters in “Their World”
 - Nature’s Rule reigns supreme!
- Take the time to insure you & loved ones are protected when going outside
- Be aware of what is going on in your backyard and take necessary action
- Keep informed on mosquito & arbovirus announcements in your town and support efforts for control

*My time is over.
I thank you for yours!*



**Contact us at:
978-463-6630**

and

www.northeastmassmosquito.com