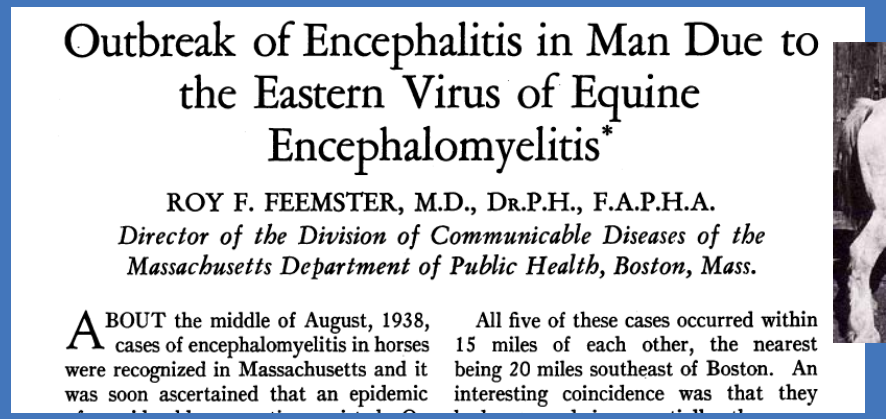
Massachusetts Department of Public Health

150 YEARS OF ADVANCING PUBLIC HEALTH

EEE - 2021



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

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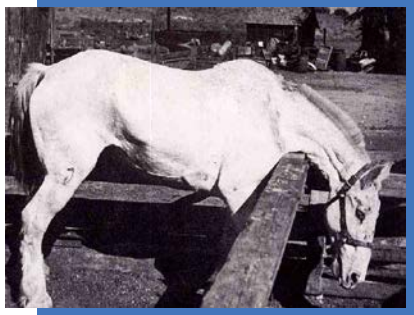
ABOUT the middle of August, 1938, cases of encephalomyelitis in horses were recognized in Massachusetts and it was soon ascertained that an epidemic

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



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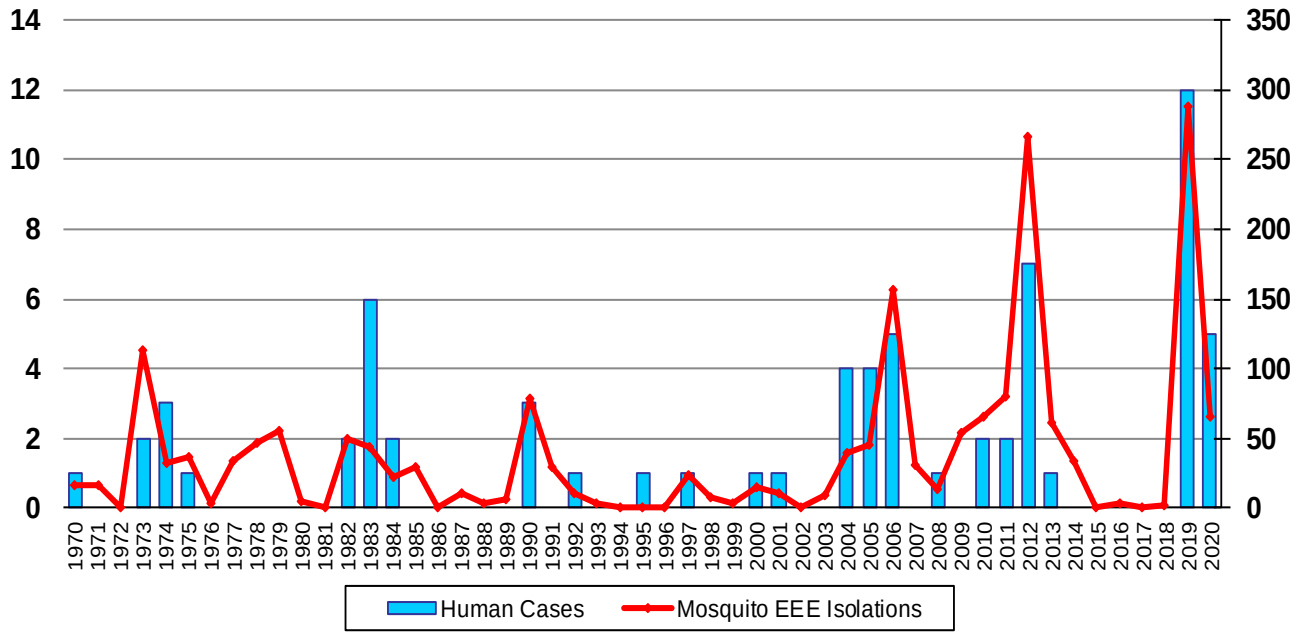
EEE: Setting the Stage

- EEE is a rare but serious mosquito-borne disease
  - 50% mortality
  - Up to 80% of survivors left with permanent neurologic damage
  - All ages can be affected, including children
- 2019 was likely the beginning of a 2-3 year cycle
- MDPH/MDAR worked over the winter to:
  1. Review 2020 season and response activities
  2. Prepare for 2021



REMINDER: 2020 Plan Updated in 5 Key Areas

Communications: maximize adoption of personal prevention behaviors

- DPH initiated communication with camps, schools and sports organizations in early June, promoting the use of bug spray
- DPH public awareness campaign launched mid-June

Surveillance/Trapping: to drive use of all prevention tools

- DPH added trapping locations, expanding its surveillance efforts
- DPH worked with MCPs to reduce time between trapping and testing

Larviciding: a targeted mitigation tool

- MDAR coordinated early in the season with mosquito districts to conduct aggressive, targeted larviciding operations
- MDAR implemented Larviciding Product Choice Field Trials

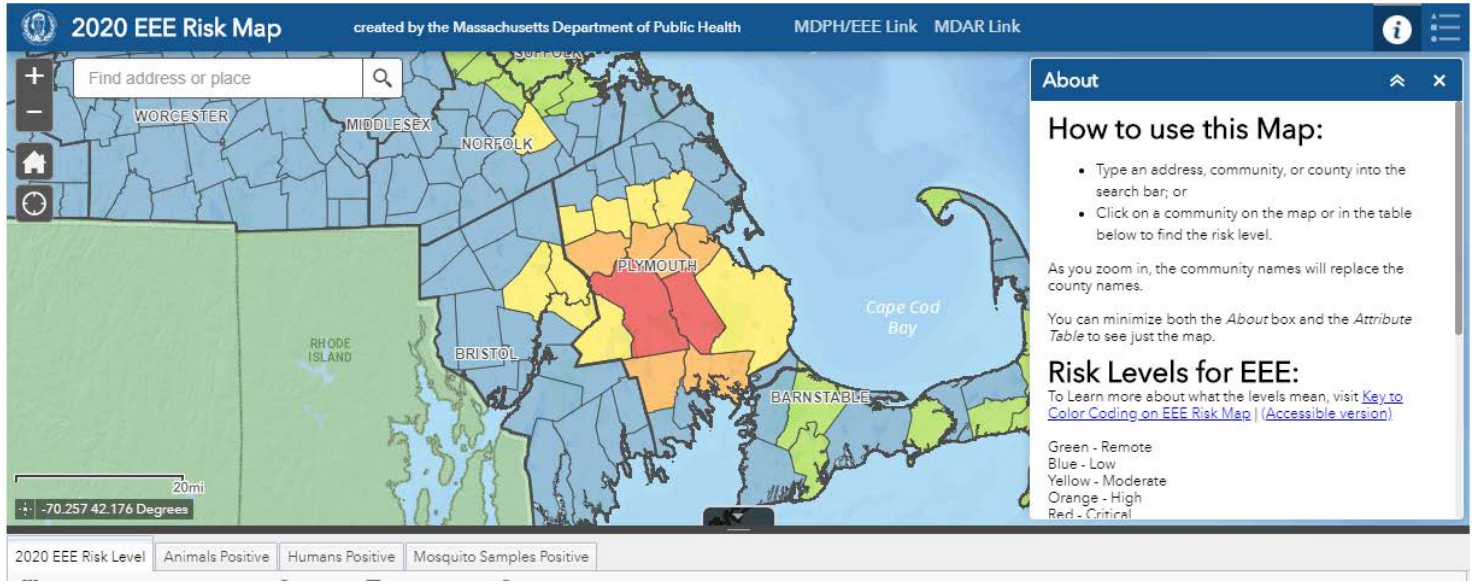
Adulticiding: can be targeted or widespread mitigation tool

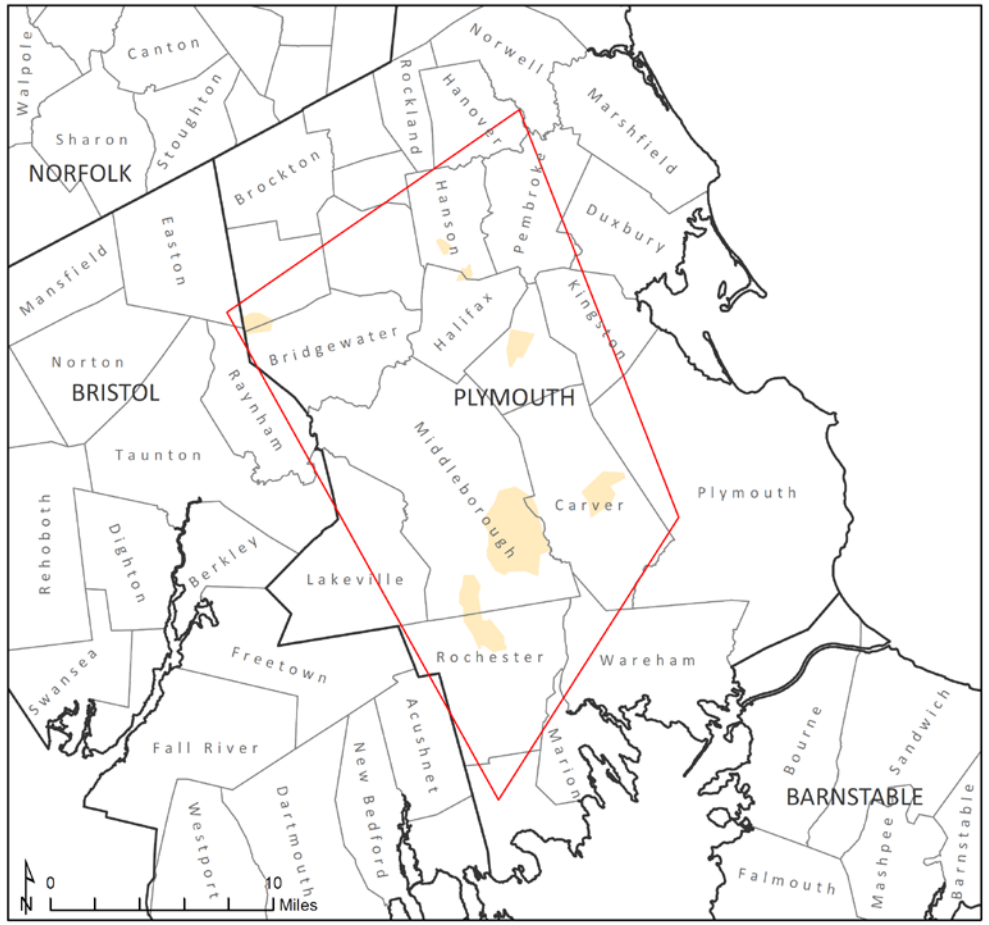
- Upon decision to spray, contractors will have assets & personnel in place w/in 3 days with 2 aircraft for over 250,000 acres

Statewide Mosquito Control *(long-term plan)*

2020 Data

	Season Total	Total Positive
Number of Mosquito Samples Tested	7155	WNV – 97 EEE – 66
Number of Animals Tested	12	WNV – 0 EEE – 0
Number of People Tested	229	WNV – 8 EEE – 5



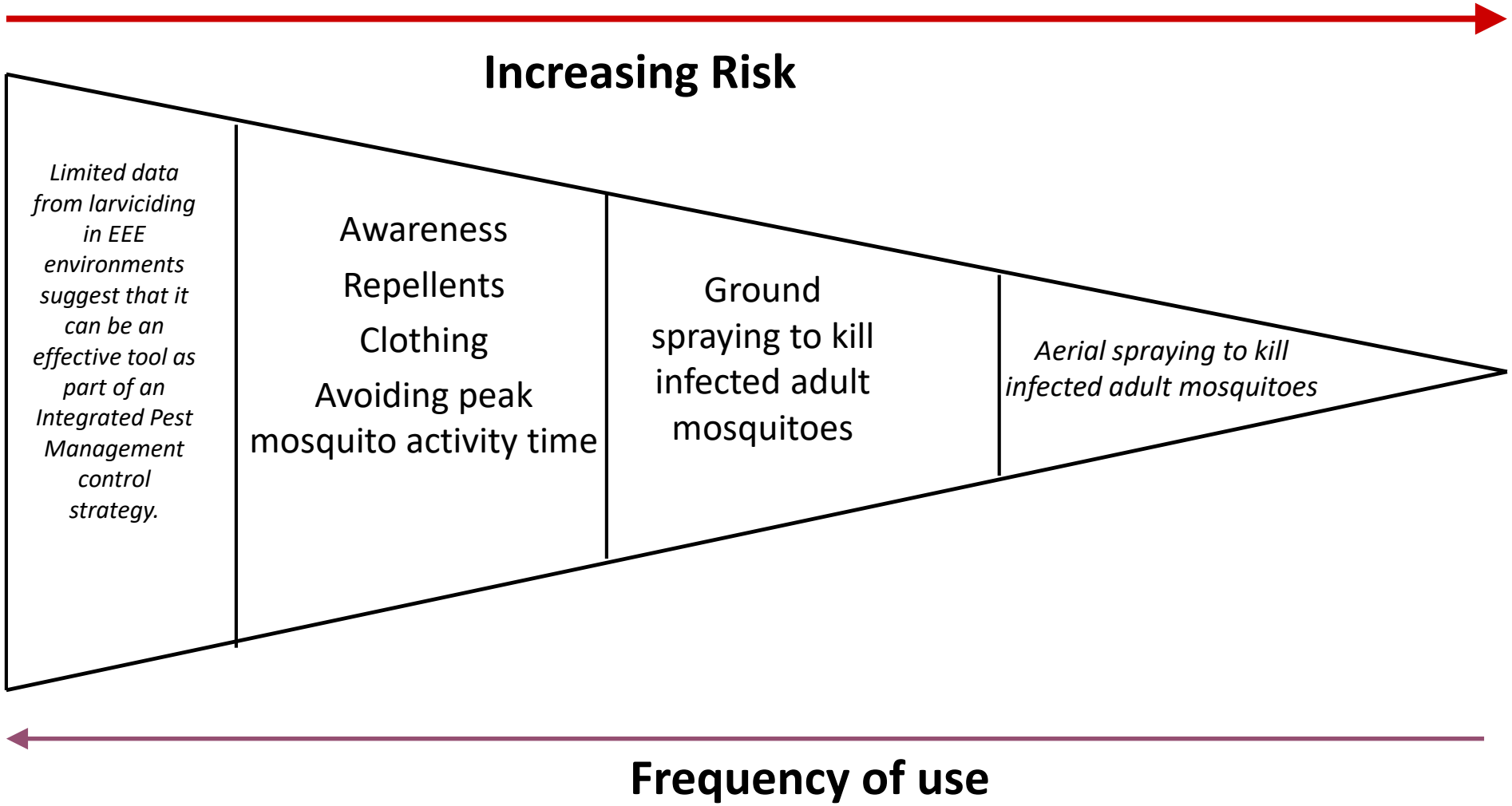


	% Total Control	% PER Control	% MEL Control
DPH	70.1	82.2	52.8

Historical Indicators of Risk

- ✗ Above-average rainfall in the prior fall and current 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 mosquitoes
- Infection of a human prior to late August
- Higher than average summer temperatures
  - accelerates the mosquito reproductive and development cycle
  - shortens the time interval between a mosquito becoming infected with EEE virus and when it becomes capable of transmitting the virus.

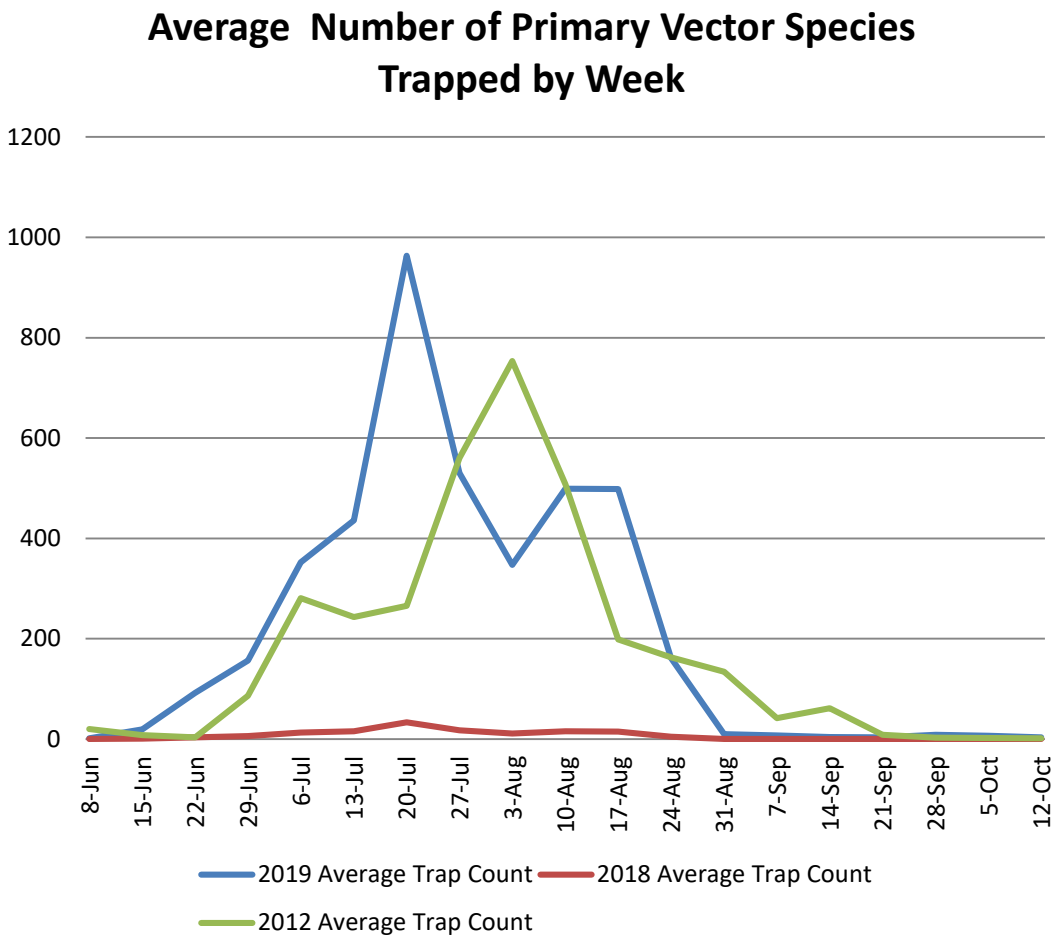
Prevention Tools



Decision-making for Aerial Mosquito Control Intervention

- **Mosquito abundance – how large are the populations of concern?**
- **Mosquito infection rates – how much EEE virus is in the populations?**
- **Geography – is risk widespread +/- occurring in areas where truck-based mosquito control is not available or unlikely to be effective due to habitat?**
- **Weather**
- **Time of season**

Aerial spray decision-making inputs:
DPH – risk assessments and geographic distribution of virus
MDAR/State Reclamation & Mosquito Control Board – pesticide regulation and subject matter expertise
Mosquito Control Districts – field condition awareness and mosquito control expertise
Mosquito Advisory Group – mosquito control expertise advisory group



Aerial Application of Pesticide

- Supplements locally applied truck-based spraying
- Particularly useful to reach inaccessible areas
  - Kills adult, infected mosquitoes
  - May interrupt viral amplification throughout region
- Both use same pesticide: Anvil 10+10, applied by fixed-wing aircraft at ultra-low volume (0.62 oz./acre)
- Aerial application is one tool that can be employed to reduce, but not eliminate, risk
  - It is not possible to prevent every case of EEE
  - Personal prevention should form the basis of all risk reduction efforts

Aerial Spray Efficacy

Aerial Spray Efficacy: Percent Reduction in Mosquitoes Trapped Comparing Pre-Spray Trapping Numbers to Post-spray Trapping Numbers							
Aerial Intervention Location	**Start Date**	**End Date**	**Total Reduction in Primary Mosquito Vector[1,2]**	**Total Reduction in Mosquitoes Trapped**	**Temperature Range (°F)[3]**	**Dewpoint Range[4] (°F)**	**Acres per hour (average across all hours of spray)**
Bristol/Plymouth	8/8/2006	8/9/2006	35-92%	59-86%	59-64	53-57	17,499
Bristol/Plymouth	8/22/2006	8/24/2006	0-94%	60-89%	57-69	55-62	34,191
Bristol/Plymouth	8/5/2010	8/7/2010	87-89%	77-87%	58-79	57-73	26,194
Bristol/Plymouth	7/20/2012	7/22/2012	14-84%	42-81%	56-73	54-61	30,701
Bristol/Plymouth	8/13/2012	8/14/2006	46-60%	36-47%	66-73	64-66	21,981
Bristol/Plymouth	8/8/2019	8/11/2019	66%	58%	55-72	50-70	20,112
Bristol/Plymouth	8/21/2019	8/25/2019	91%	25%	57-77	51-74	15,066
Middlesex/Worcester	8/26/2019	8/27/2019	38%	20%	53-64	45-57	16,212
Middlesex/Norfolk/ Worcester	9/10/2019	9/18/2019	ND	ND	52-70	42-69	16,975
Hampden/Hampshire/Worcester	9/16/2019	9/17/2019	ND	ND	48-58	47-51	14,388
Bristol/Plymouth	9/18/2019	9/24/2019	ND	53%	54-70	51-67	12,125
Bristol/Plymouth	8/10/2020	8/11/2020	82%	70%	73-78	68-72	29,833

ND = Control not detected; calculations may be affected by small sample sizes

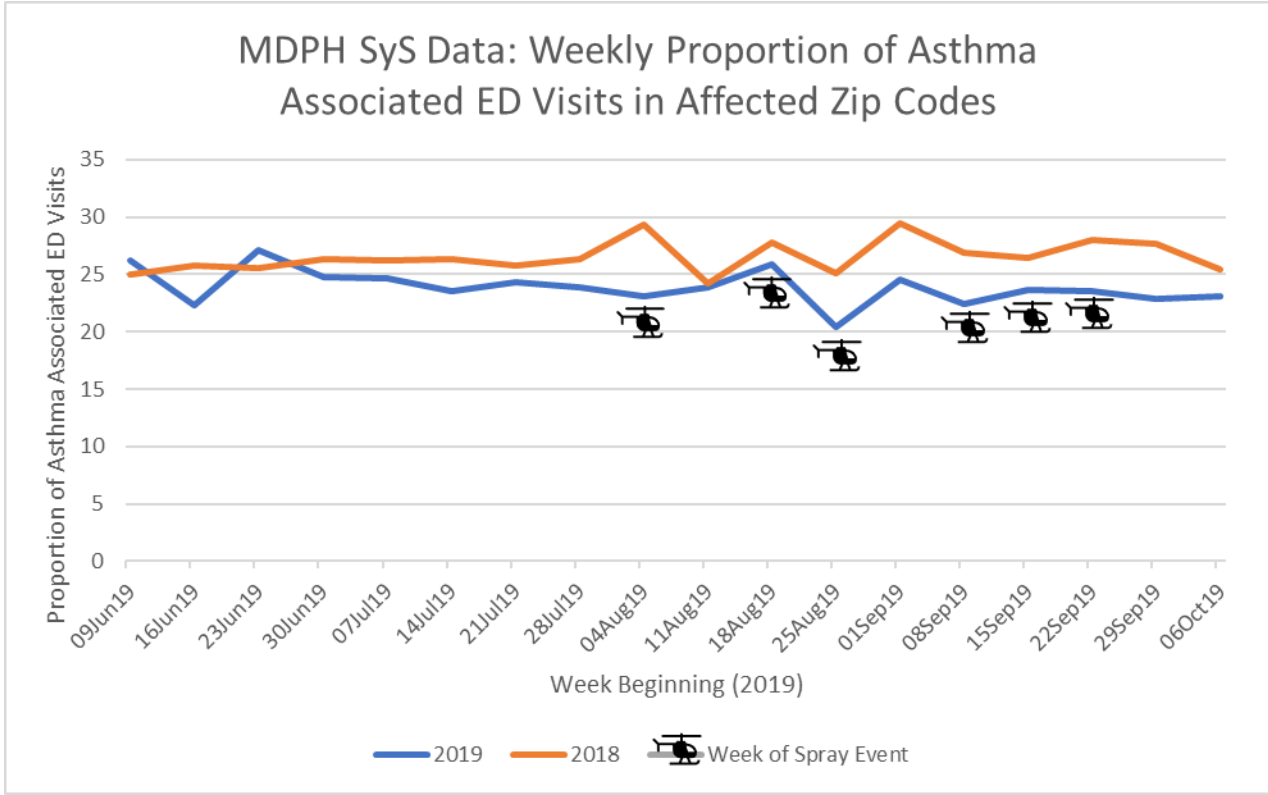
[1]Primary mosquito vector is the mammal-biting species Coquillettidia perturbans considered to be the mosquito most likely to spread EEE to humans

[2]Data sources includes DPH, and Bristol and Plymouth County Mosquito Control Districts. 2006-2012 data shown as ranges inclusive of all three data sources. 2019 combines data from all three sources into a single calculation.

[3,4]Weather data taken from Plymouth, Worcester and Westover airports and may not accurately represent actual temperature and dewpoint at location of spraying.

Human health effects of Anvil 10+10 (sumithrin and piperonyl butoxide)

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



* Note: helicopters are not used for these aerial spray events and are for illustration purposes only.

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

“After Atlantic white cedar trees were harvested for use in houses and carpentry products and the resulting swamps were drained in the early 1800s, wetland forests were reestablished over the next century; these forests included red maple trees, whose roots — lying just below bird-roosting sites — provide excellent oviposition (egg-laying) sites for C. melanura mosquitoes. As passerine birds such as American robins foraged from these trees in burgeoning suburbs, growth and movement of the human population facilitated spillovers of EEEV to humans, leading to cases of encephalitis.”

Morens, N Engl J Med 2019; 381:1989-1992