

Biological Products in Public Health

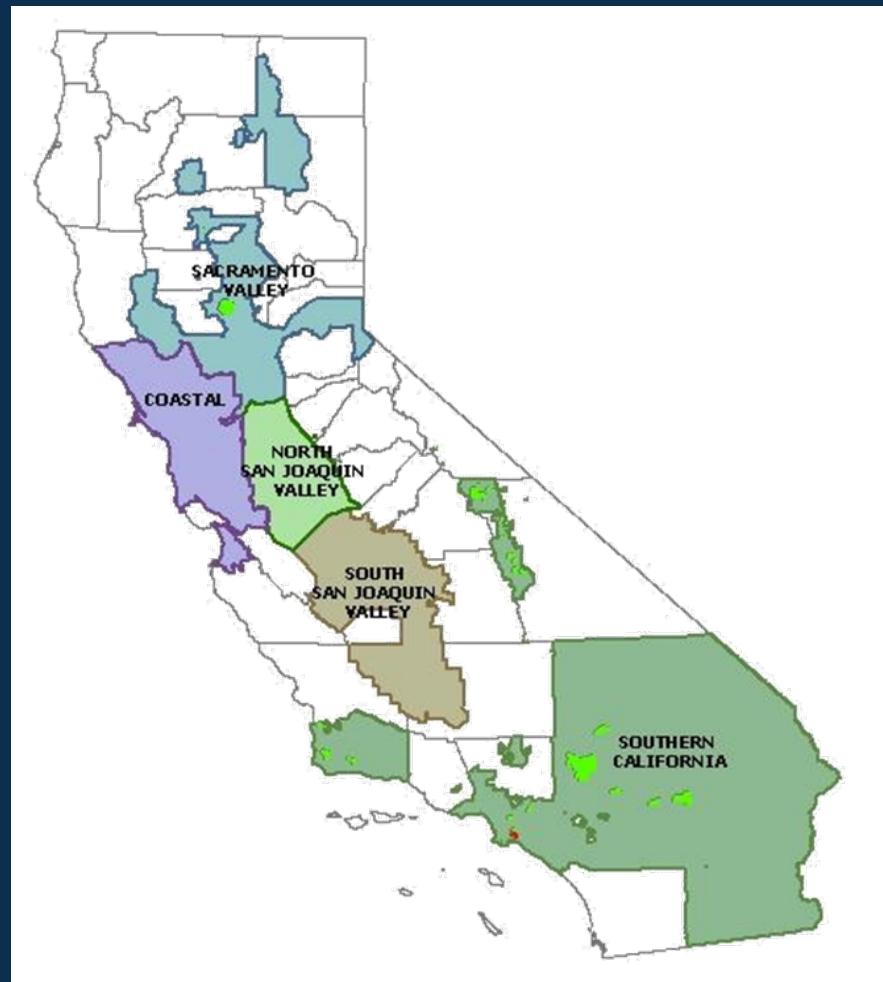


Greater Los Angeles County Vector Control District
Susanne Kluh
Scientific-Technical Director

California Vector Control

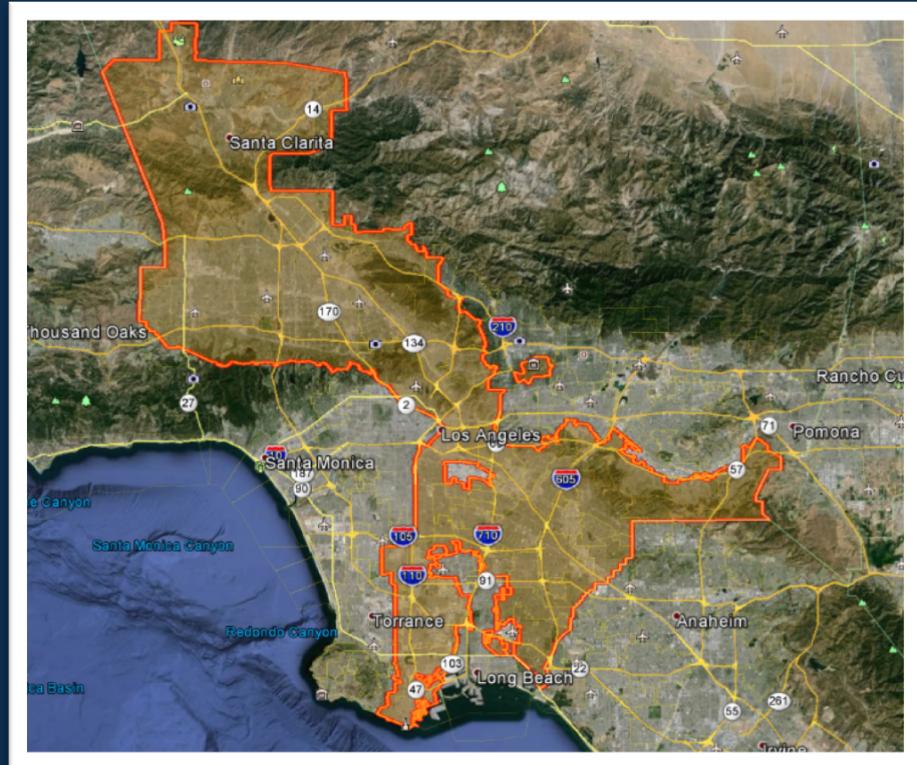
Program Types:

- Independent Special Districts
- City/County Vector Control Programs
- Funding varies
- Services vary
- Over 80 mosquito and vector control programs statewide
- Work closely with CDPH, University of CA
- MVCAC



The District at a Glance

- Independent special district formed under authority of the CA State Health and Safety Code
- Formed in 1952 and governed by a Board of Trustees
- Provides services to 35 cities within Los Angeles County and sections of unincorporated LA County
- Serves approximately 6.8 million residents over 1,340 square miles



What is a Vector?

Any animal or insect that is capable of transmitting a disease or considered a public health nuisance.

Mosquitoes are the most dangerous vector



Mosquito $\frac{3}{8}$ - $\frac{5}{8}$ inches

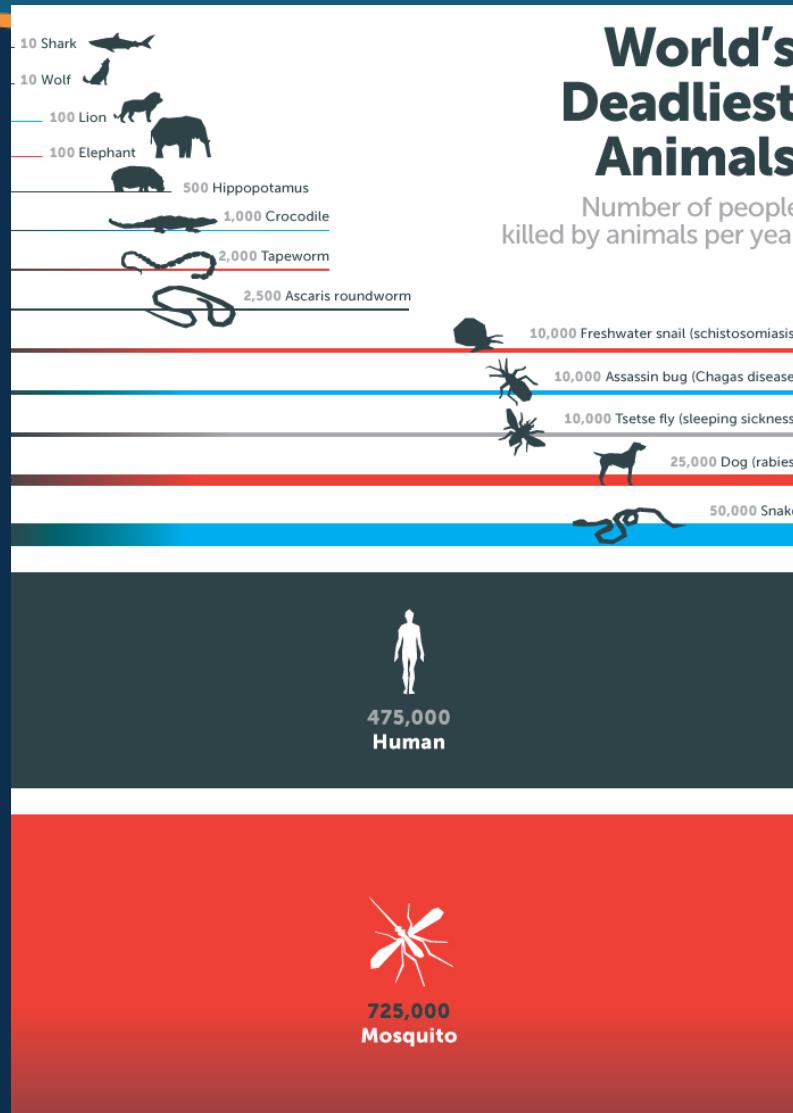


Midge – $\frac{1}{2}$ in.



Black Fly – $\frac{1}{4}$ in.

What is the Deadliest Vector?



Mosquito Lifecycle

Culex/Culiseta



What We're Doing: *Integrated Vector Management (IVM)*

Disease Surveillance

- Mosquito populations
- Disease transmission

Mosquito Management

- Inspections & service requests
- Source reduction / elimination
- Treatments

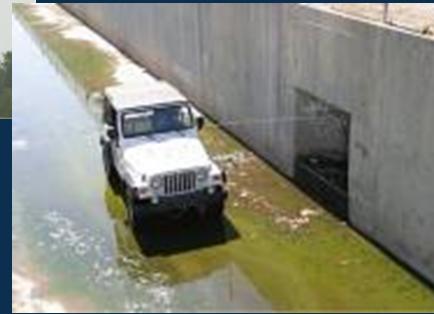
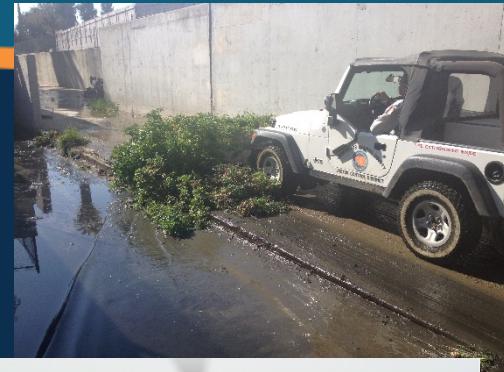
Outreach & Education

- Community events
- Elementary education
- Media alerts



Mosquito Management & IVM

- Physical control
- Chemical control
- Biological control
- Public education



Three Invasive Aedes Mosquitoes in Los Angeles County



Asian tiger mosquito

Australian backyard mosquito



Yellow fever mosquito

Brought in commercially



with pots



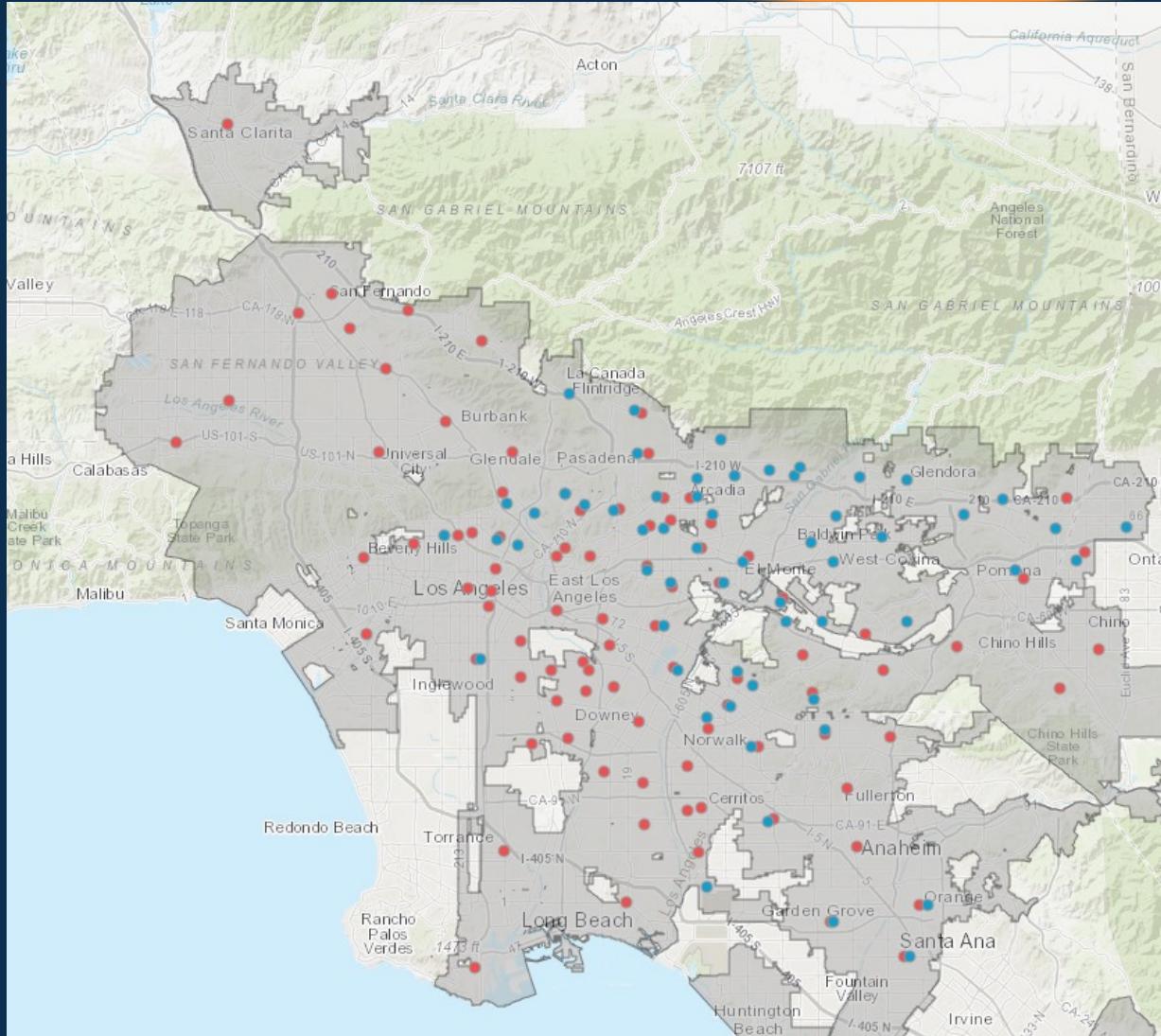
moving with people



and tires



Aedes Distribution in Los Angeles & Orange County



Cities with Aedes

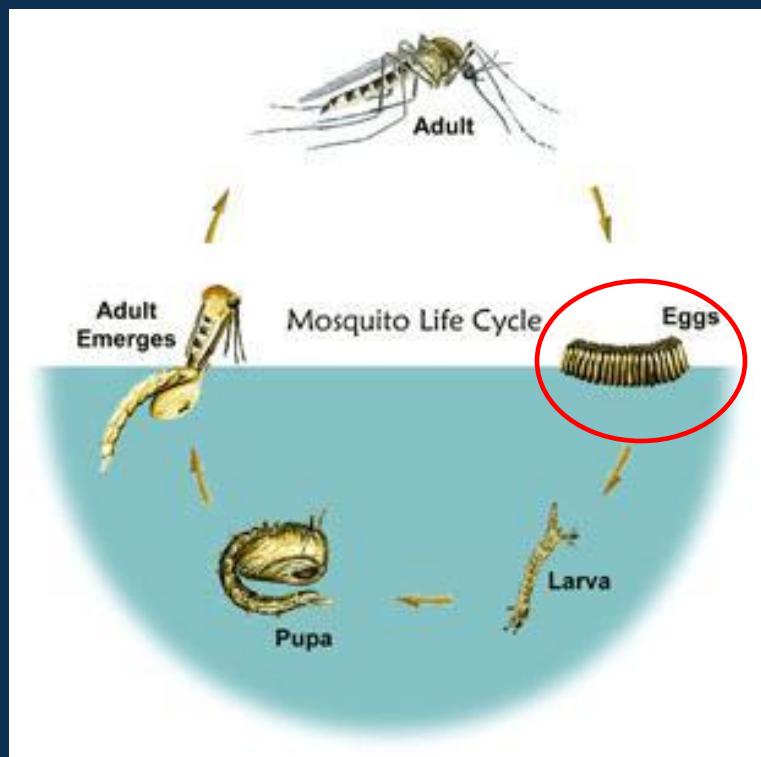
- *Aedes aegypti*
- *Aedes albopictus*

Approximate Aedes Infestation Area

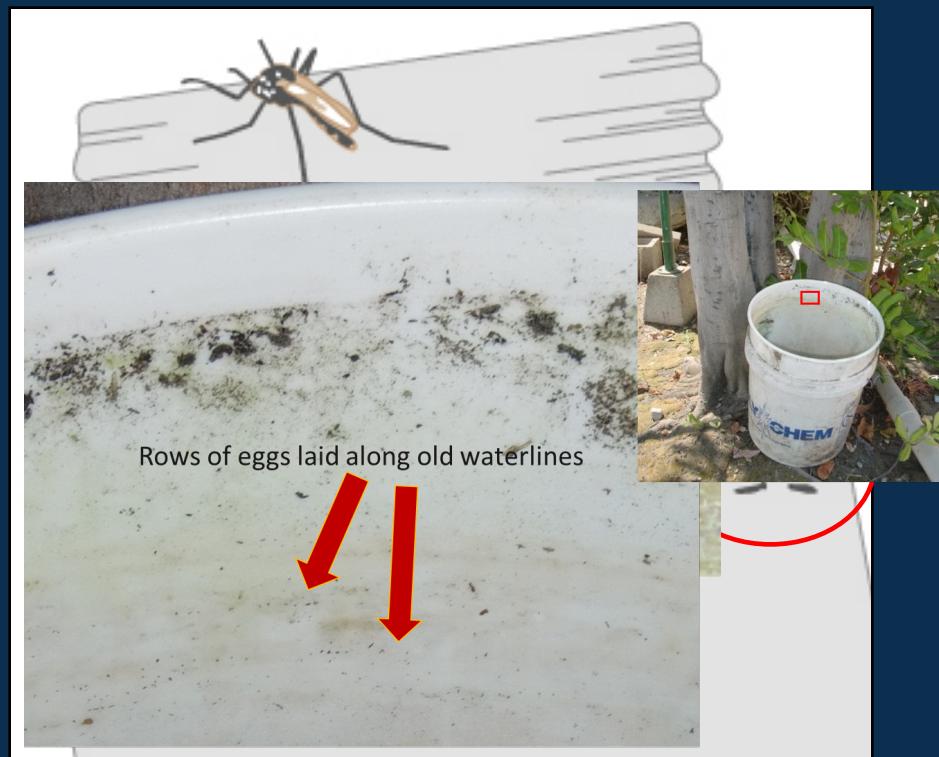


What a Difference an Egg makes: Mosquito Lifecycle

Culex/Culiseta mosquitoes

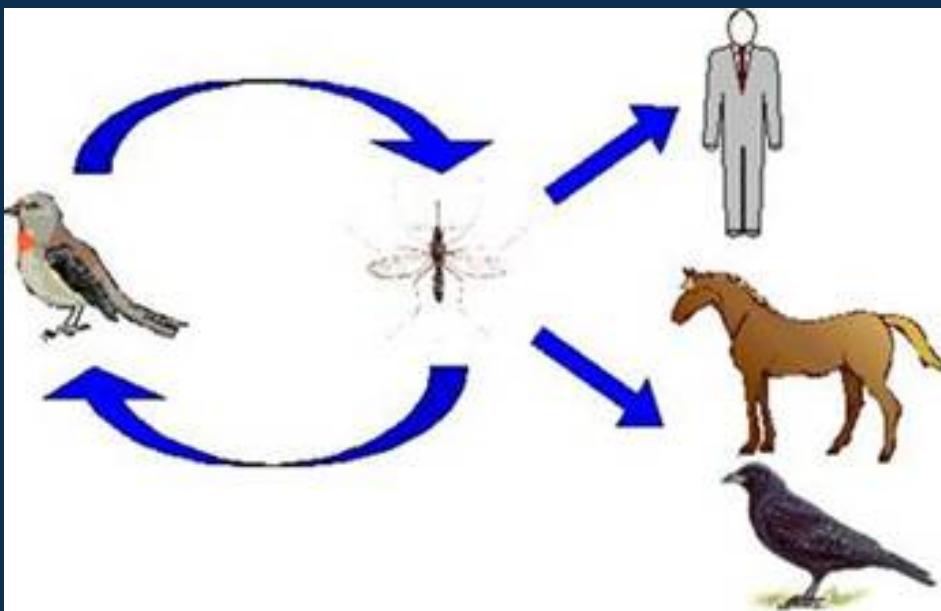


Invasive *Aedes* mosquitoes

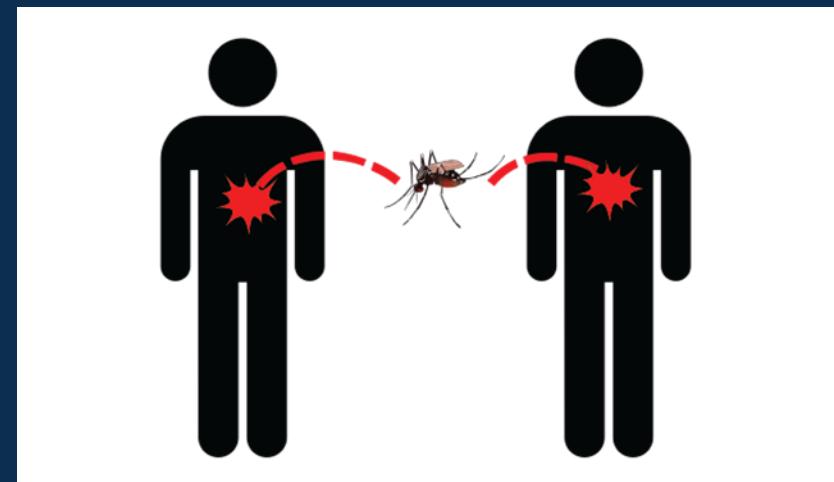


Disease Transmission Cycles

- West Nile Virus (WNV)
- Saint Louise Encephalitis (SLE)
- Western Equine Encephalomyelitis (WEE)



- Dengue
- Chikungunya
- Zika

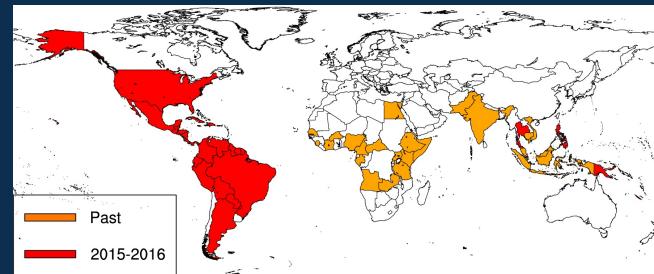
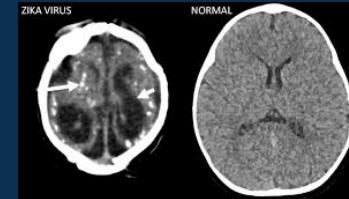


Invasive Aedes & Related Diseases

- Dengue



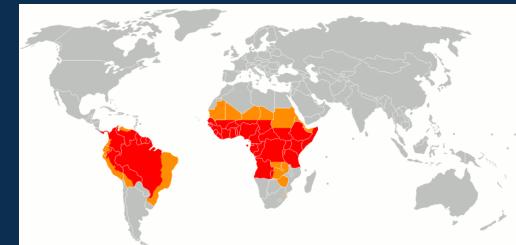
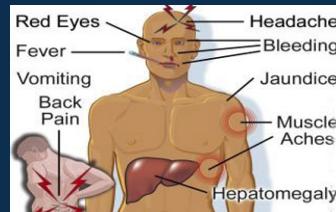
- Zika



- Chikungunya



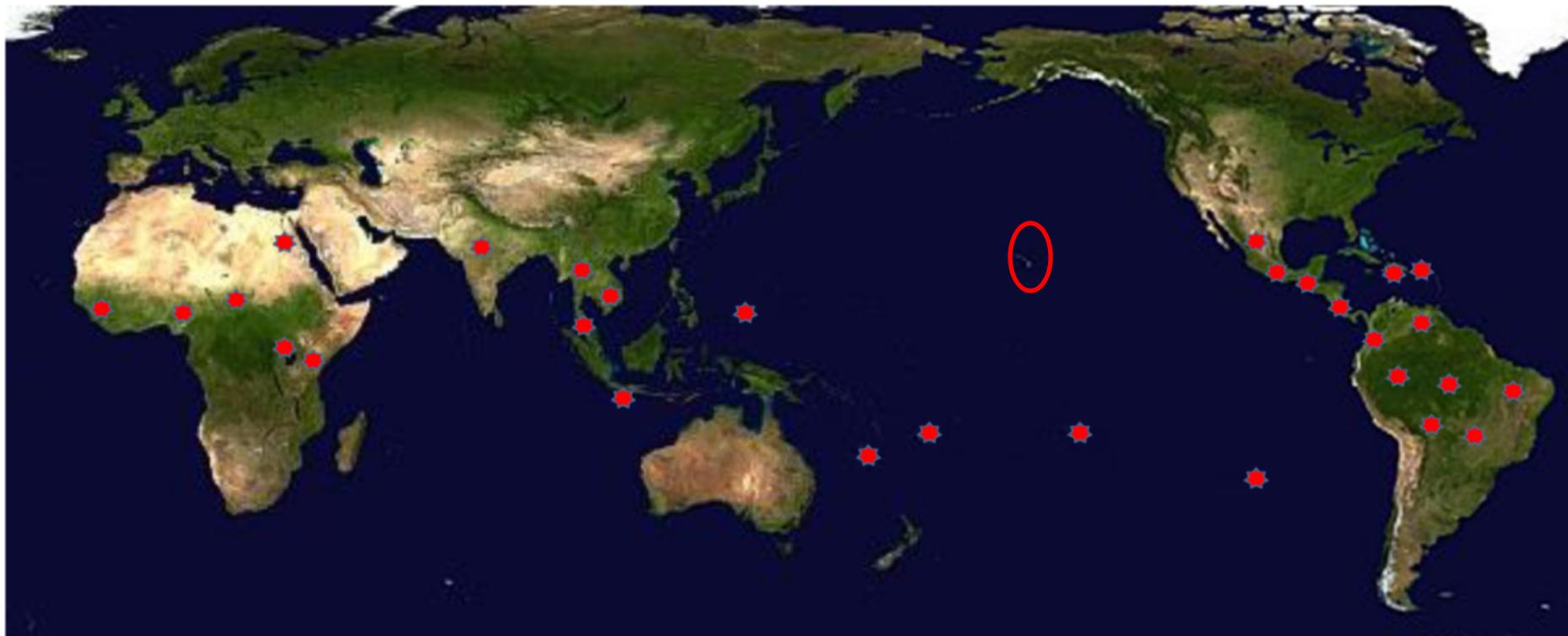
- Yellow Fever



Zika Virus



The Spread of Zika Virus Discovery



1947
Discovery

1954
1st Human

1954-2007
Asia

2007-2014
Pacific

2015
Americas



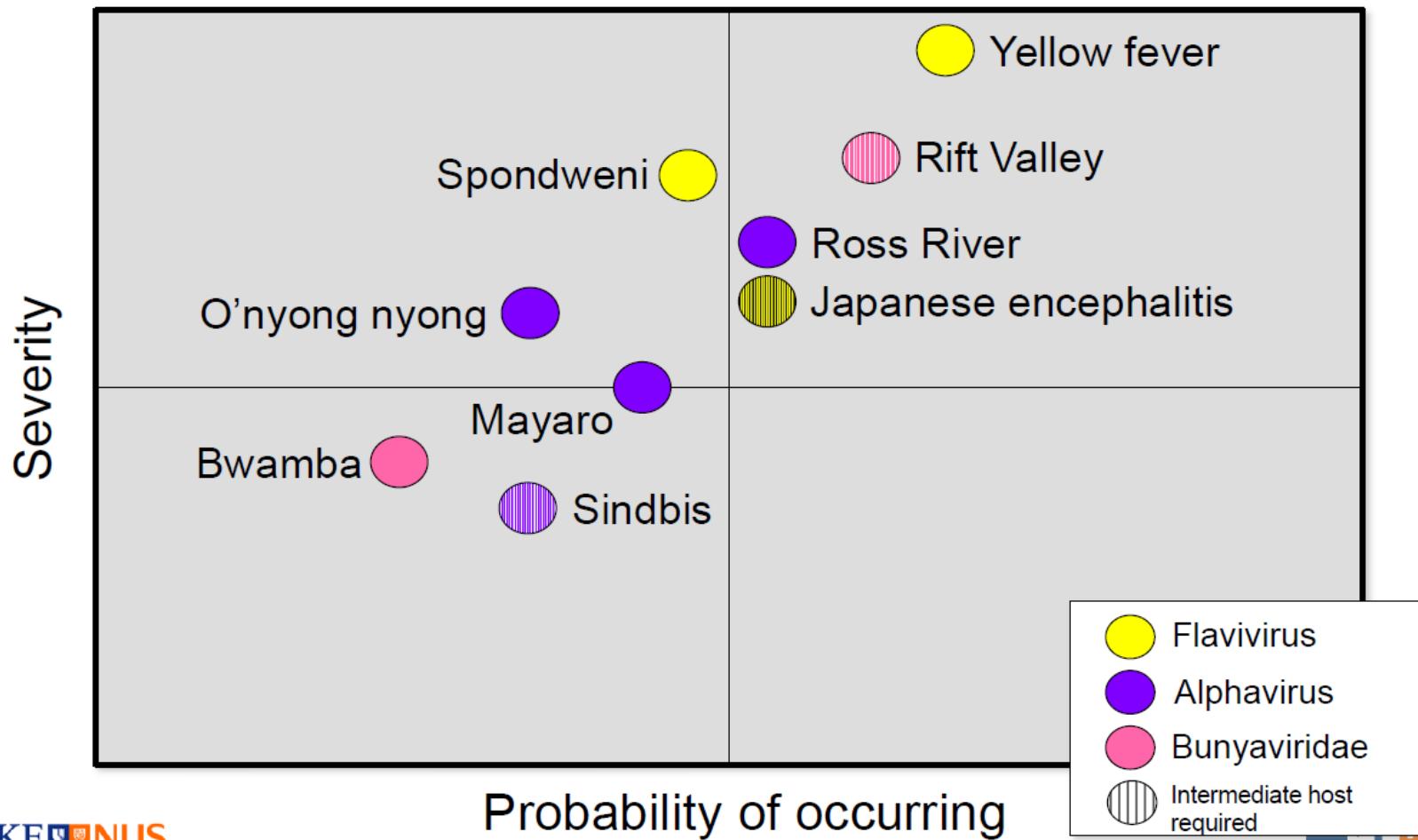
About Zika Virus

- 80% will have no symptoms
- 20% will have mild illness:
 - Fever
 - Rash
 - Joint Pain
 - Conjunctivitis
 - Muscle pain
 - Headache
 - Guillain-Barré Syndrome
 - Encephalitis



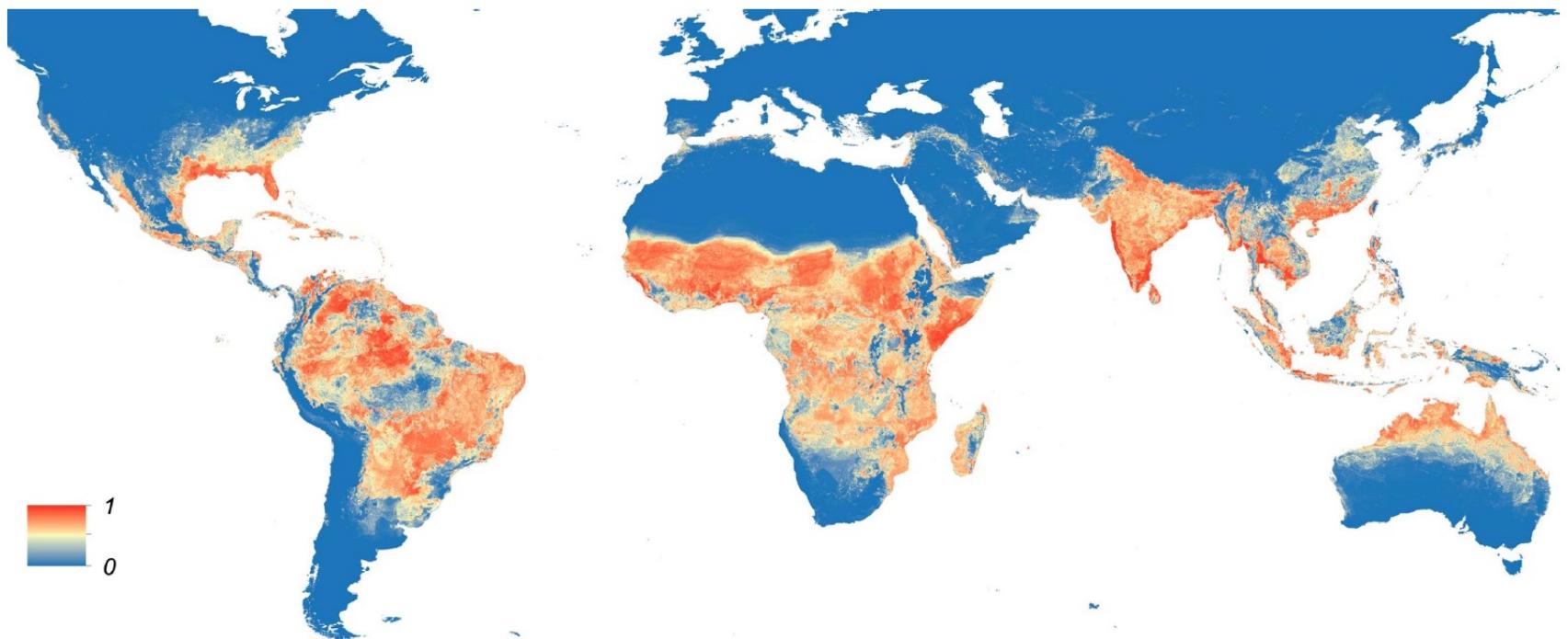
Most significant risk: For pregnant woman and unborn fetus

Other Arboviruses with Potential for Urban Emergence



“A Warming World is a Sicker World”

Actual & Potential Geographic Distribution of *Aedes aegypti*



Kraemer MUG, et alii, eLife 2015;4:e08347

Challenges



Larvicides

Bacillus thuringiensis subsp. *israelensis* (Bti)

Bacillus sphaericus (Bs)

Methoprene

Petroleum Distillates

Spinosad

Adulticides

Deltamethrin

Etofenprox

Malathion

Naled

N-octyl bicycloheptene dicarboximide (MGK-264)

Piperonyl butoxide (PBO)

Permethrin

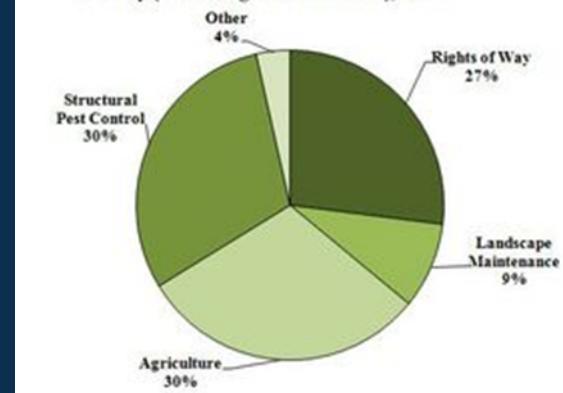
Prallethrin

Pyrethrin

Resmethrin

Sumithrin

Uses of Most Toxic Pesticides in San Mateo County (Excluding Residential Use), 2006



Challenges



Bacillus thuringiensis subsp. *israelensis* (*Bti*)

Bacillus sphaericus (*Bs*)

Methoprene

Petroleum Distillates

Spinosad

Pyriproxyfen

Deltamethrin

Etofenprox

Malathion

Naled

Piperonyl butoxide (PBO)

Permethrin

Prallethrin

Pyrethrin

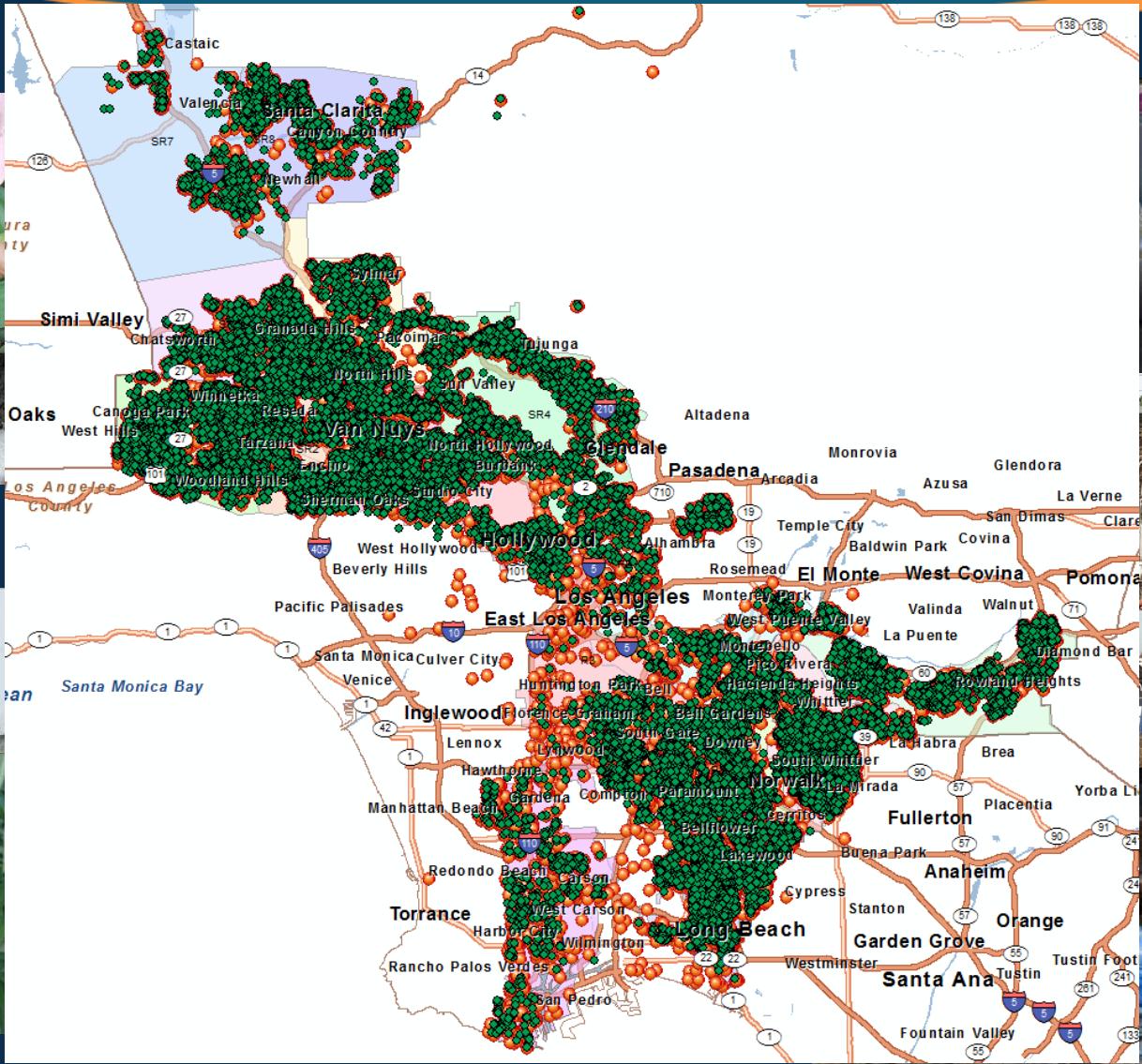
Resmethrin

Sumithrin

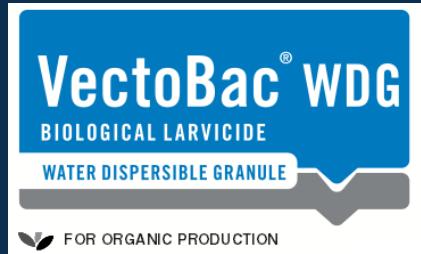
Challenges



Aedes Mosquitoes



Truck-Mounted Larvicide Applications

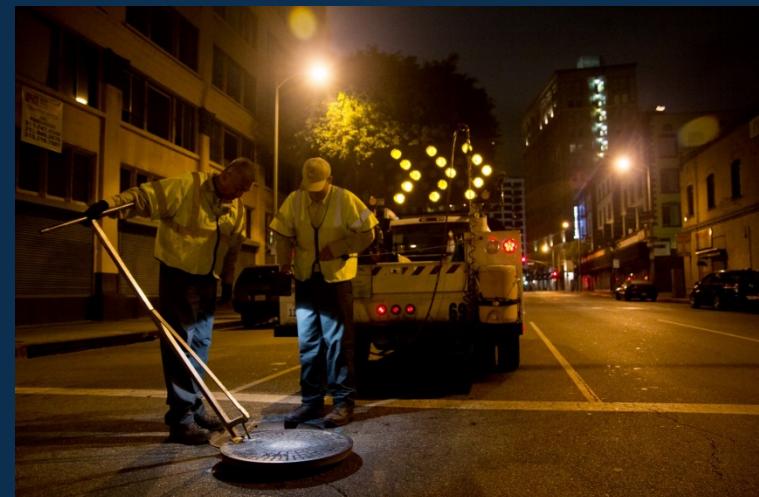
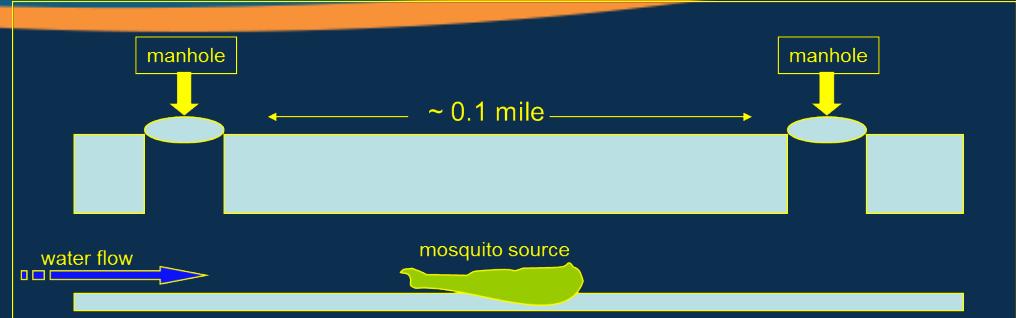


Wide Area Larvicide Spray (WALS)

- Compare equipment: TIFA, LV8, London 1820



Underground Storm Drains



New Approaches *Wolbachia*-based Control Strategies

Population Replacement

- Release of *Wolbachia* infected **females**
- Goal: **infect local populations** of mosquitoes with *Wolbachia*



Sterile Insect Technique (SIT)

- Release of *Wolbachia* infected **males**
- Goal: **reduce mosquito densities** with sterile male releases (similar to insecticides)



Sterile Insect Technique (SIT)

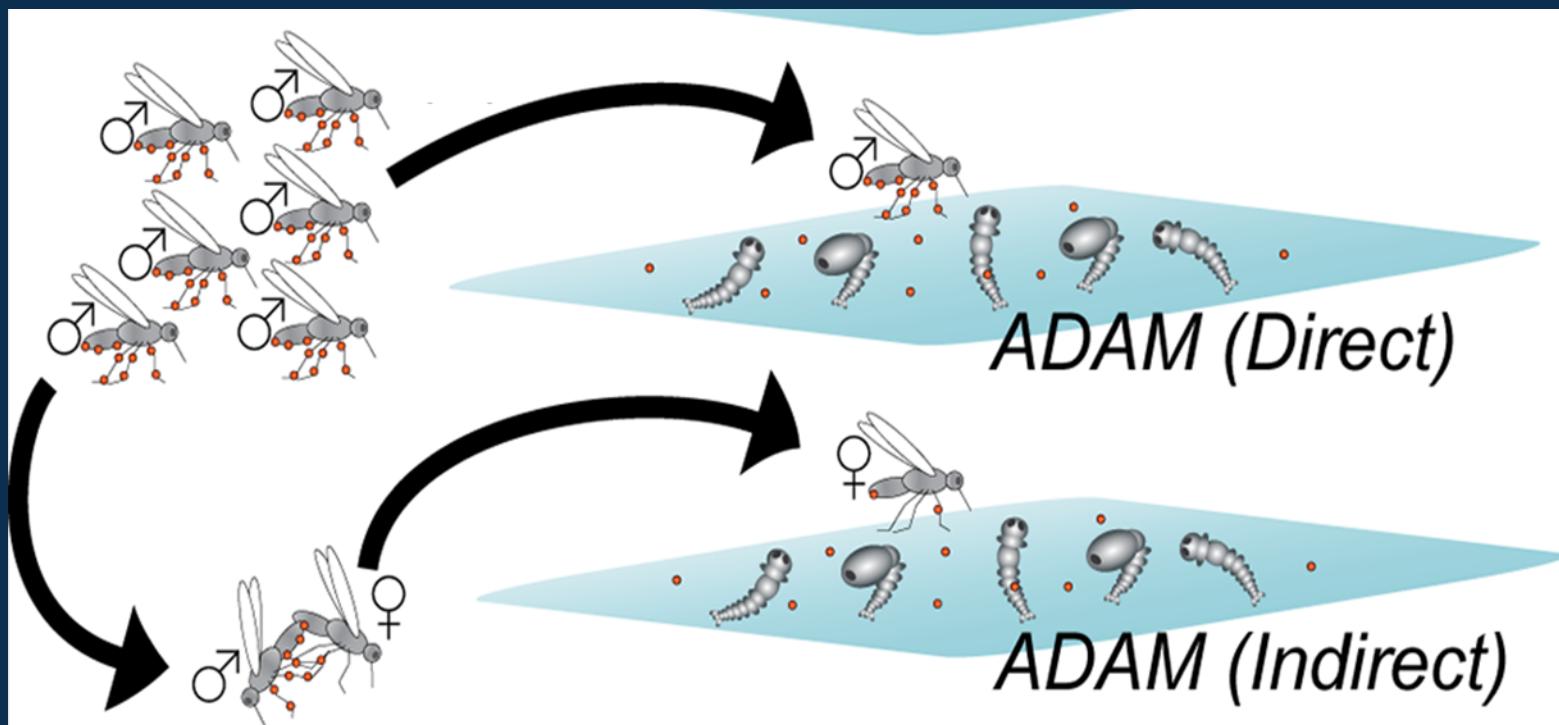
- Release of genetically altered male mosquitoes
- Goal: reduce mosquito densities with sterile male releases (similar to insecticides)



New Approaches

ADAM

Auto-Dissimination (of Pesticide) Augmented by Male Mosquito



Questions?

