Arbovirus Surveillance in Connecticut

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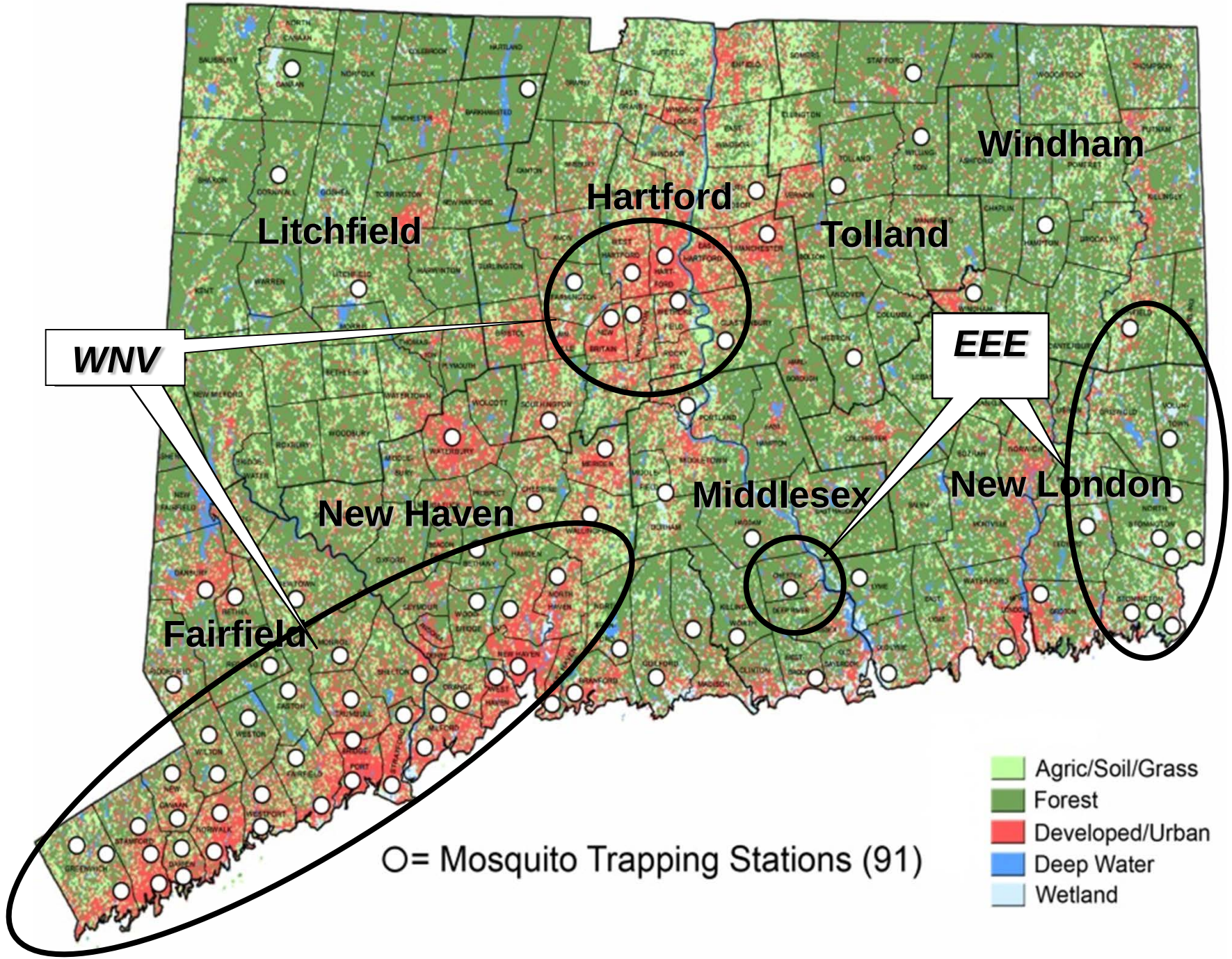
CAES
The Connecticut Agricultural Experiment Station
Putting Science to Work for Society since 1875

Connecticut Mosquito Management Program

- Comprised of 5 State Agencies
  - The CT Agricultural Experiment Station (mosquito surveillance, virus testing)
  - Department of Energy & Environmental Protection (mosquito control, environmental management)
  - Department of Public Health (epidemiology of human cases)
  - Department of Agriculture (veterinary cases)
  - Pathobiology Department at UCONN (necropsy, initial veterinary testing)

Mosquito Surveillance

- Mosquito trapping from June – October
- 92 permanent trapping stations
  - 91 Sites maintained by CAES
  - 1 Site (Groton) maintained by US Navy
  - Trap on a Rotational Basis (every 10 days)
    - WNV or EEE isolates from mosquitoes
    - Trap twice a week after detection of virus
- 2 or 3 types of trap per location

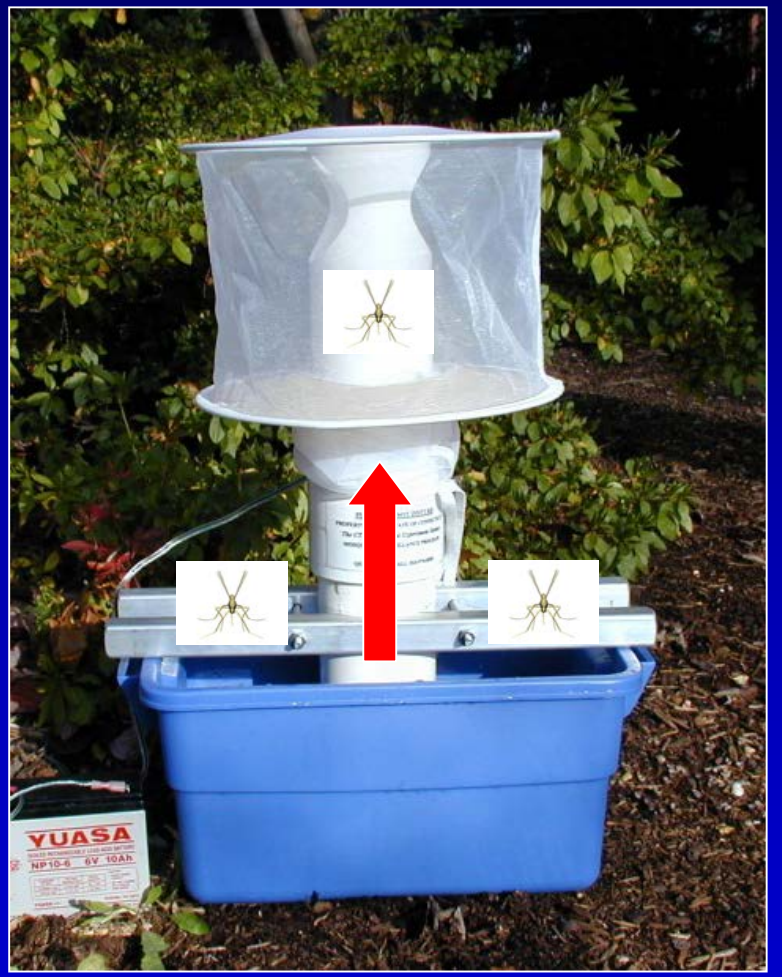

Windham
Hartford
Litchfield
Tolland
WNV
EEE
New London
Middlesex
New Haven
Fairfield
O= Mosquito Trapping Stations (91)
Agric/Soil/Grass
Forest
Developed/Urban
Deep Water
Wetland

CDC Light Trap

- Hos
  - C
- Coll
  num
  - A
  - C
  - C
  - C
  - R

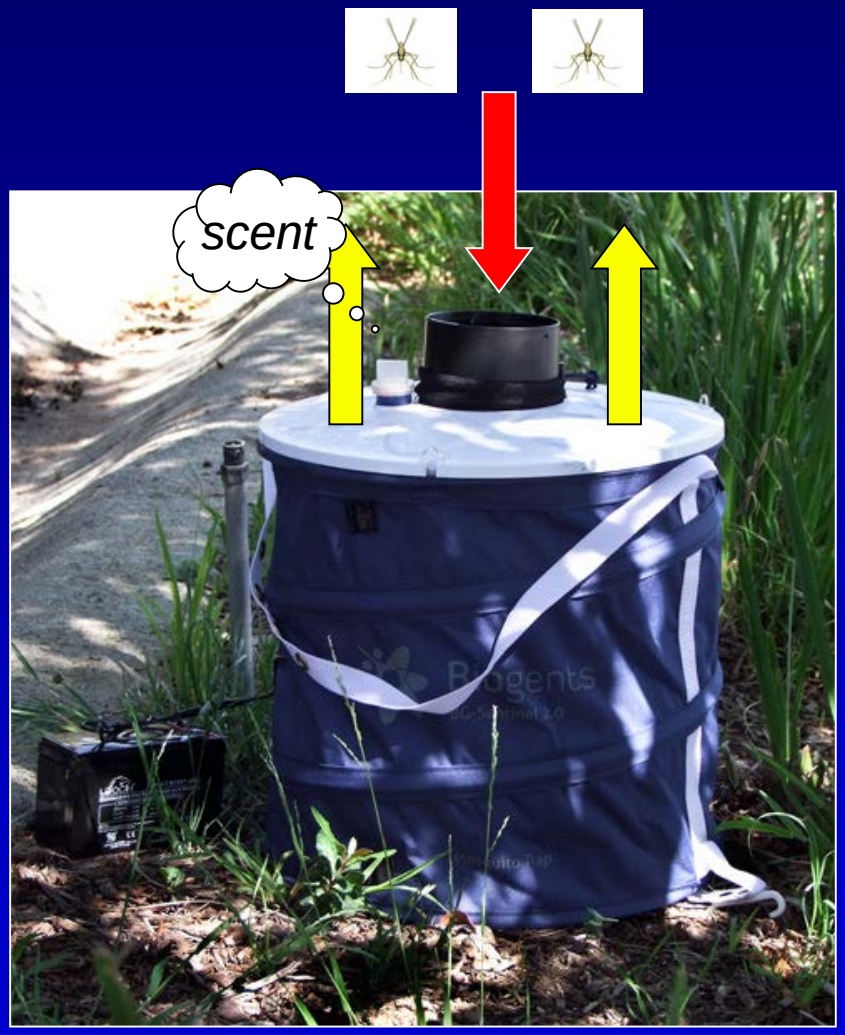
CDC Gravid Trap

- Hay-lactalbumin infusion
- *Culex pipiens & Cx. restuans*
  - Ready to lay eggs
  - Obtained blood meal
  - More Likely to be WNV (+)
  - 90% of collection
- Accounts for 75% of WNV (+) isolates from *Cx. pipiens* and *Cx. restuans*



BG Sentinel Trap

- Designed for *Ae. albopictus*
  - Used at sites to evaluate population size
  - Invasive Species
  - Small populations in CT
    - Coastal Fairfield county
  - Aggressive Human Biter
    - Zika
    - Chikungunya
    - Dengue



Mosquito Trapping Locations

- Rural Areas
  - Permanent swamps and bogs
  - Marsh areas (fresh and salt)

- Urban / Suburban Sites
  - Neighborhood parks and schools
  - Along waterways and streams
  - Sewage treatment plants
  - Horse stables
  - Tire dumps

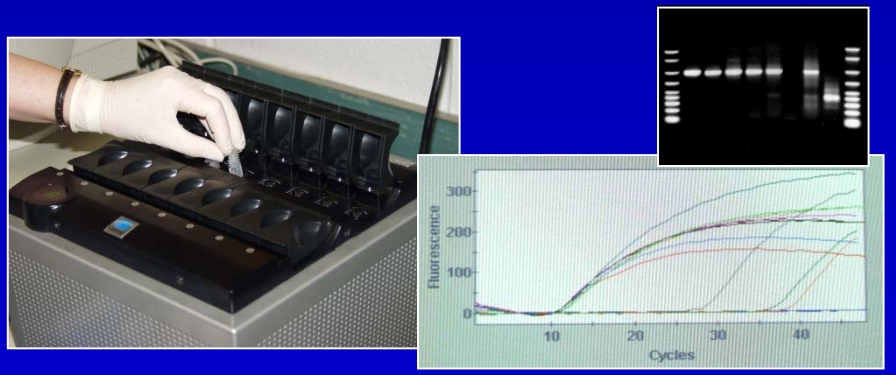
Mosquito Identification

- Mosquito identification to species
  - 52 species in CT
  - Routinely collect 35 species
- Completed on day of collection
- Pooled by species, site and trap type
  - Maximum of 50 / pool
- All species tested

Virus Isolation & Identification

- Biosafety Level 3 Laboratory
- Virus isolation in Vero cell cultures (African Green Monkey)
  - Incubate for 7 days at 37 ^{o}C in 5% CO_2
  - Examine daily for virus growth

- Virus identification by Real time PCR, RT-PCR, molecular techniques

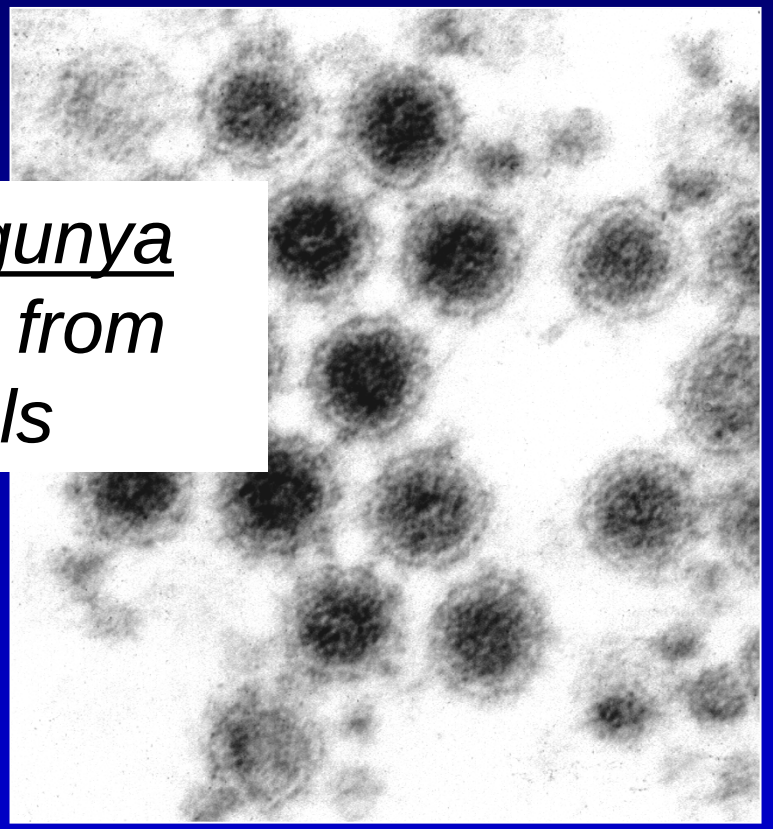


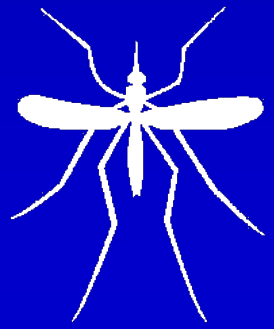
- *4 to 6 days turnaround*

Mosquito-Borne Viruses in Connecticut

- *West Nile Virus*
- *Eastern Equine Encephalitis*
- *Jamestown Canyon*
- *Cache Valley*
- *Trivittatus*
- *La Crosse*
- *Highlands J*
- *Potosi*
- *Flanders*

<u>Zika and Chikungunya</u> can be tested for from mosquito pools

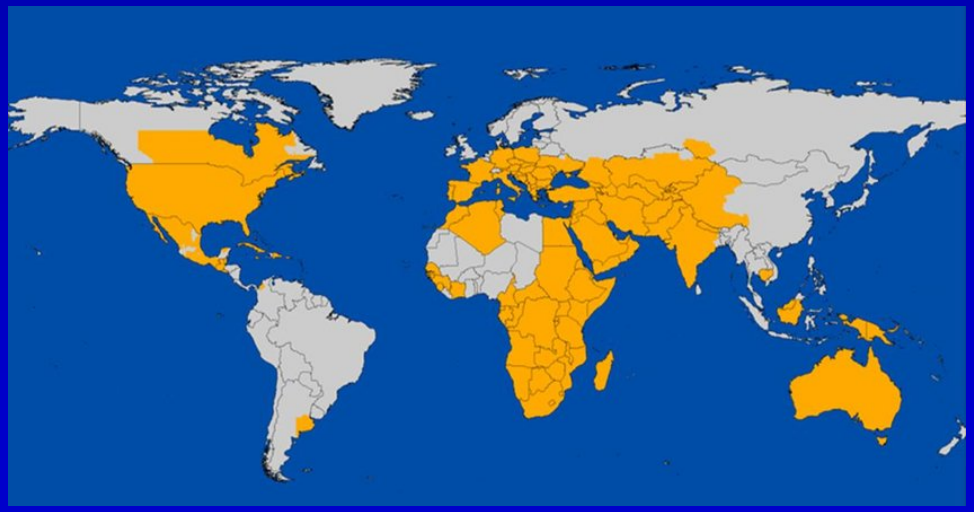


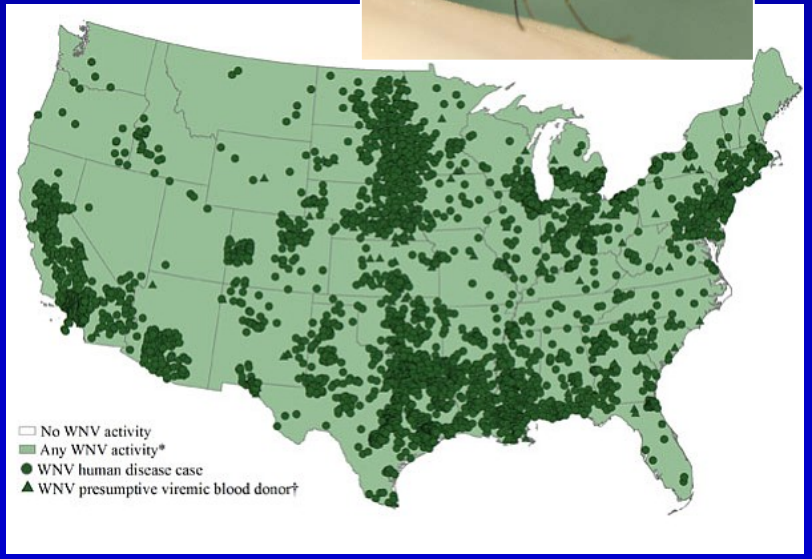


Cause Human Disease

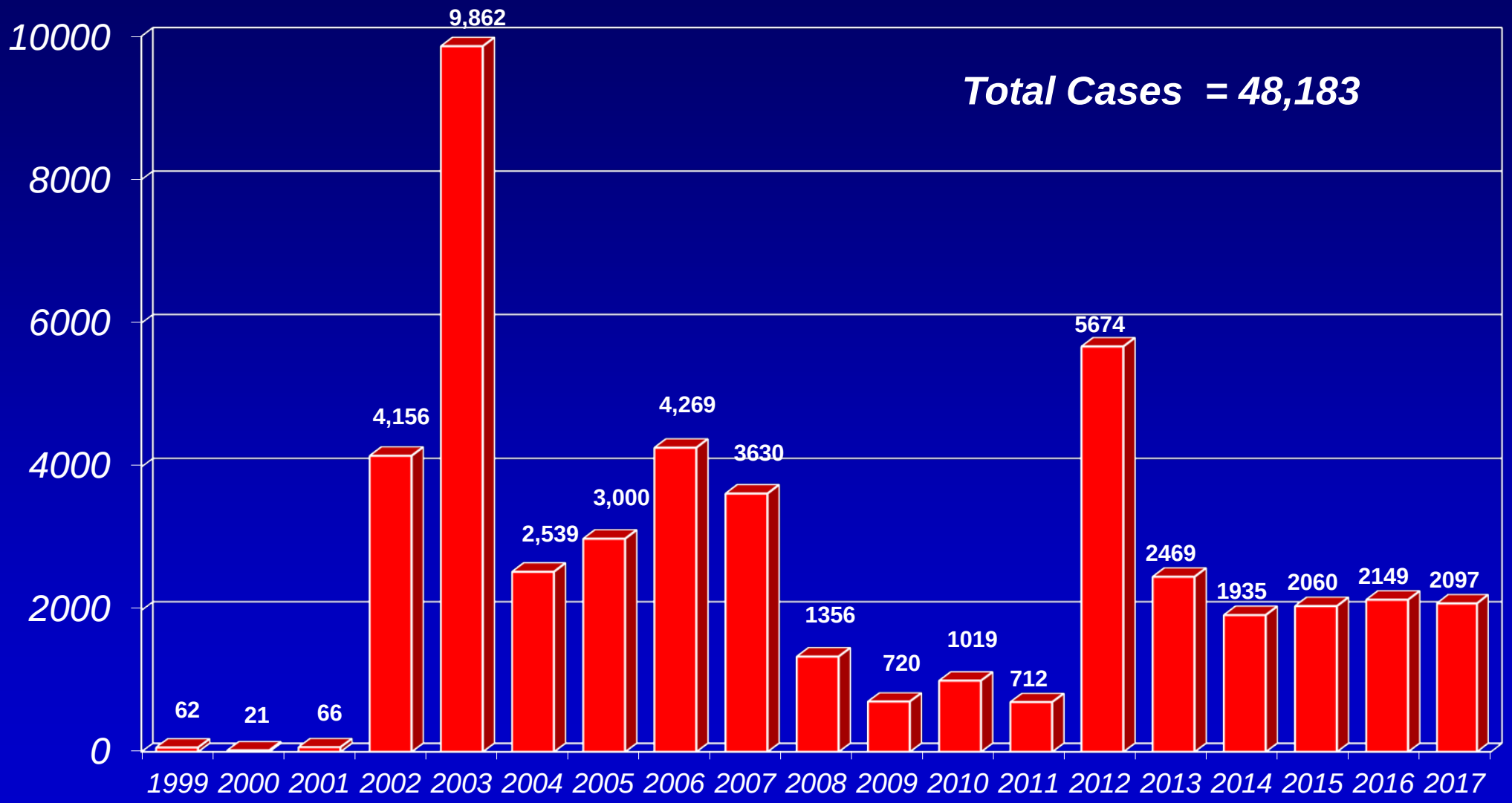
West Nile Virus

- Widely distributed- occurs in tropical and temperate climates on every continent
- Introduced into North America in 1999 and rapidly spread throughout the Americas
- Transmitted by *Culex* mosquitoes
- Maintained in a bird-mosquito transmission cycle
- Humans are infected when mosquitoes feed opportunistically on birds and mammals

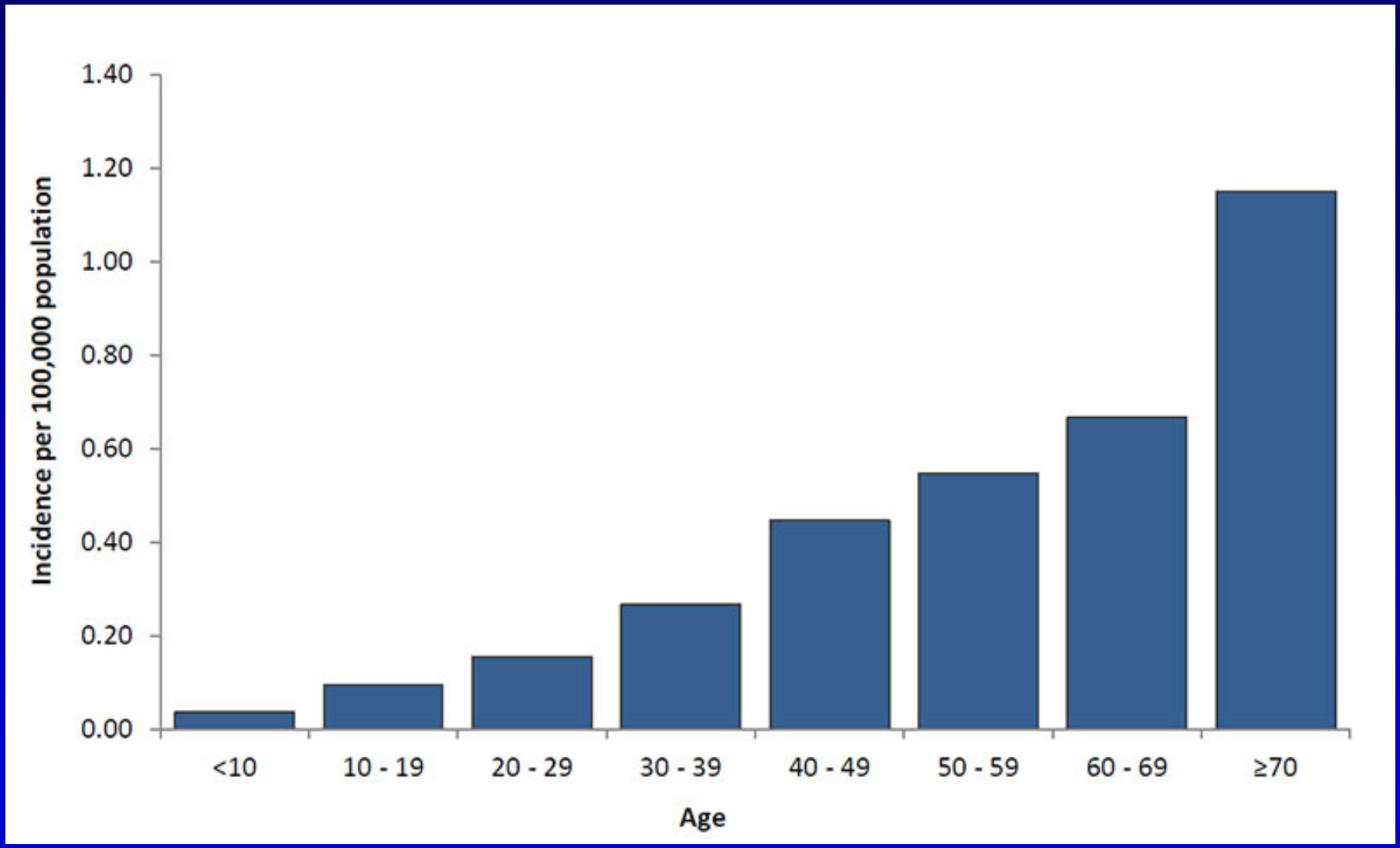




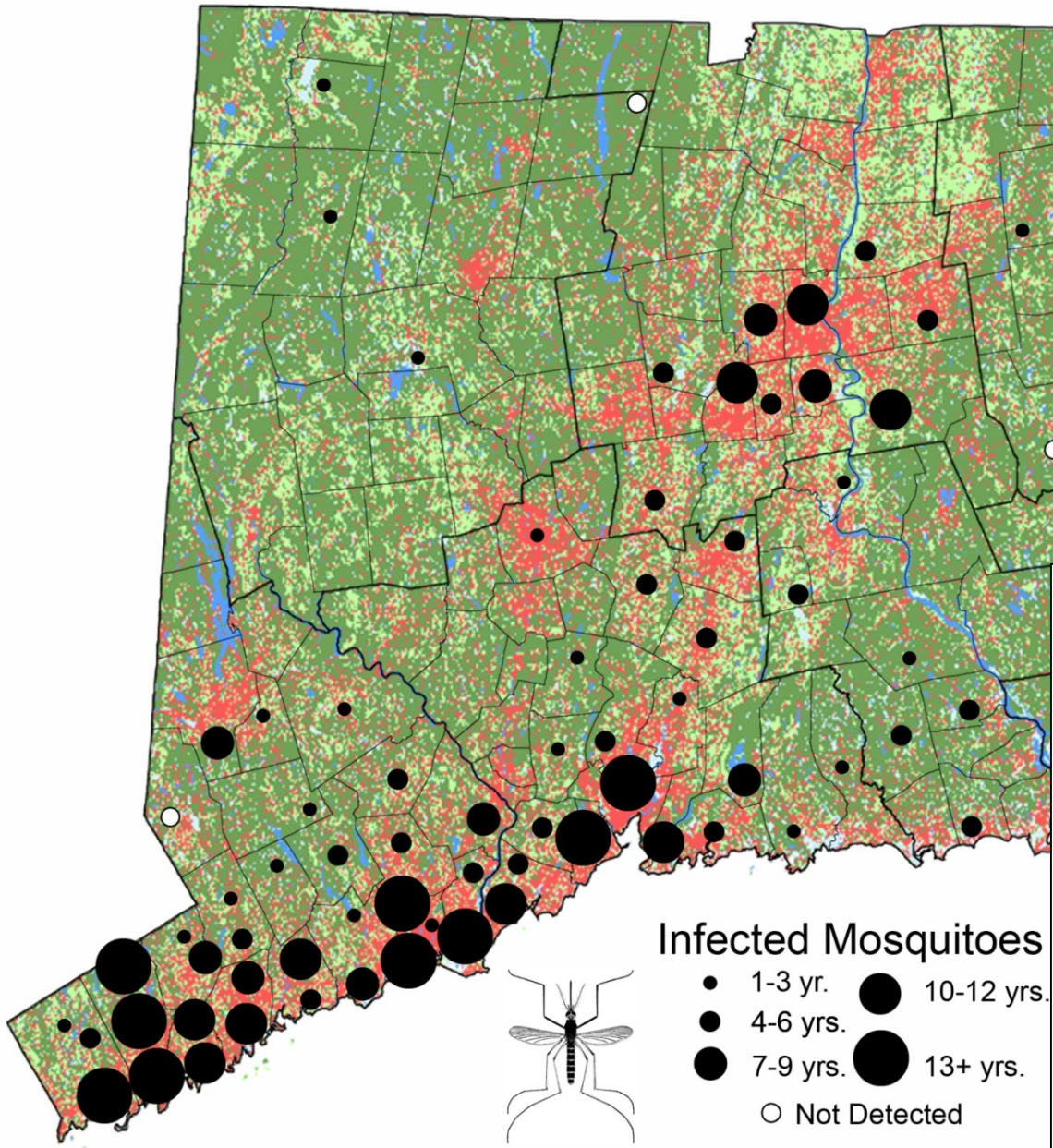
Human Cases of WNV in US 1999 - 2017

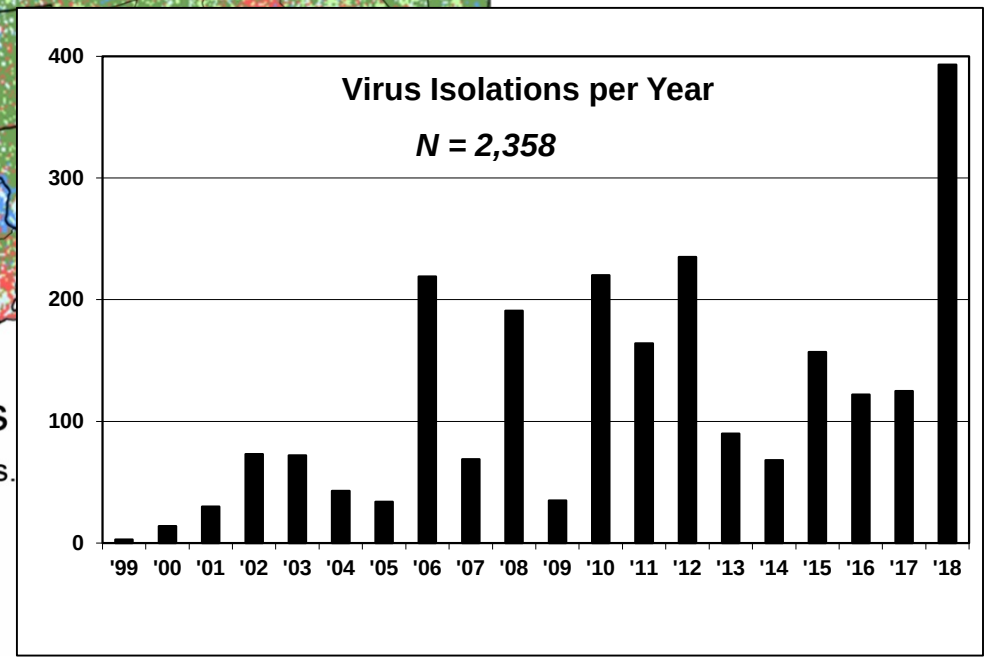


Incidence of WNV Neuroinvasive Disease by Age Group

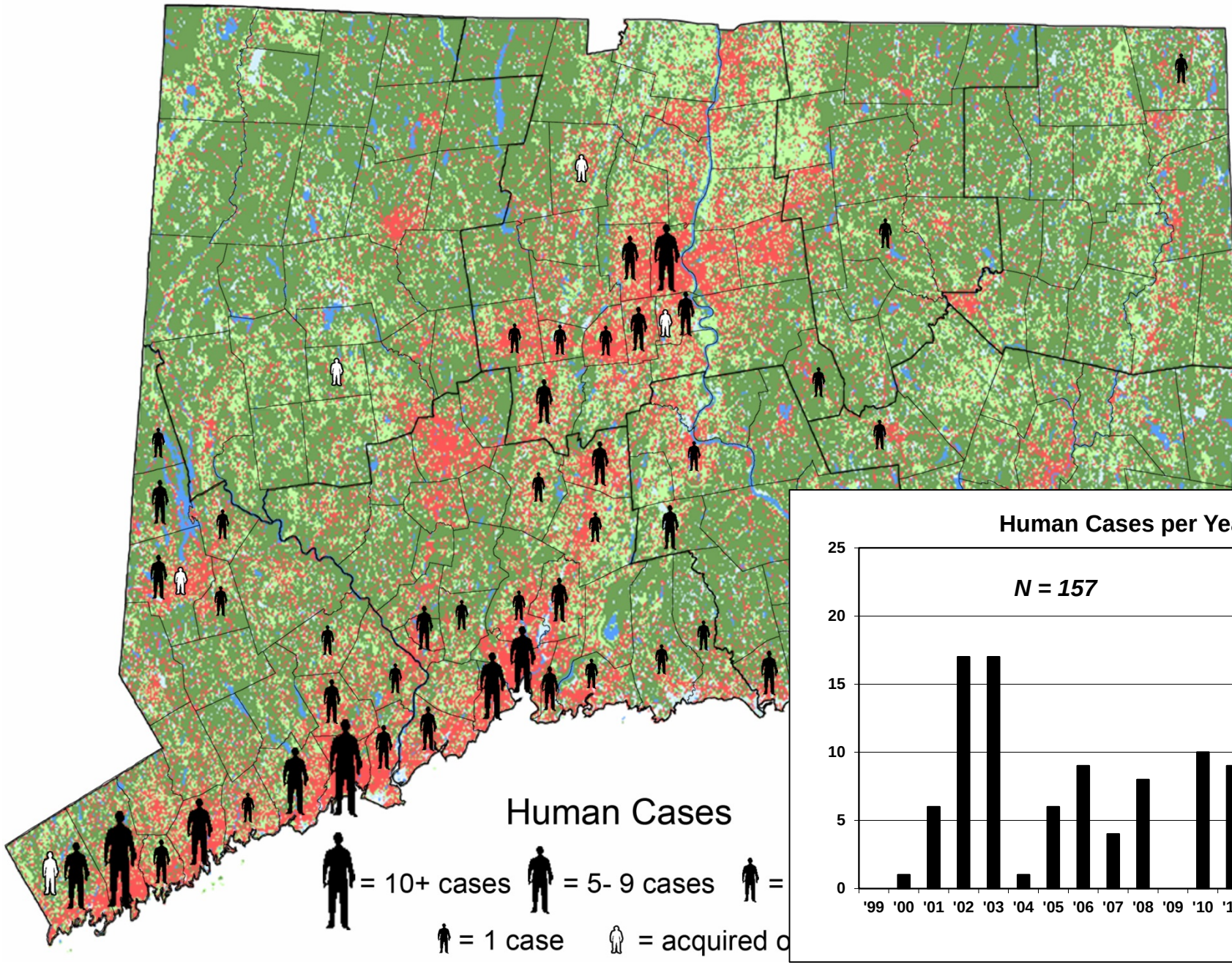


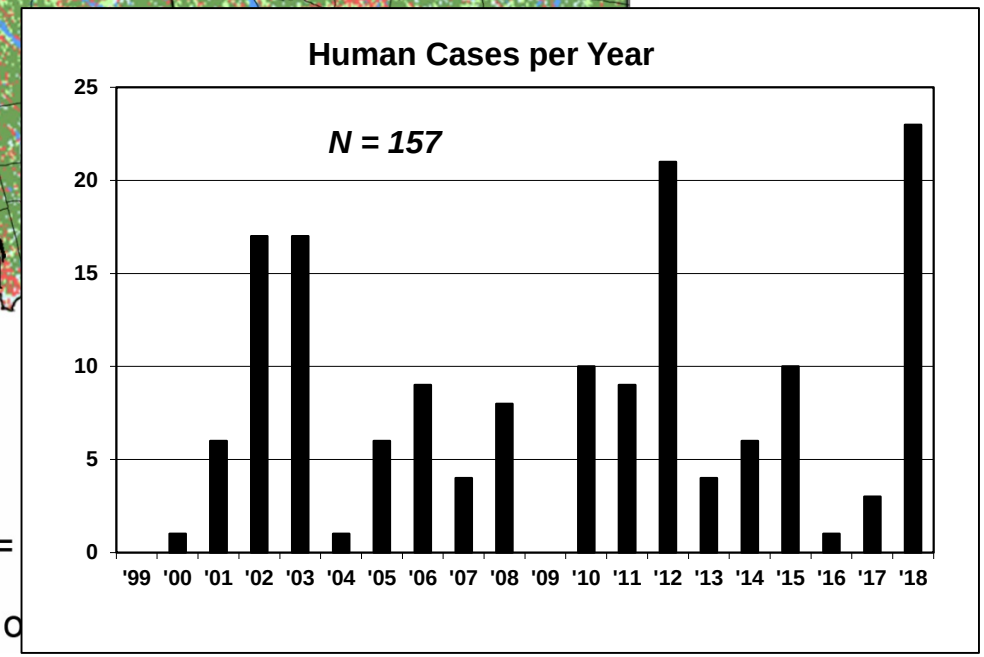
West Nile Virus Isolations from Mosquitoes, 1999-2018





West Nile Virus Human Cases, 1999-2018





WNV Epidemic Curve

10 yr Mean Mosq.

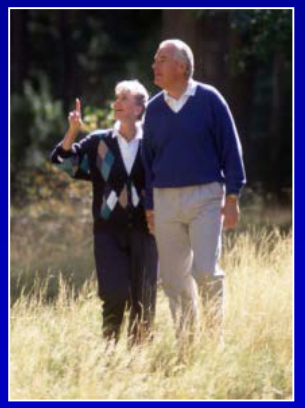
No. WNV Isolates

25
20
15
10
5
0

6/1 6/8 6/15 6/22 6/29 7/6 7/13 7/20 7/27 8/3 8/10 8/17 8/24 8/31 9/7 9/14 9/21 9/28 10/5 10/12 10/19 10/26

Week

WNV Epidemic Curve



10 yr Mean Human

10 yr Mean Mosq.

No. WNV Isolates

25
20
15
10
5
0

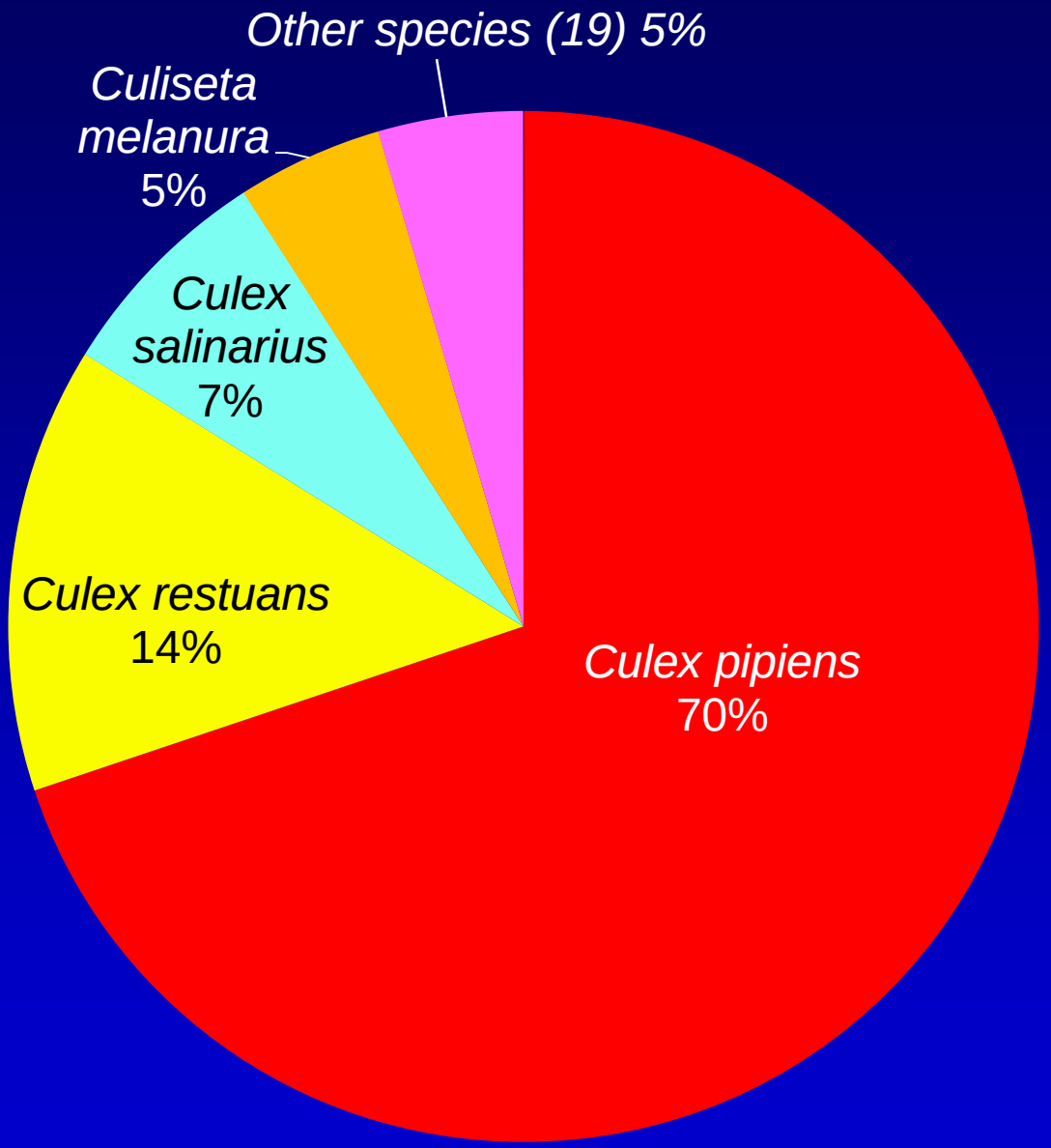
2
1.5
1
0.5
0

6/1 6/8 6/15 6/22 6/29 7/6 7/13 7/20 7/27 8/3 8/10 8/17 8/24 8/31 9/7 9/14 9/21 9/28 10/5 10/12 10/19 10/26

Week

WNV Isolations from Mosquito Pools - CT 1999-2018

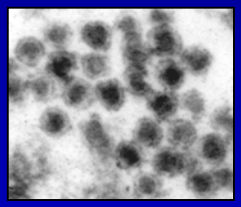
Species	Isolates
Culex pipiens	1,647
Culex restuans	330
Culex salinarius	166
Culiseta melanura	108
Aedes vexans	18
Aedes cinereus	13
Coquillettidia perturbans	11
Ochlerotatus japonicus	10
Oc. canadensis	10
Oc. taeniorhynchus	6
Other Species (14)	45
TOTAL	2,358



Northeastern US West Nile Virus Transmission Cycle

Culex pipiens
Culex restuans
Culiseta melanura

Enzootic Cycle



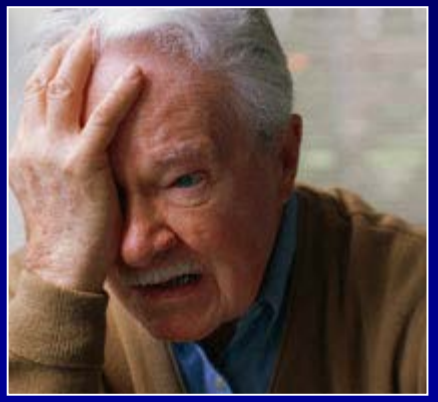
Virus




Wild Passerine Bird Reservoir and Amplifying Hosts

June to October

Epidemic / Epizootic Transmission



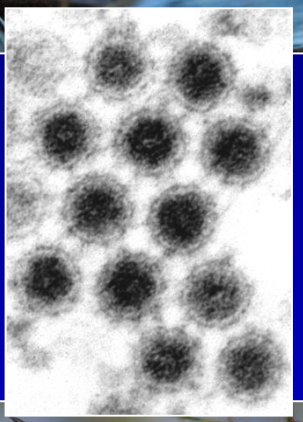
Culex salinarius
Culex pipiens
Aedes species

Incidental Infections

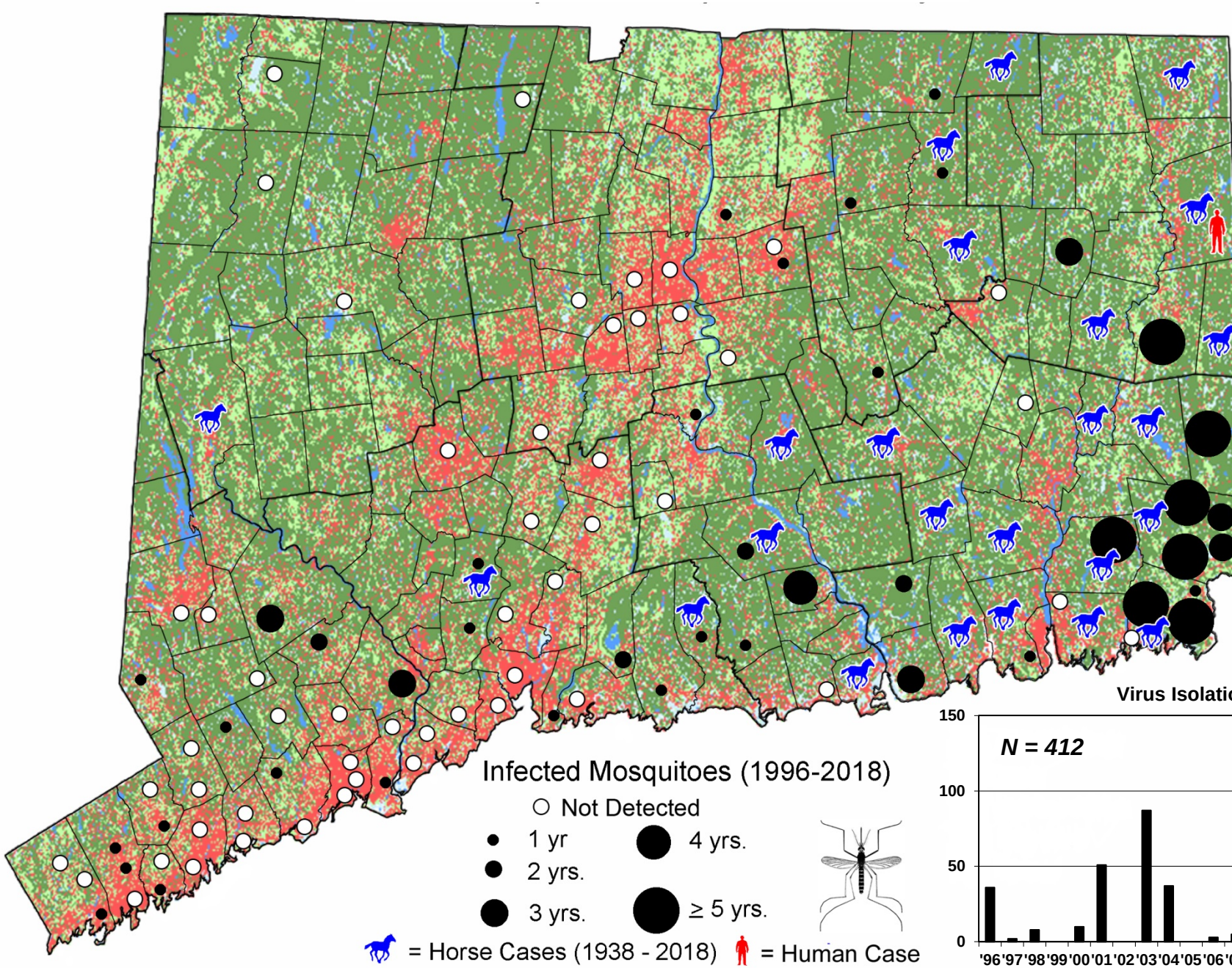
August to October

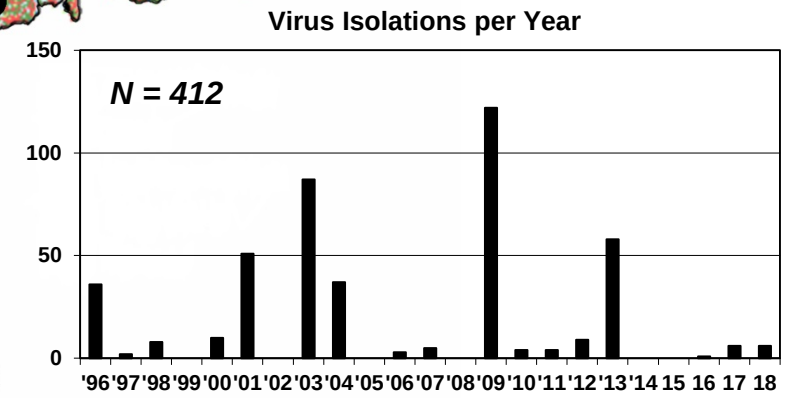
Eastern equine encephalitis (EEE) virus

- Discovered in the 1930's
- Sporadic disease outbreaks in horses and humans
- Maintained in a bird-mosquito cycle
- *Culiseta melanura*- the main mosquito vector
- Occurs mainly in fresh-water hardwood swamps



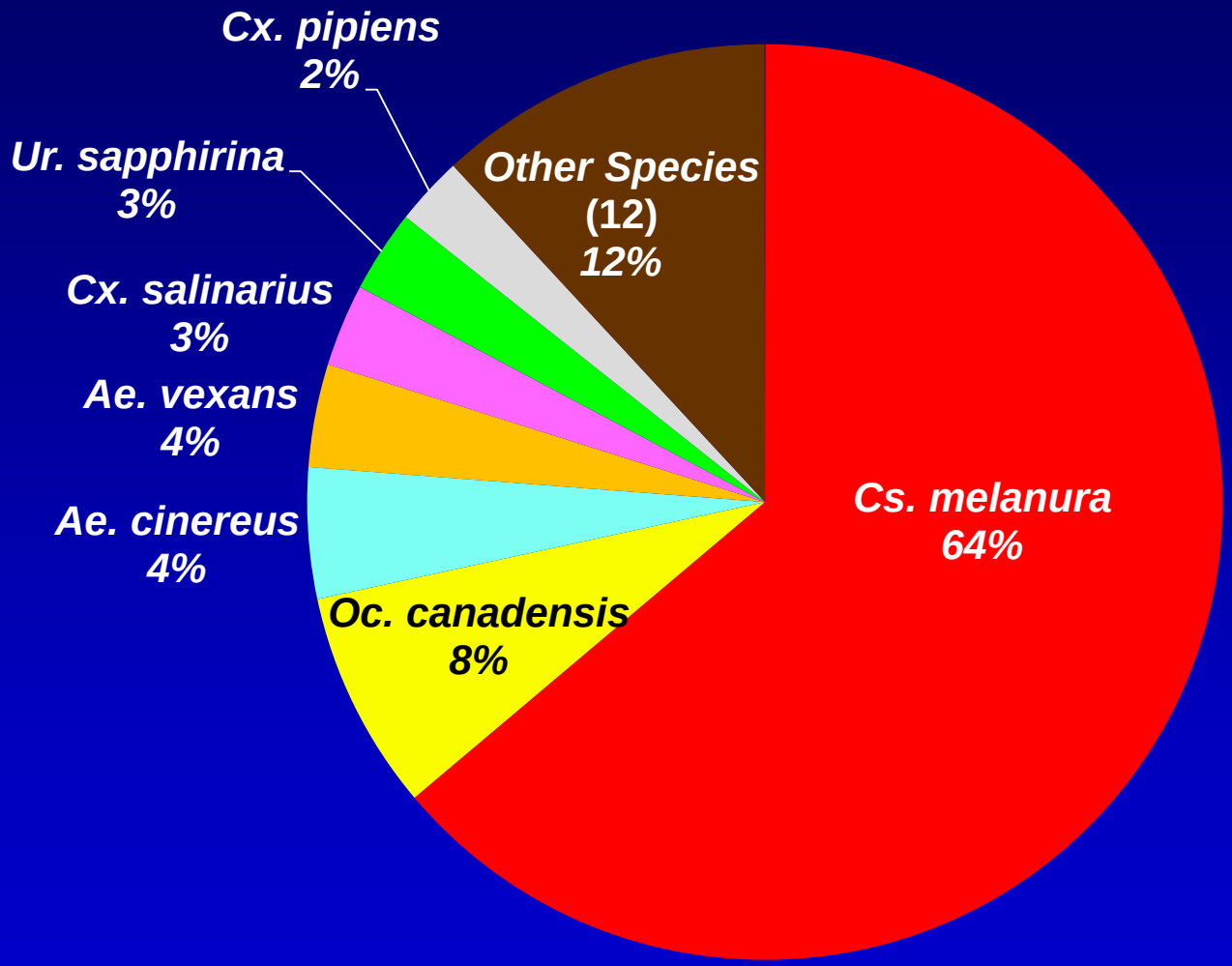
Eastern Equine Encephalitis Activity

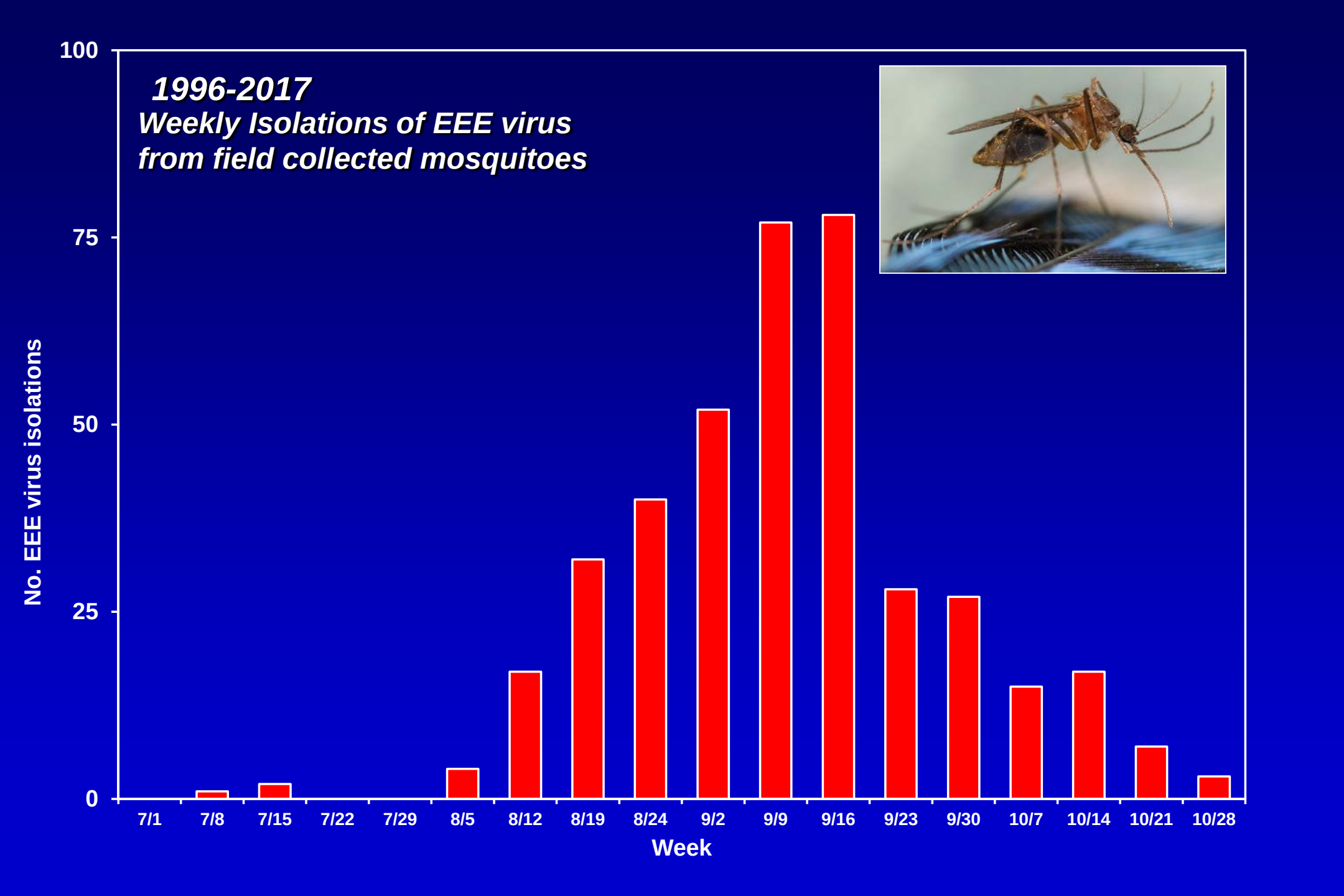




EEE Isolations from Mosquito Pools - CT 1996-2018

Species	Isolates
Culiseta melanura	263
Ochlerotatus canadensis	32
Aedes cinereus	19
Aedes vexans	15
Culex salinarius	12
Uranotaenia sapphirina	12
Culex pipiens	10
Other Species (12)	49
TOTAL	412

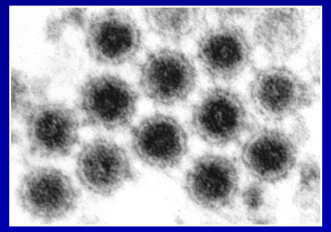



1996-2017
Weekly Isolations of EEE virus
from field collected mosquitoes
No. EEE virus isolations
100
75
50
25
0
7/1
7/8
7/15
7/22
7/29
8/5
8/12
8/19
8/24
9/2
9/9
9/16
9/23
9/30
10/7
10/14
10/21
10/28
Week

Northeastern US EEE Virus Transmission Cycle

Culiseta melanura

Enzootic Cycle



Virus

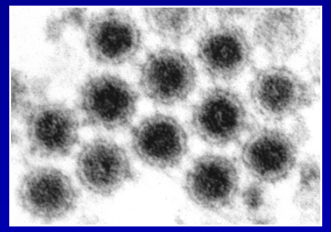
July to October

? Wild Passerine Bird Reservoir and Amplifying Hosts

Northeastern US EEE Virus Transmission Cycle

Culiseta melanura

Enzootic Cycle



Virus

July to October

Wild Passerine Bird Reservoir and Amplifying Hosts

Epidemic / Epizootic Transmission

Aedes species
Ochlerotatus canadensis
Culiseta melanura

Incidental Infections

August to October

Reporting of Results

- WNV, EEE, or exotic virus identified
  - Notify CT DPH, DEEP
    - DPH contacts local Health Dept.
  - Report to CDC (ArboNet)
- Post on CAES/Mosquito Management Website
  - www.ct.gov/caes/mosquitotesting
  - www.ct.gov/mosquito
  - Map
  - Weekly, Cumulative Results Tables
- Press Releases

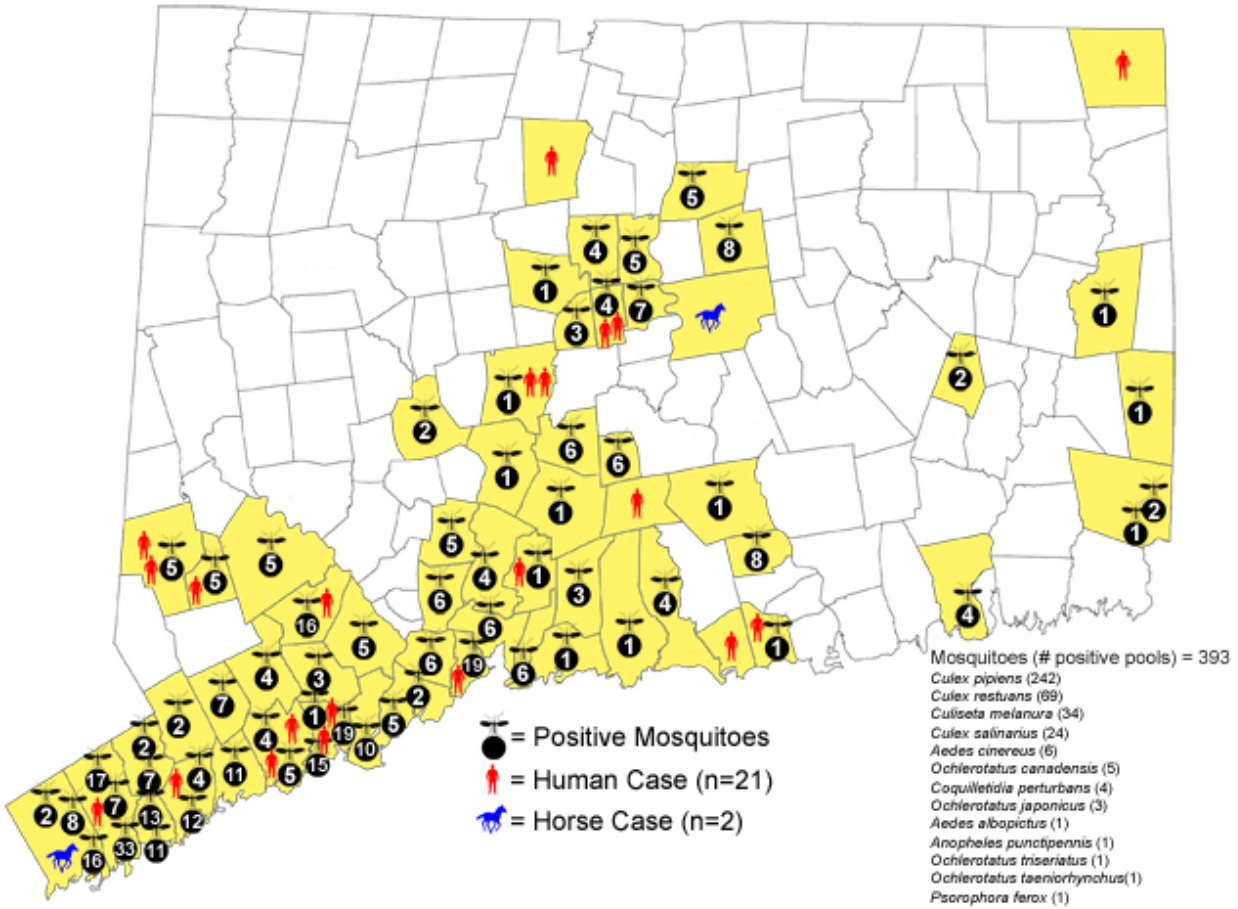
https://portal.ct.gov/lib/caes/images/mosquito_testing/2018/wnv_oct_16.png

portal.ct.gov

https--wwwnc.cdc | Products Archive - Perciv... | Home | DNA Extraction Protocols ... | Suggested Sites | blast Bas

Updated: October 16, 2018

2018 West Nile Virus Activity



Mosquitoes (# positive pools) = 393

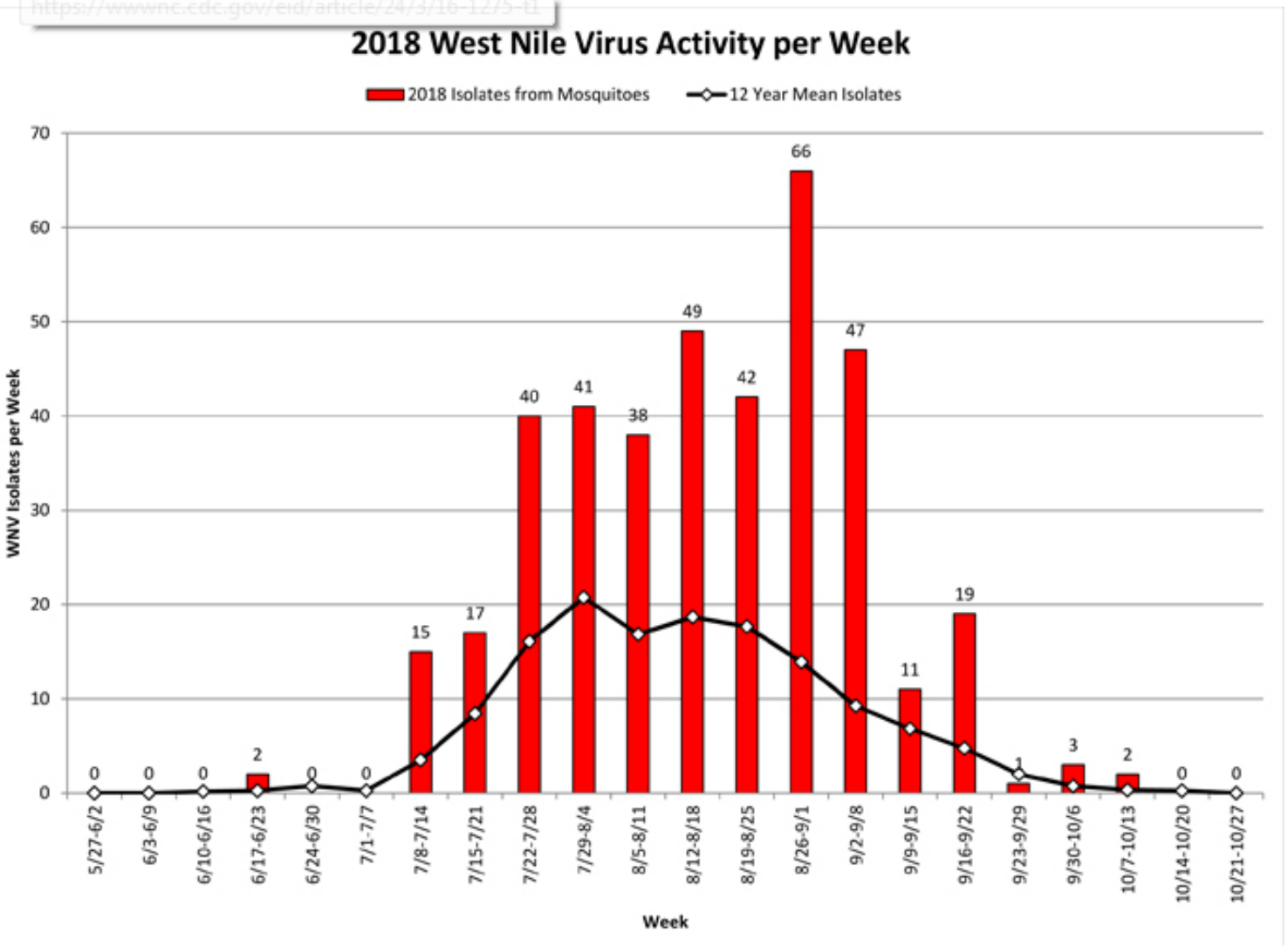
Culex pipiens (242)
Culex restuans (69)
Culiseta melanura (34)
Culex salinarius (24)
Aedes cinereus (6)
Ochlerotatus canadensis (5)
Coquillettidia perturbans (4)
Ochlerotatus japonicus (3)
Aedes albopictus (1)
Anopheles punctipennis (1)
Ochlerotatus triseriatus (1)
Ochlerotatus taeniorhynchus(1)
Psorophora ferox (1)

https://portal.ct.gov/lib/caes/images/mosquito_testing/2018/wnv_activity_oct_16.png

portal.ct.gov

https--wwwnc.cdc | Products Archive - Perciv... | Home | DNA Extraction Protocols ... | Suggested Sites | blast Basic Local Al

https://wwwnc.cdc.gov/eid/article/24/3/16-1275-t1



Asian Longhorned Beetle (ALB)
Bed Bugs (CCABB)
Board of Control
Boxwood Blight
CAES Accomplishment Report
CAES in the News
CAES Seminar Series
Center for Vector Biology and Zoonotic Diseases (CVBZD)
Code of Ethics
Cooperative Agricultural Pest Survey (CAPS)
Departments
Director's Report
Emerald Ash Borer (Agrilus planipennis) (EAB)
Events
Experiment Station Associates (ESA)
Insect Information Office
Invasive Aquatic Plant Program (IAPP)
Job Opportunities
Licenses and Permits
Mosquito and Arbovirus Surveillance Program
Plant Disease Information Office (PDIO)
Plant Pest Handbook
Publications
Research Foundation, Inc.
Soil Testing Laboratory
The History of Public Health at CAES 1904-2009
Tick Management Handbook
Tick Testing Laboratory
Videos

Updated October 28

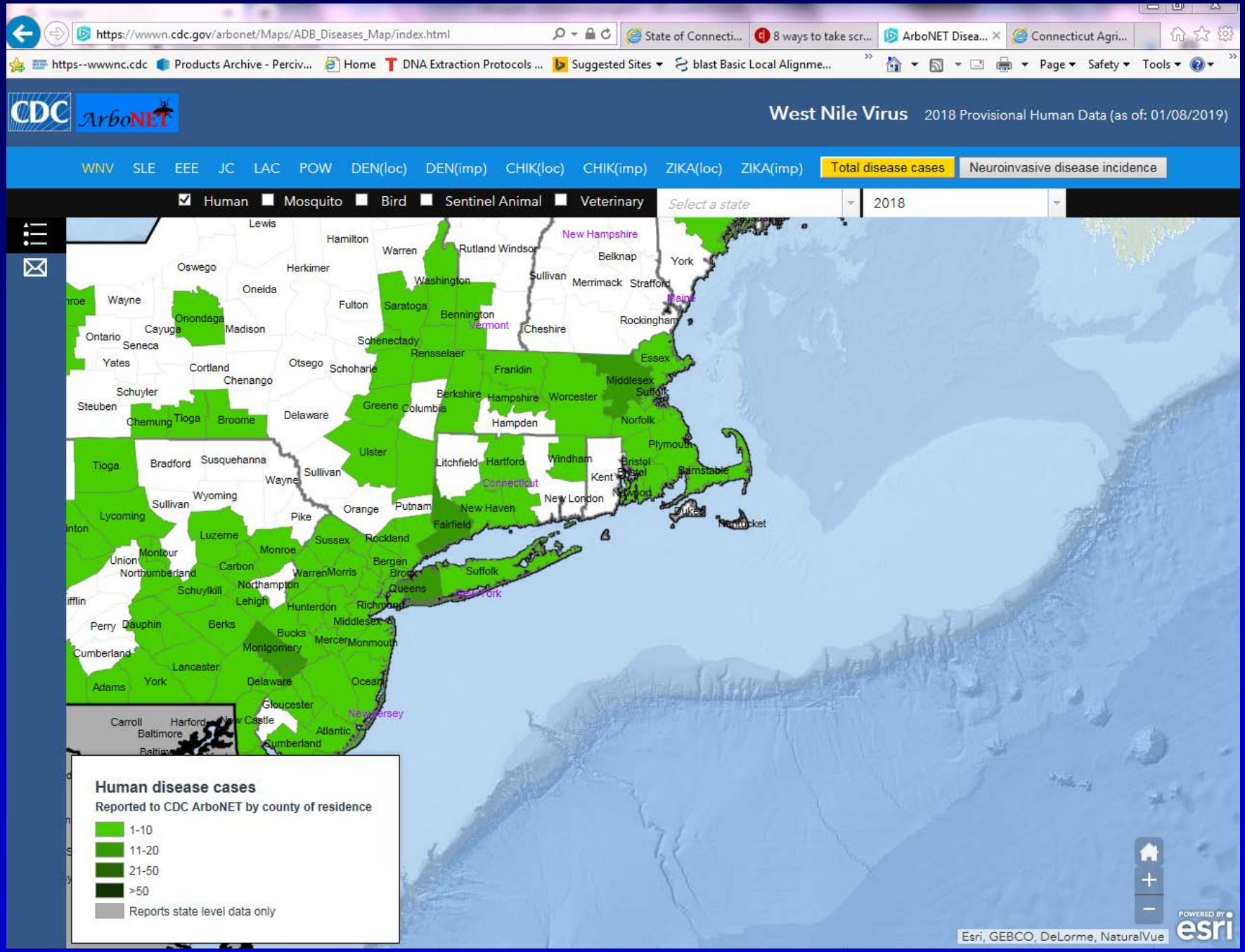
The following numbers of mosquitoes were collected, identified, and tested at The Connecticut Agricultural Experiment Station in New Haven. The towns and locations of the sites, number of mosquitoes tested, and virus isolations are listed. The total number tested to date: **177,509**

WNV = West Nile virus
EEE = Eastern Equine Encephalitis virus
JC = Jamestown Canyon virus

Follow this link to see a description of the Mosquito Management Program

Follow this link see current week's results

Town	Trap Site	Number of Mosquitoes	Pos. or Neg.	WNV, EEE, JC	Mosquito Species (No.)
Barkhamsted	Hoyt Hayes Swamp	649	Neg.	-	-
Bethany	Bethany Bog	1,942	Neg.	-	-
Bethel	Meckauer Park	419	Neg.	-	-
Branford	Hosley Ave.	556	Neg.	-	-
Bridgeport	Beardsley Zoo	802	**Pos.**	**WNV:3**	*Cx. pipiens* (3)
Bridgeport	Barnum Blvd.	2,345	**Pos.**	**WNV:16**	*Cx. pipiens* (6) *Cx. restuans* (1) *Cx. salinarius* (8) *Ae. vexans* (1)
Canaan	Robin's Swamp	7,494	**Pos.**	**JC: 1**	*Oc. provocans* (1)
Cheshire	Lock 12	807	**Pos.**	**WNV:2**	*Cx. pipiens* (1) *Cx. restuans* (1)
Chester	Cockaponset St. Forest	2,360	**Pos.** **Pos.**	**WNV:1** **JC: 1**	*Cs. melanura* (1) *Oc. abserratus* (1)
Cornwall	Mohawk Pond	5,691	Neg.	-	-
Cromwell	Cromwell Meadows	3,259	**Pos.**	**JC: 1**	*Oc. trivittauts* (1)
Danbury	Reservoir Road	1,476	Neg.	-	-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8 ways to take scr...
ArboNET Disea...
Connecticut Agri...
https--wwwnc.cdc
Products Archive - Perciv...
Home
DNA Extraction Protocols ...
Suggested Sites
blast Basic Local Alignme...
Page
Safety
Tools
CDC
ArboNET
West Nile Virus
2018 Provisional Human Data (as of: 01/08/2019)
WNV
SLE
EEE
JC
LAC
POW
DEN(loc)
DEN(imp)
CHIK(loc)
CHIK(imp)
ZIKA(loc)
ZIKA(imp)
Total disease cases
Neuroinvasive disease incidence
Human
Mosquito
Bird
Sentinel Animal
Veterinary
Select a state
2018
Human disease cases
Reported to CDC ArboNET by county of residence
1-10
11-20
21-50
>50
Reports state level data only
Esri, GEBCO, DeLorme, NaturalVue
POWERED BY esri

Acknowledgements

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Thank You