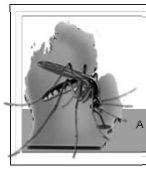


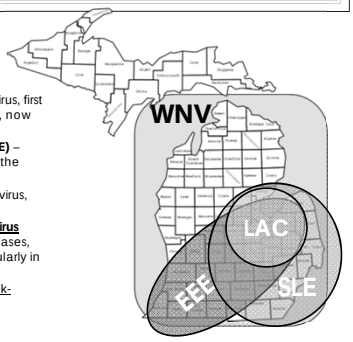
WEST NILE VIRUS: MICHIGAN 2012

A SUMMARY OF ECOLOGIC AND HUMAN CASE SURVEILLANCE

13th Annual Michigan Communicable Disease Conference
Kimberly Signs, DVM
Michigan Department of Community Health

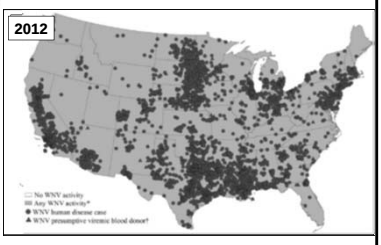
GEOGRAPHIC DISTRIBUTION OF ARBOVIRUSES IN MICHIGAN

- **West Nile virus (WNV)** – flavivirus, first detected in the state in 2001, now endemic
- **St. Louis Encephalitis virus (SLE)** – flavivirus, historic outbreak in the 1970's, sporadic cases
- LaCrosse virus (LAC) – bunyavirus, sporadic cases
- **Eastern Equine Encephalitis virus (EEE)** – alphavirus, sporadic cases, occasional outbreaks particularly in equine
- **Powassan virus** – flavivirus, tick-borne



WEST NILE VIRUS (WNV) HISTORY

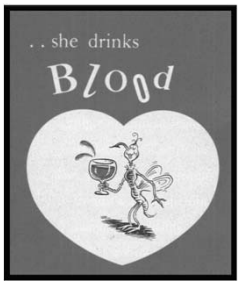
WNV was introduced to the U.S. in 1999. The strain of virus was similar to that of an outbreak strain circulating in the Middle East at the time.



Nationally 5,674 human cases of WNV reported from 48 states, the District of Columbia and Puerto Rico (51% neuroinvasive) and 286 fatalities. Michigan reports 202 cases (71% neruroinvasive) and 17 fatalities.

THE 2012 OUTBREAK

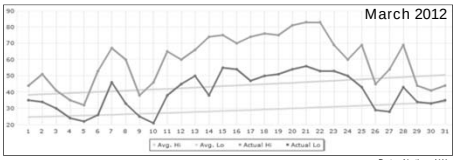
- In the summer of 2012 Michigan experienced the worst West Nile virus (WNV) outbreak since 2002
- The progression of the 2012 outbreak geographically and over time was nearly identical to 2002
- The outbreak was concentrated primarily in Michigan's two largest urban areas
- Weather trends may have affected the severity of the outbreak



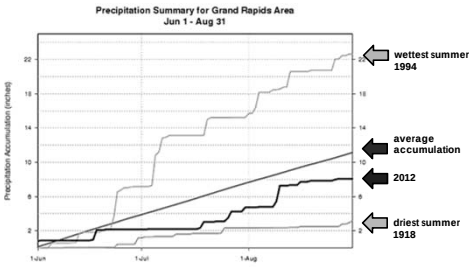
1943: Theodor Geisel (aka Dr. Seuss)

HOW WEATHER IMPACTS WNV: WINTER – SUMMER, 2012

- The winter of 2011-2012 was **the fourth warmest on record** (records since 1894) in lower Michigan with monthly temperatures an average of 5.4ºF (4.8º-5.9º) above 30-year averages
  - Mild winters allow for greater survival of overwintering adult *Culex* mosquito populations
- The 2012 spring season (March – May) was **the warmest on record** in Michigan
  - Resulted in early emergence of *Culex* mosquitoes and is a factor in the early amplification of WNV in bird populations
- The 2012 summer season (June – August) was **the 10th warmest on record** in Michigan



Data: National Weather Service



2012 SUMMER PRECIPITATION IN GRAND RAPIDS

Hot and Dry summers tend to promote WNV transmission

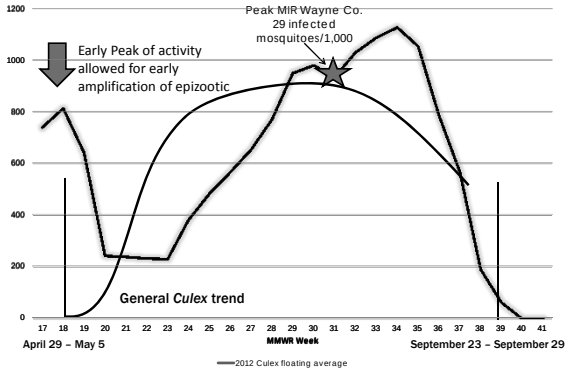
Data: National Weather Service

2012 MOSQUITO SURVEILLANCE IN MICHIGAN

5,649 mosquito pools tested for arboviruses in 2012. (78,713 mosquitoes)

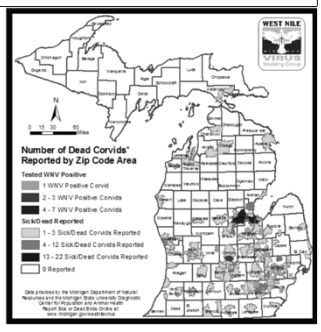
2,015 Mosquito Pools tested specifically for WNV. (15,711 mosquitoes)

CULEX MOSQUITO POPULATION: 2012



BIRD SURVEILLANCE IN MICHIGAN

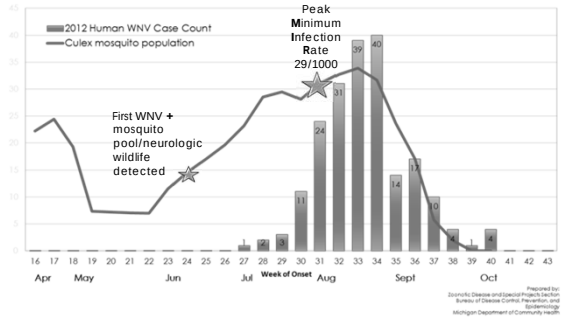
- Sick/dead birds may be a useful sentinel for early season detection of WNV activity
- Michigan citizens may report birds online (www.michigan.gov/westnile) or by calling local DNR offices
- Reductions in funding for WNV surveillance and public apathy towards WNV have resulted in fewer reports and birds tested



HUMAN DIAGNOSTIC TESTING FOR ARBOVIRUSES

- Patients presenting with meningitis/encephalitis from May-Nov should be tested for all arboviruses potentially circulating in Michigan; WNV, SLE, EEE, LAC
- CSF is the preferred specimen
  - MDCH turn-around is approximately 1 week
- Paired sera is an alternative to CSF
  - At MDCH, reserved for hospitalized patients for whom CSF is not available, more prolonged turn-around time
- Flavivirus (SLE, WNV) cross-reaction poses a diagnostic dilemma, particularly for commercial labs that lack an equivalent EIA for SLE.
- **MDCH confirmed 30% of WNV cases in 2012, no other arboviruses were detected.**

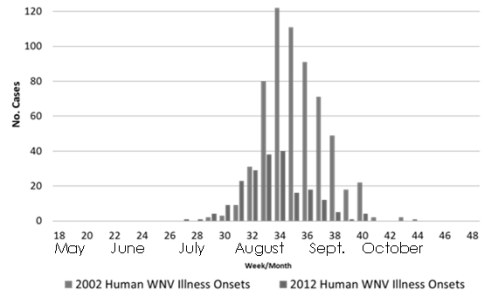
2012 WEST NILE VIRUS ACTIVITY* IN MICHIGAN



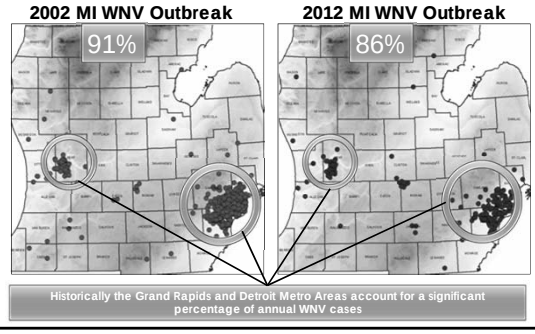
WNV EPIDEMIOLOGY: MICHIGAN 2012

- 202 West Nile virus cases
  - 144 (71%) neuroinvasive
  - 17 fatalities (Case Fatality Rate 12%)
  - Onsets 7/6 – 10/6
- Median age 58 (range 2 – 91)
  - Median age West Nile fever: 56
  - Median age West Nile neuroinvasive: 61
  - Median age fatalities 73 (range 48 – 87)
- 52% male
- 38 presumptive viremic blood-donors
  - Donation date range 7/25 – 10/16
  - 11 reported as West Nile fever
- 86% of West Nile activity reported from Detroit Metro and Grand Rapids Metro areas

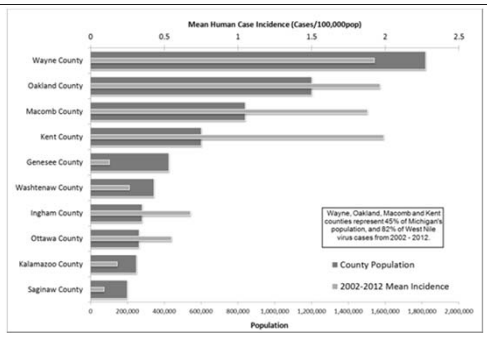
OUTBREAK YEAR COMPARISON: EPI CURVE



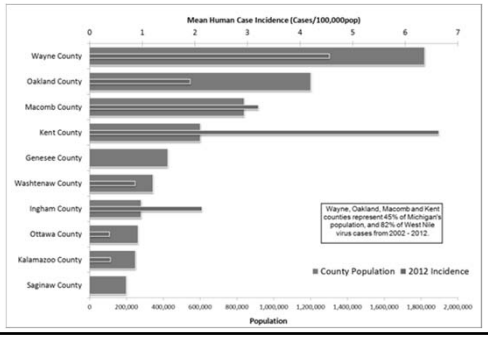
OUTBREAK YEAR COMPARISON: GEOGRAPHY



WEST NILE VIRUS INCIDENCE IN MICHIGAN'S 10 LARGEST COUNTIES: MEAN 2002-2012



WEST NILE VIRUS INCIDENCE IN MICHIGAN'S 10 LARGEST COUNTIES: 2012



IN SUMMARY

- The 2012 outbreak of WNV was similar epidemiologically to Michigan's banner 2002 outbreak
- West Nile virus is considered endemic in Michigan
- Human cases will likely be seen yearly, with periodic epidemic activity mediated by climate and host factors
  - Hot and dry years are likely to produce outbreaks in Michigan's largest urban areas
- West Nile virus prevention depends upon personal protective measures and/or community mosquito control

FIGHT THE BITE COMMUNITY MOSQUITO CONTROL

Cultural Controls

- Educational campaigns
- Filling areas prone to flooding
- Drain management
- Scrap-tire campaigns
- Draining/filling abandoned pools

Pesticides

- Larviciding
  - Killing mosquito larvae before they emerge
  - The best, most cost-effective preventive measure
- Adulticiding
  - Killing mosquitoes "on the wing"
  - Ultra-low volume applications

Communities in Michigan with active mosquito control historically report fewer human cases of West Nile virus disease, despite detecting the disease in mosquitoes and wildlife yearly.

QUESTIONS TO PONDER

- Did Michigan "get lucky" in 2012?
  - Only 202 cases compared to 644+ in 2002
  - Was the summer of 2012 "too dry" in Michigan, blunting the WNV epidemic?
- Are Michigan communities any more prepared for an arboviral epidemic, 15 years after WNV was first detected in the U.S.?
  - Texas reported 1868 cases and 89 deaths in 2012 (most activity in Dallas area).
- What have we learned in 12 years of WNV activity in Michigan and where can we focus our efforts?
  - Nearly identical distribution of cases in Kent Co. and SE Michigan between 2002 and 2012.
- What efforts are possible, given the economic realities?
- Madison WI survey: "nuisance factor" more important than "disease factor" in willingness to pay for mosquito control.