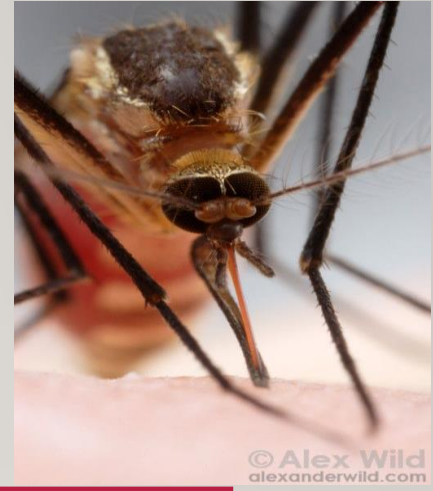


# LACROSSE VIRUS IN THE APPALACHIANS



RESPONSE TO TWO CASES  
IN A NORTH GEORGIA  
STATE PARK

Raymond R. King – District Director of Environmental Health

# LaCrosse (LACV) Review

I. An arboviral encephalitis native to North America circulated among the Eastern Tree Hole Mosquito, chipmunks, gray squirrels and fox squirrels.



La Crosse encephalitis was discovered in 1965, after the virus was isolated from preserved brain tissue and spinal cord of a child who died from the unknown infection in La Crosse, Wisconsin in 1960.

The cause of La Crosse encephalitis is an RNA virus of the same name. In areas endemic for La-Crosse virus, the annual incidence of the disease is approximately 10 to 30 cases per 100,000 in individuals younger than 16 years.

LACV is the most common cause of arboviral encephalitis in children. Ranges from mild febrile illness to severe neuroinvasive form that can result in life-long disabilities or death. Most children recover without sequelae.





2. Other *laboratory* vector-competent species include *Ae. albopictus*, *Ae. japonicus*, *Ae. aegypti*, *Ae. canadensis*, and certain *Culex* sp.



3. Estimated human fatality rate of 0.5% to 1.9%. LACV is rapidly becoming a leading cause of encephalitis in the United States.

As in these two cases, the severe neuroinvasive form of the disease occurs most often in children under the age of 16.

LACV disease can have a wide range of lifelong neurological consequences

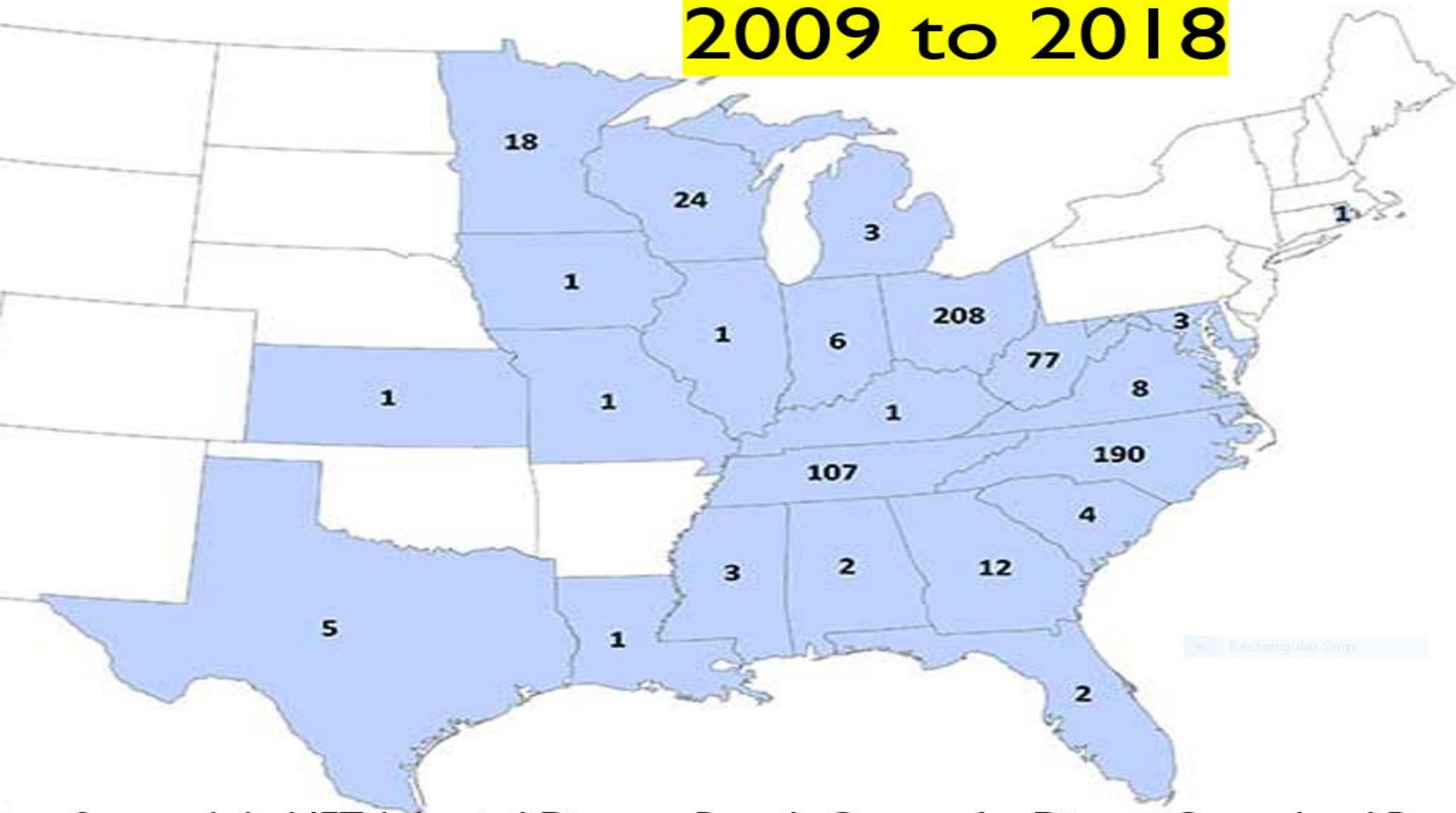
4. Since the mid-1990's Appalachia has emerged as a new focus for LACV cases.

Previously most LACV cases were associated with forested midwestern areas of the United States.





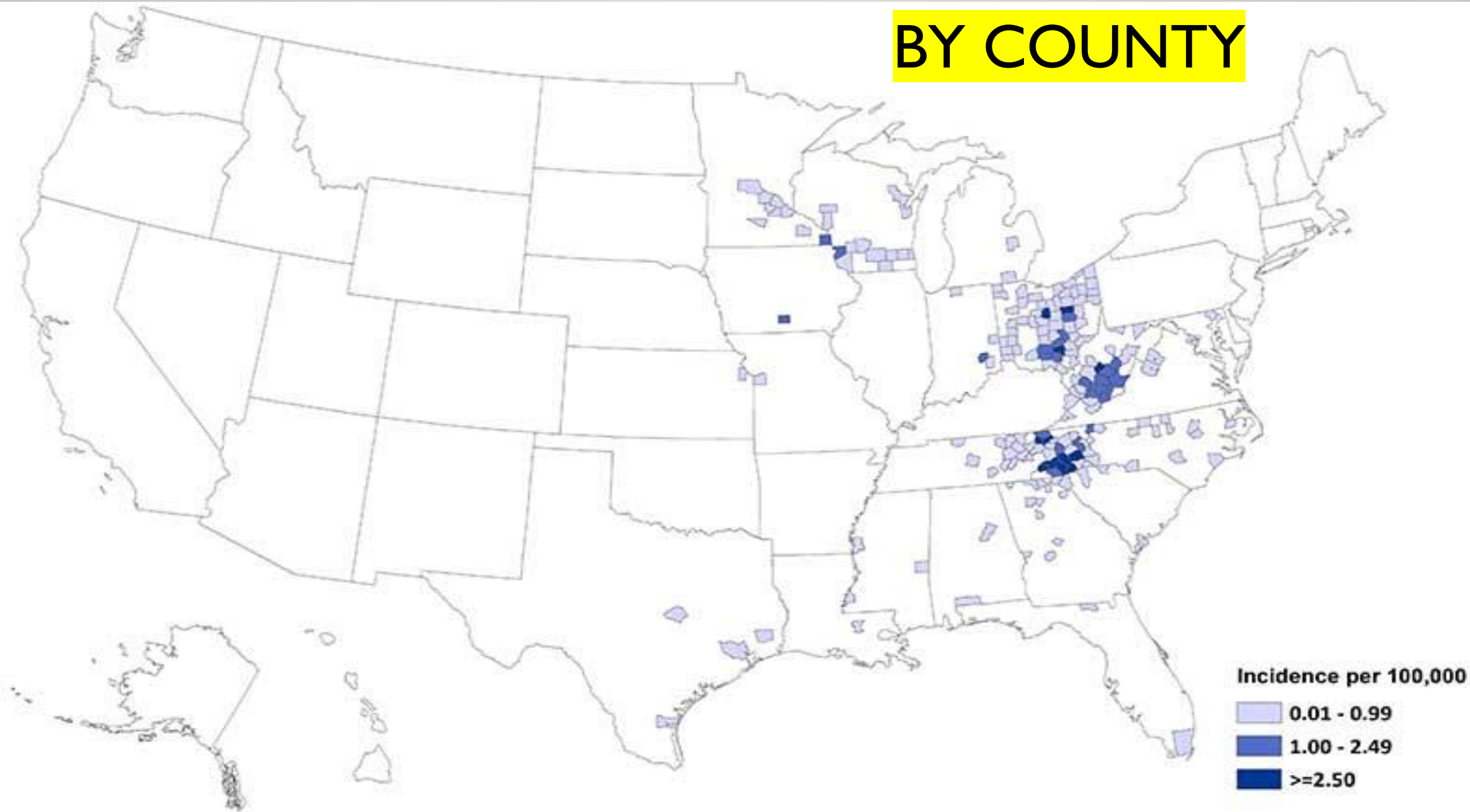
**2009 to 2018**



Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention



# BY COUNTY



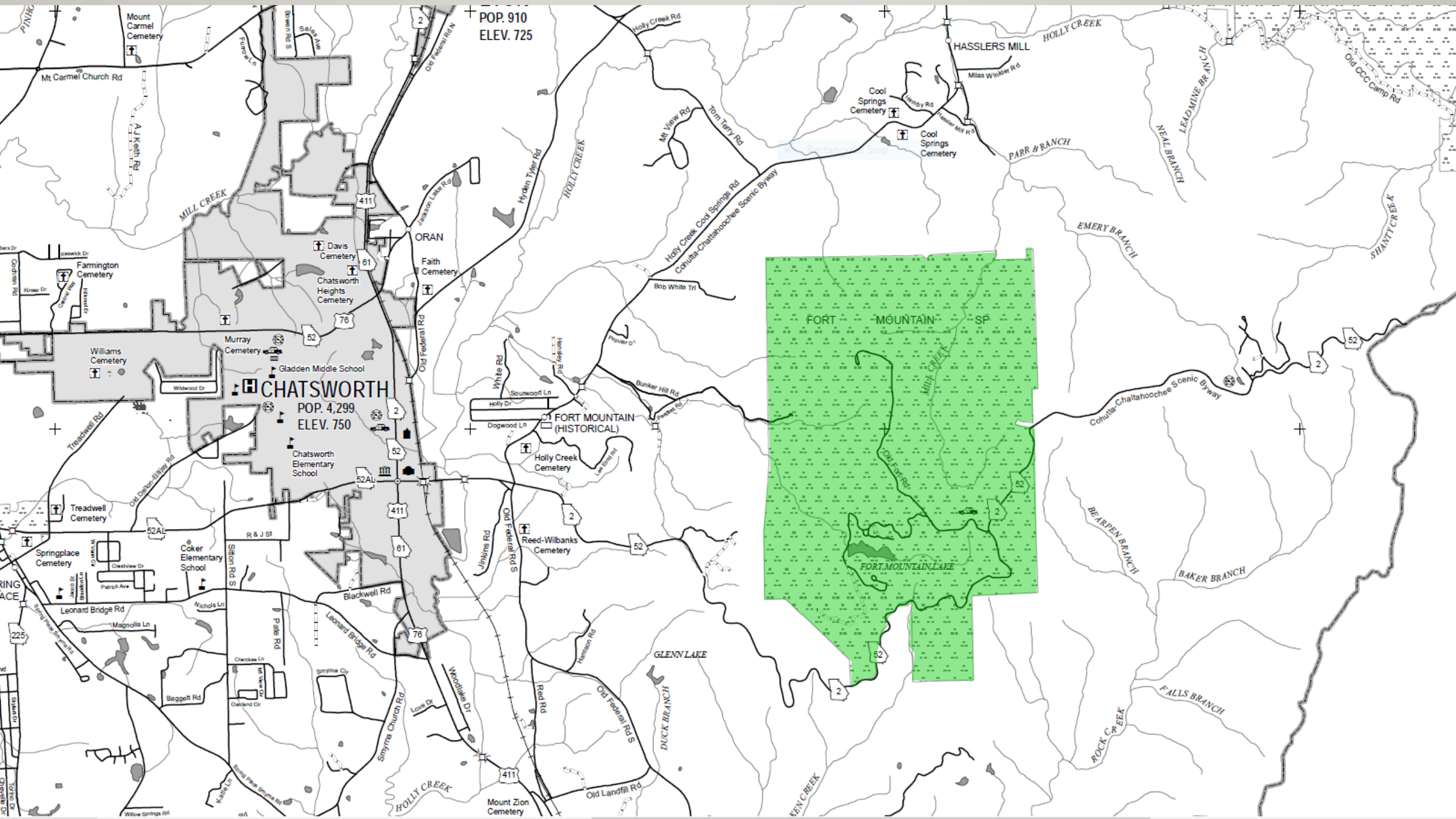
In the summer of 2018 two adolescents acquired LACV at Fort Mountain State Park, Murray County, Chatsworth, GA. Both cases were severe neuroinvasive. One was air-lifted to Erlanger Medical Center in Chattanooga, TN. One male, one female. Both less than 16 years old.



Both required intensive hospital care and rehabilitation. One was an out-of-state visitor to park with her family, and the boy was child of a park employee. Incubation periods and dates of onset put them both at the park for most likely times of exposure.

















# 2018 - STRATEGY TO PREVENT FURTHER CASES

- I. Meeting of all concerned parties:
  - Public Health (District and County Environmental Health)
  - Park and Regional Administration
  - City of Chatsworth (Mosquito Control Program)



2. Barrier sprays and backpack sprayer provided to park staff by P.H.
3. City of Chatsworth will provide ULV spraying (reimbursement by P.H. and D.N.R.) spraying an average twice/month.
4. Public Health will larvicide in campgrounds and other park areas.



5. Public Health will perform routine collections of mosquitoes, larvae and adults.

6. Public Health will create educational posters and notices for visitors and staff.

7. Public Health will provide repellants to visitors when possible.



Protect  
yourself and  
your children.  
Always use  
mosquito  
repellents  
when  
outdoors.

PROTECTS YOU FROM TICK  
DISEASES TOO!

WEST NILE, ZIKA, LACROSSE,  
EASTERN EQUINE, ST. LOUIS,  
CHIKUNGUNYA.....



*Aedes triseriatus* – The Treehole Mosquito





Fort Mountain Lake

Goldmine B

Beach

Playground

Lot run-off

Flood  
Plain

Creekside  
Campground

SPRING

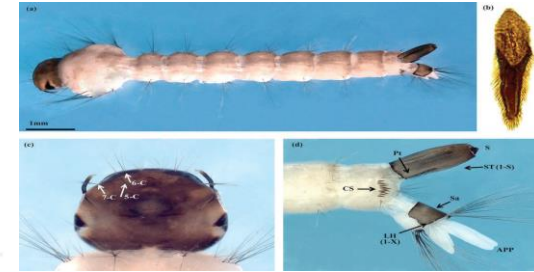
Lakeside  
Campground

Google

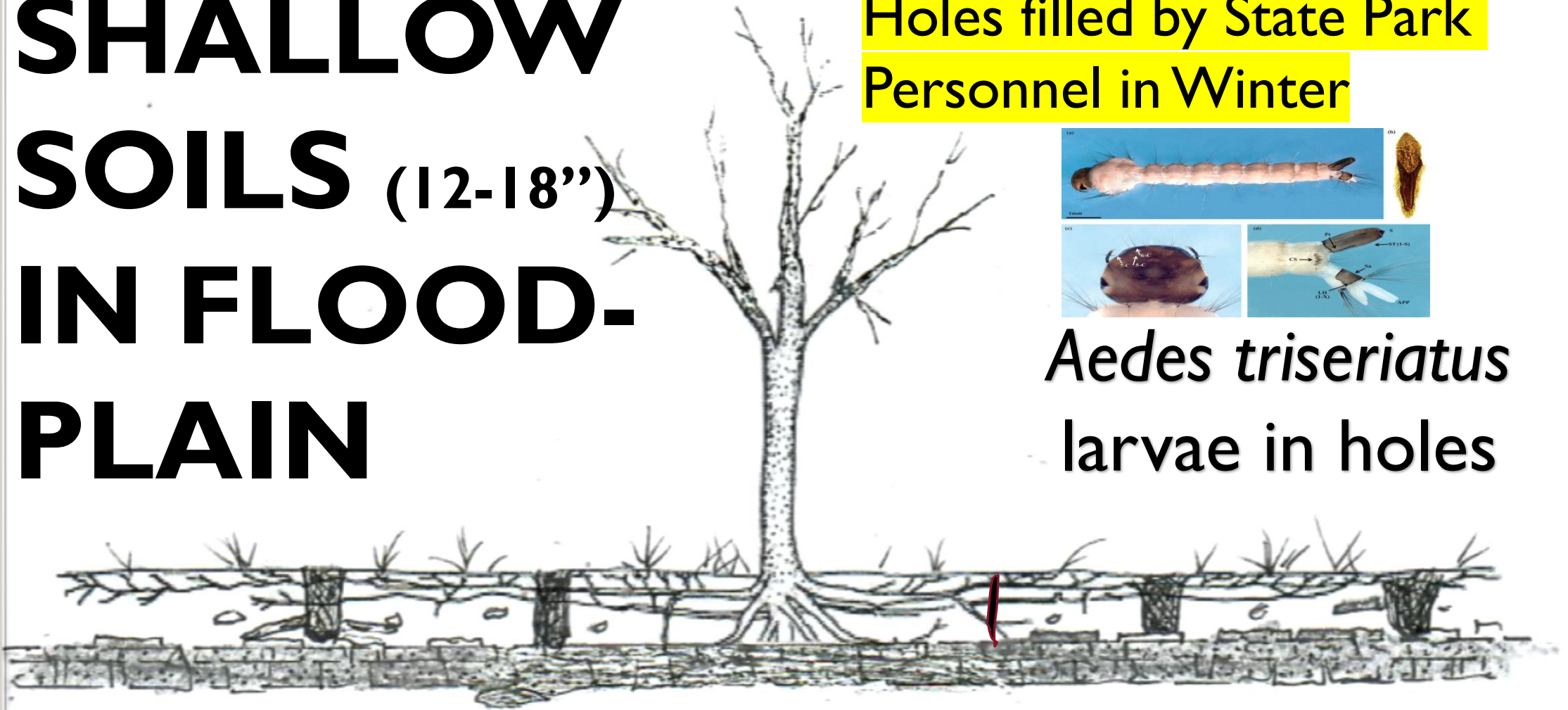


# SHALLOW SOILS (12-18") IN FLOOD- PLAIN

Holes filled by State Park  
Personnel in Winter



*Aedes triseriatus*  
larvae in holes



ROCK STRATA



This floodplain area was treated twice in 2018 and three times (one more pending) in 2019 with Altosid blocks and granules placed in holes and other suspect areas in the park.



Of course there are innumerable trees in and around the park, so plenty of habitats for *Aedes triseriatus*. We never located a tree hole with larvae. Twenty larvae traps in campgrounds never found *Aedes triseriatus* larvae in them.



*Aedes triseriatus* is almost never abundant in its range making evaluation of control measures difficult. Mosquito species richness, composition, and abundance generally decrease with increasing altitude and slopes. There have been no further human cases associated with the park, and we *assume* control measures were effective, but can't be certain.



La Crosse infections rarely result in symptomatic disease. Males account for the majority of cases. Cases have more to do with age and susceptibility to neuroinvasive form than actual exposure. *Aedes triseriatus* overwinter as eggs located in dry nesting sites that become flooded in spring, but in warm areas may also overwinter as adults.





Females will lay eggs in man-made water holding containers, particularly discarded tires like *Aedes albopictus*. Feeding activity is largely crepuscular.

Can  
be a  
daytime  
biter.



Populations of eastern treehole mosquitoes have a high level of plasticity and vary among regions and even from year to year. This is also due to delayed hatchings, amount of rainfall, temperature, and resource availability. As a result, there are usually multiple adult populations and all instar stages present at once. Some populations have been observed with only one population per year. Interestingly, females infected with La Crosse encephalitis virus are more efficient at mating than non-infected females.



## IDENTIFICATION

- Medium Sized
- Scutum with jet-black median stripe bordered with large patches of silvery white scales.
- Abdomen black, also with silvery white patches on lateral margin of each segment. Legs dark except for beginning and underside of femur. Proboscis dark.
- *Aedes hendersoni* and *Aedes triseriatus* adults difficult to distinguish. Larvae differ little (anal papillae.) Overlap in range.



Rodent reservoirs are not essential to the persistence of LACV in nature and the mosquito itself can be a reservoir host. A transovarian-infected female *Aedes triseriatus* is able to transmit the virus at its first blood feeding without previously having taken an infectious blood meal. Also, *Aedes triseriatus* males, infected transovarially, can transfer LAC virus to females via mating (i.e., venereal transmission.)



MALE



## OBSERVATIONS AND COMMENTS

Large numbers of chipmunks in both campgrounds. Asian Tiger Mosquitoes were present whose larvae probably compete with larvae of *Aedes triseriatus*, but research indicates Tiger mosquitoes are probably not responsible for more human LACV cases nor new emergence in Appalachians.

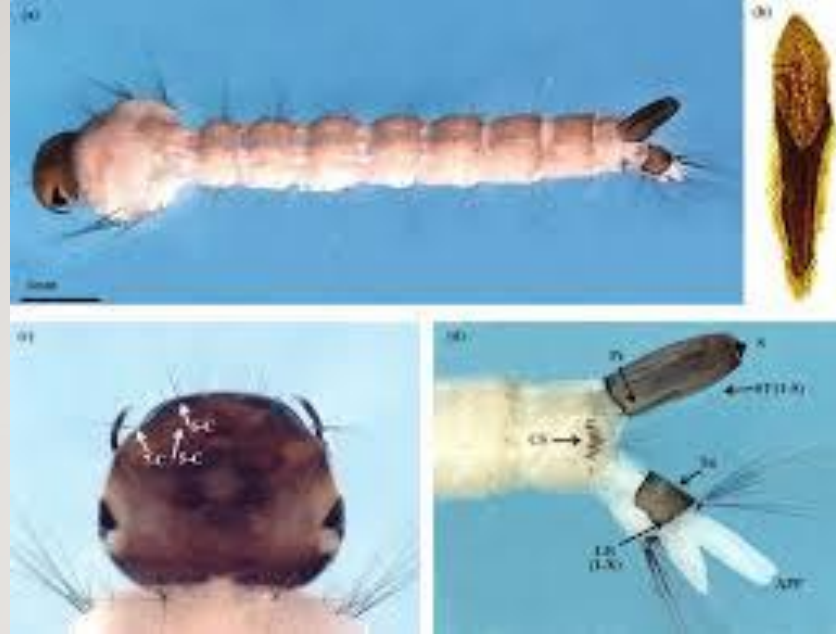
- Other factors including:
- DIFFERENT MOSQUITO SPECIES
- CLIMATE CHANGES
- CHANGES IN WILDLIFE DENSITIES  
(e.g., chipmunks and squirrels)  
& other unknown ecological factors
- HUMAN ACTIVITIES





# 2019: 14 SPECIES – 137 mosquitoes

SPECIES 2019	NUMBER
<i>Aedes japonicus</i>	36
<i>Aedes albopictus</i>	34
<i>Anopheles punctipennis</i>	22
<i>Aedes triseriatus</i>	17 (12.4 %)
<i>Culex quinquefasciatus</i>	9
<i>Orthopodomyia signifera</i>	5
<i>Aedes canadensis</i>	3
<i>Aedes vexans</i>	3
<i>Aedes atropalpus</i>	2
<i>Aedes cinereus</i>	2
<i>Aedes infirmatus</i>	1
<i>Coquillettidia perturbans</i>	1
<i>Culex erraticus</i>	1
<i>Psorophora cyanescens</i>	1



**SPECIAL THANKS TO:**  
**CITY OF CHATSWORTH,**  
**Mayor Tyson Haynes**



A black bear is sitting on a wooden picnic table in a grassy field. The bear is looking to the right. A speech bubble points from the bear to the text box.

**I CONFESS. I  
DESTROYED TWO  
LIGHT TRAPS.**

**QUESTIONS ?**

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