Notes From the Field: Expanding Surveillance Related to Zika Virus

February 7, 2018
1:00-2:00 PM (ET)

Council of State and Territorial Epidemiologists

Webinar Housekeeping

- **Today's webinar is being recorded**
  - The webinar recording and presentation slides will be available in the webinar library on CSTE's website: http://www.cste.org/?page=WebinarLibrary
- **All lines have been muted**
- **There will be a question-and-answer session at the end of the webinar**
  - To ask a question, please use the Q&A box on the right side of your screen

Webinar Objectives

Participants will:

- Registrants will be able to describe how public health jurisdictions can collaborate with the US military to expand on surveillance capacities
- Registrants will be able to describe how public health jurisdictions can collaborate with mosquito control districts to expand surveillance and monitoring capacities
- Registrants will be able to describe how public health jurisdictions can use the resources of “citizen scientists” to expand mosquito surveillance and monitoring capacities

Zika Virus Vector Surveillance Activities

LTC Jeffrey Clark, PhD

Entomological Sciences Program
September 2016

Army Entomology

- Army entomological expertise and support found in three core areas:
  - Installation (garrison) IPM
  - Deployed IPM
  - Research and development

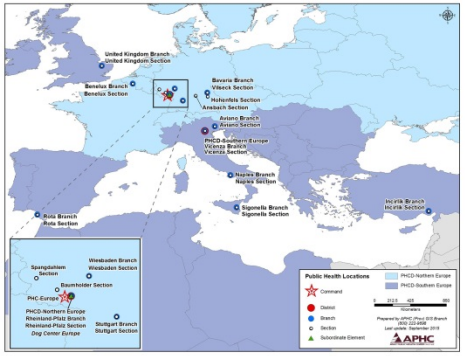
Installation Surveillance

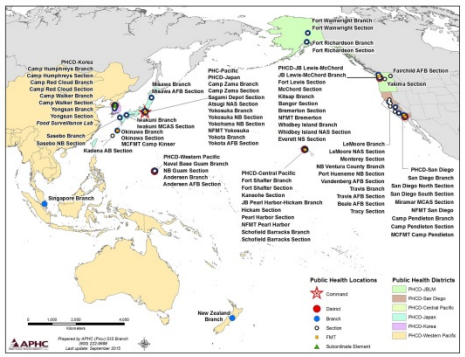
- Hospital environmental section responsible for surveillance on large installations
  - May cover satellite installations
- The responsibility of vector control on installations falls under Army Environmental Command
  - May be contracted out
  - May or may not conduct surveillance
  - May or may not coordinate with hospital environmental shop

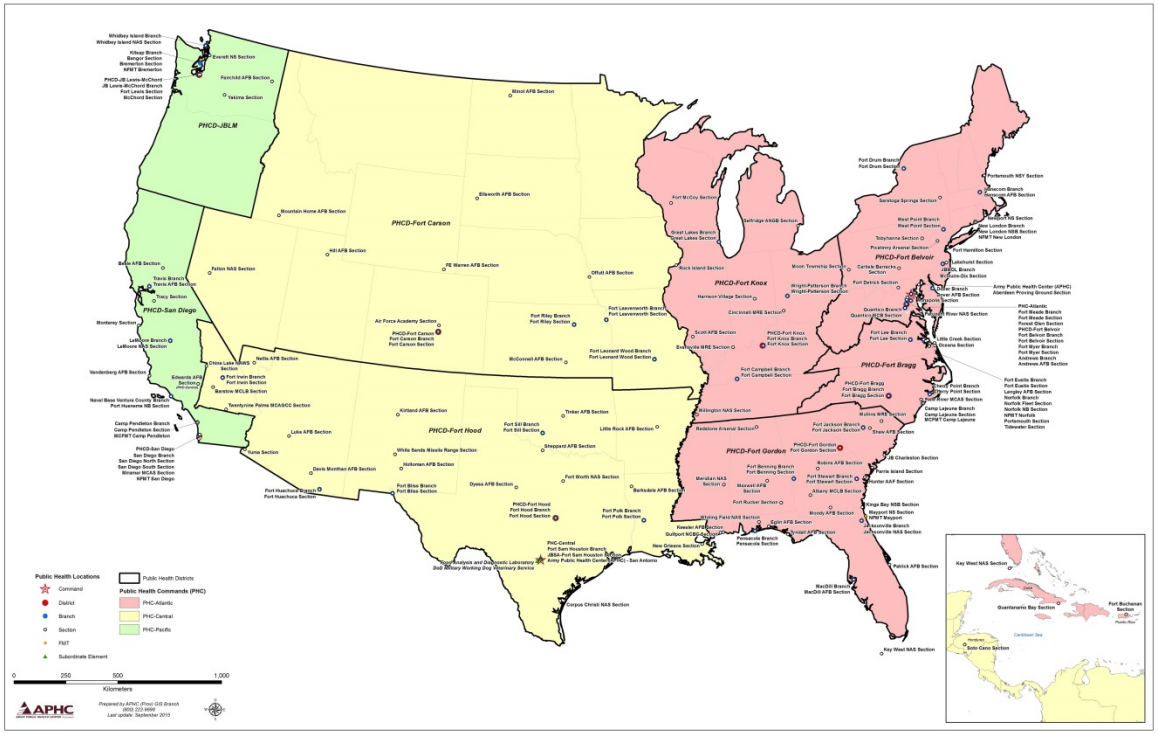
Pathogen Testing and Reporting

- Pathogen testing services provided by Regional Public Health Commands (RPHCs)
  - Installations send collected specimens to supporting Command
    - IDs verified and species tested for appropriate pathogens
  - Results sent to customer
- Testing results sent to Army Public Health Center (APHC) for archival
  - Compliance variable
  - Considerable time lag

Army MEDCOM Public Health







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- In 2016 installations were required to conduct surveillance and submit collections per MEDCOM OPORD 16-37
- Raw data submitted to APHC from Regional PHCs weekly
- APHC provided a monthly report of surveillance activities

ZIKA SURVEILLANCE LOG

Collector: Complete columns A - J
PHC Entomologist: Verify column J and complete columns K - L
PHC Lab: Complete columns M - S
Hold cursor over column headers for comments

COLLECTION INFORMATION									VECTOR ID			TEST RESULTS				LAB PROCESSING		
Date Trap Set	Date Trap Collected	Collection code	State or Province	Installation / Camp / Base	Specific Location/Trap #	Collecting Method/Trap Type	Life Stage Collected	Vector Count	Genus	Species	Identified By	ZIKV	WNV	CHIKV	DENV	Date rec'd by Lab	Lab eLIMS/ LIMS #	Pathogen Testing Organization
19-Apr-16			GUAM	Naval Base Guam	2	CDC/CO2	Adult	1	Aedeomyia	catasticta		NT	NT	NT	NT			PHC-Pacific
18-Jul-16	19-Jul-16	HILL-16-0001	Virginia	A.P. Hill, Fort	30	BG Sentinel trap/ Day	Adult	1	Aedes	albopictus		ND	NT	ND	ND	25-Jul-16		PHC-Atlantic
18-Jul-16	19-Jul-16	HILL-16-0002	Virginia	A.P. Hill, Fort	30	BG Sentinel trap/ Day	Adult	4	Aedes	albopictus		ND	NT	ND	ND	25-Jul-16		PHC-Atlantic
18-Jul-16	19-Jul-16	HILL-16-0004	Virginia	A.P. Hill, Fort	33	BG Sentinel trap/ Day	Adult	1	Aedes	albopictus		ND	NT	ND	ND	25-Jul-16		PHC-Atlantic
25-Jul-16	26-Jul-16	HILL-16-0005	Virginia	A.P. Hill, Fort	30	BG Sentinel trap/ Day	Adult	9	Aedes	albopictus		ND	NT	ND	ND	29-Jul-16		PHC-Atlantic
25-Jul-16	26-Jul-16	HILL-16-0006	Virginia	A.P. Hill, Fort	30	BG Sentinel trap/ Day	Adult	15	Aedes	albopictus		ND	NT	ND	ND	29-Jul-16		PHC-Atlantic
1-Aug-16	2-Aug-16	HILL-16-0008	Virginia	A.P. Hill, Fort	36	BG Sentinel trap/ Day	Adult	9	Aedes	albopictus		ND	NT	ND	ND	9-Aug-16		PHC-Atlantic
18-Jul-16	19-Jul-16	APGA-16-0023	Maryland	Aberdeen Proving Ground, Aberdeen	8	BG Sentinel trap/ Day	Adult	1	Aedes	albopictus		ND	NT	ND	ND	29-Jul-16		PHC-Atlantic
28-Jun-16	29-Jun-16	APGE-16-0002	Maryland	Aberdeen Proving Ground, Edgewood	5	BG Sentinel trap/ Day	Adult	1	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
12-Jul-16	13-Jul-16	APGE-16-0008	Maryland	Aberdeen Proving Ground, Edgewood	4	BG Sentinel trap/ Day	Adult	3	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
18-Jul-16	19-Jul-16	APGE-16-0009	Maryland	Aberdeen Proving Ground, Edgewood	4	BG Sentinel trap/ Day	Adult	1	Aedes	albopictus		ND	NT	ND	ND	29-Jul-16		PHC-Atlantic
12-Apr-16			Hawaii	Aliamanu Military Reservation	5	BG Sentinel	Adult	1	Aedes	albopictus		NT	NT	NT	NT			PHC-Pacific
14-Apr-16			Hawaii	Aliamanu Military Reservation	5	BG Sentinel	Adult	1	Aedes	albopictus		NT	NT	NT	NT			PHC-Pacific
5-May-16			Hawaii	Aliamanu Military Reservation	4	BG Sentinel/CO2	Adult	1	Aedes	albopictus		NT	NT	NT	NT			PHC-Pacific
5-May-16			Hawaii	Aliamanu Military Reservation	5	BG Sentinel/CO2	Adult	2	Aedes	albopictus		NT	NT	NT	NT			PHC-Pacific
9-Jun-16			Hawaii	Aliamanu Military Reservation	3	BG Sentinel	Adult	1	Aedes	albopictus		NT	NT	NT	NT			PHC-Pacific
9-Jun-16			Hawaii	Aliamanu Military Reservation	3	BG Sentinel	Adult	2	Aedes	albopictus		NT	NT	NT	NT			PHC-Pacific
9-Jun-16			Hawaii	Aliamanu Military Reservation	5	BG Sentinel	Adult	2	Aedes	albopictus		Pending	NT	Pending	Pending			PHC-Pacific
26-Jun-16	27-Jun-16	ANNX-16-0024	District of Columbia	Anacostia Annex	6	Gravid Trap CDC John Hocl	Adult	1	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
2-Aug-16	3-Aug-16	ANNX-16-0072 1	District of Columbia	Anacostia Annex	6	BG Sentinel trap/ Day	Adult	1	Aedes	albopictus		ND	NT	ND	ND	9-Aug-16		PHC-Atlantic
18-Jul-16	19-Jul-16	ANSC-16-1000	Virginia	Arlington Naval Service Center	2	Gravid Trap CDC John Hocl	Adult	1	Aedes	albopictus		ND	NT	ND	ND	26-Jul-16		PHC-Atlantic
8-Jun-16	9-Jun-16	AFRH-16-0008	District of Columbia	Armed Forces Retirement Home	2	Gravid Trap CDC John Hocl	Adult	1	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
15-Jun-16	16-Jun-16	AFRH-16-0017	District of Columbia	Armed Forces Retirement Home	2	Gravid Trap CDC John Hocl	Adult	3	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
6-Jul-16	7-Jul-16	AFRH-16-0025	District of Columbia	Armed Forces Retirement Home	1	BG Sentinel trap/ Day	Adult	3	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
6-Jul-16	7-Jul-16	AFRH-16-0030	District of Columbia	Armed Forces Retirement Home	2	BG Sentinel trap/ Day	Adult	5	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
13-Jul-16	14-Jul-16	AFRH-16-0033	District of Columbia	Armed Forces Retirement Home	2	BG Sentinel trap/ Day	Adult	3	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
27-Jul-2016	28-Jul-2016	AFRH-16-0041	District of Columbia	Armed Forces Retirement Home	1	BG Sentinel trap/ Day	Adult	1	Aedes	albopictus		ND	NT	ND	ND	4-Aug-2016		PHC-Atlantic
31-May-16	1-Jun-16	BELV-16-0003	Virginia	Belvoir, Fort	13	Gravid Trap CDC John Hocl	Adult	1	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
31-May-16	1-Jun-16	BELV-16-0009	Virginia	Belvoir, Fort	21	Gravid Trap CDC John Hocl	Adult	2	Aedes	sp		ND	NT	ND	ND			PHC-Atlantic
6-Jun-16	7-Jun-16	BELV-16-0014	Virginia	Belvoir, Fort	18	Gravid Trap CDC John Hocl	Adult	1	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
7-Jun-16	8-Jun-16	BELV-16-0064	Virginia	Belvoir, Fort	11	BG Sentinel trap/ Day	Adult	3	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
7-Jun-16	8-Jun-16	BELV-16-0065	Virginia	Belvoir, Fort	23	BG Sentinel trap/ Day	Adult	4	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic
7-Jun-16	8-Jun-16	BELV-16-0066	Virginia	Belvoir, Fort	22	BG Sentinel trap/ Day	Adult	2	Aedes	albopictus		ND	NT	ND	ND			PHC-Atlantic

Installations Submitting Data

RHC Atlantic

Yellow=Zika vectors collected

Fort A.P. Hill, VA
Aberdeen Proving Ground, Aberdeen, MD
Aberdeen Proving Ground, Edgewood, MD
Anacostia Annex, DC
Arlington Naval Service Center, VA
Armed Forces Retirement Home, DC
Fort Belvoir, VA
Fort Benning, GA
Bolling Air Force Base, DC
Fort Bragg, NC
Fort Buchanan, Puerto Rico
Fort Campbell KY
Carlisle Barracks, PA
Clay National Guard, GA
Def. Distr. Depot, Susquehanna PA
Defense Supply Center, Columbus, OH
Defense Supply Center, Richmond, VA
Fort Eustis, VA
Guantanamo Bay Naval Base, Cuba
Fort Hamilton, NY
Henderson Hall Marine Corps Battalion, VA
Fort Indiantown Gap, PA
Fort Jackson, MS
Laurel Bay Military Housing, SC
Fort Lee, VA
Camp Lejeune, SC
Letterkenny Army Weapons Depot, PA
Marine Barracks, DC
Marine Corps Air Station, Beaufort, SC
Marine Corps Recruit Depot, Parris Island, SC
Fort McNair, DC
Fort Meade, MD
Fort Myer, VA
Jacksonville Naval Air Station, FL
Whiting Field Naval Air Station, FL
Naval Branch Health Clinic, Cherry Point, NC
Naval Branch Health Clinic, Gulfport, MS
Naval Branch Health Clinic, Meridian MS
Naval Branch Health Clinic, Panama City, FL
Naval Health Clinic, Annapolis, MD
Naval Hospital, Beaufort, SC
Naval Hospital, Pensacola, FL
Naval Observatory, DC
Naval Support Activity, Mechanicsburg PA
Naval Support Center, Carderock, MD

Navy Research Laboratory, DC
Fort Pickett, VA
Quantico Marine Corps Base, VA
Redstone Arsenal, AL
Fort Rucker, AL
Fort Stewart, GA
Fort Story, VA
Walter Reed NMMC, MD
Walter Reed, Forest Glen, MD
Walter Reed, Glen Haven, MD
Washington Navy Yard, DC

47 Army
26 Navy
3 Air Force

RHC Central

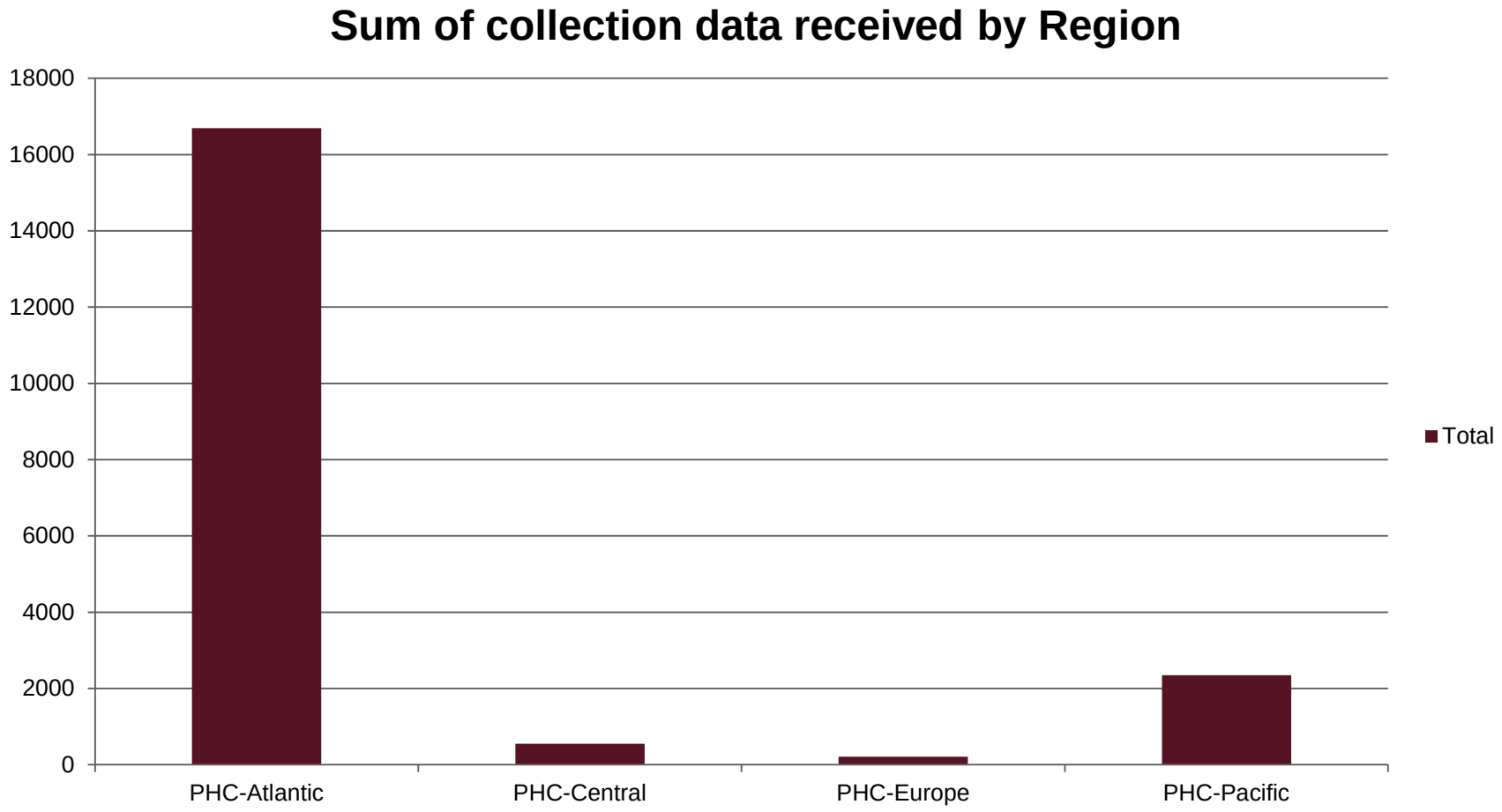
Camp Bullis, TX
Fort Hood, TX
Fort Bliss, TX
Fort Polk, LA
Fort Riley, KS
Fort Huachuca, AZ
Fort Sill, OK
Fort Sam Houston, TX
Lackland AFB, TX
Randolf AFB, TX
Red River Army Depot, TX

RHC Pacific

Aliamanu Military Reservation, HI
East Range, HI
Fort Shafter, HI
Helemano Military Reservation, HI
Keaukaha Military Reservation, HI
Kilauea Military Camp, HI
Naval Base Guam
Schofield Barracks, HI
Tripler Army Medical Center, HI
Wheeler Army Airfield, HI

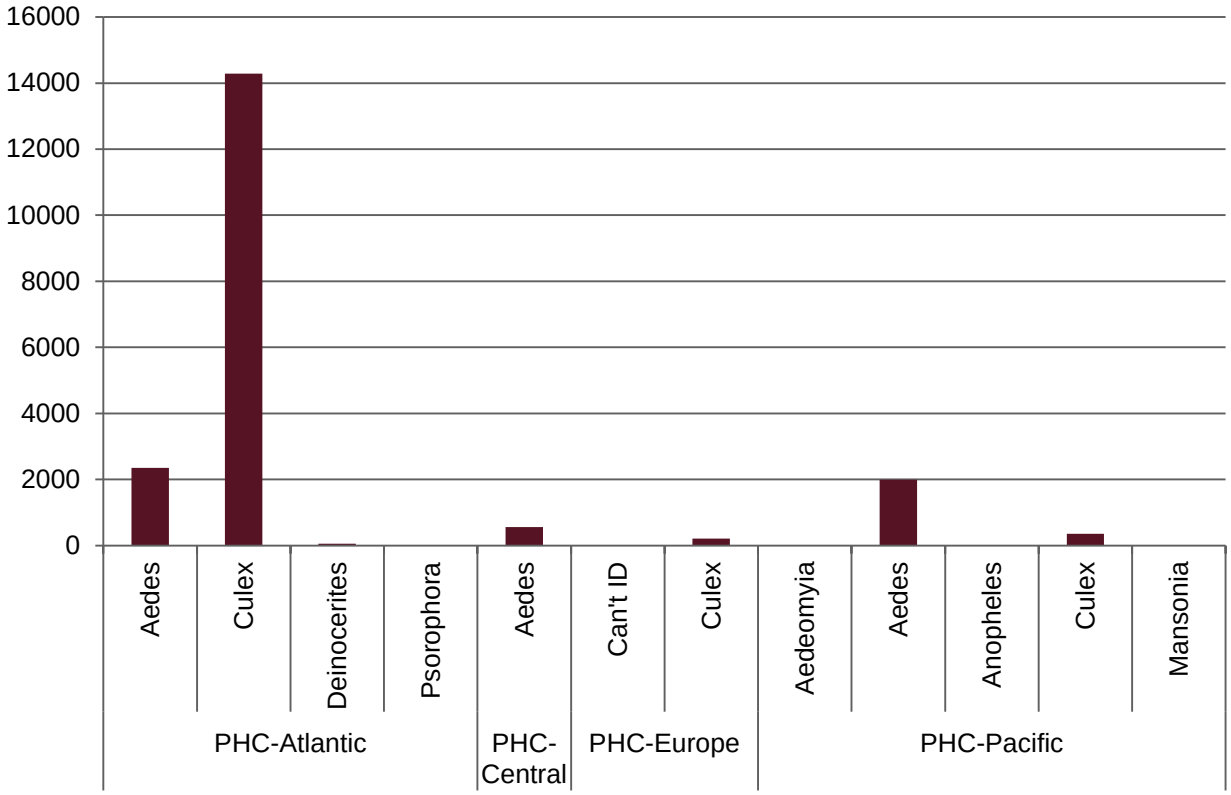
RHC Europe

Caserma Ederle, Italy


Sum of collection data received by Region
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
PHC-Atlantic
PHC-Central
PHC-Europe
PHC-Pacific
Total

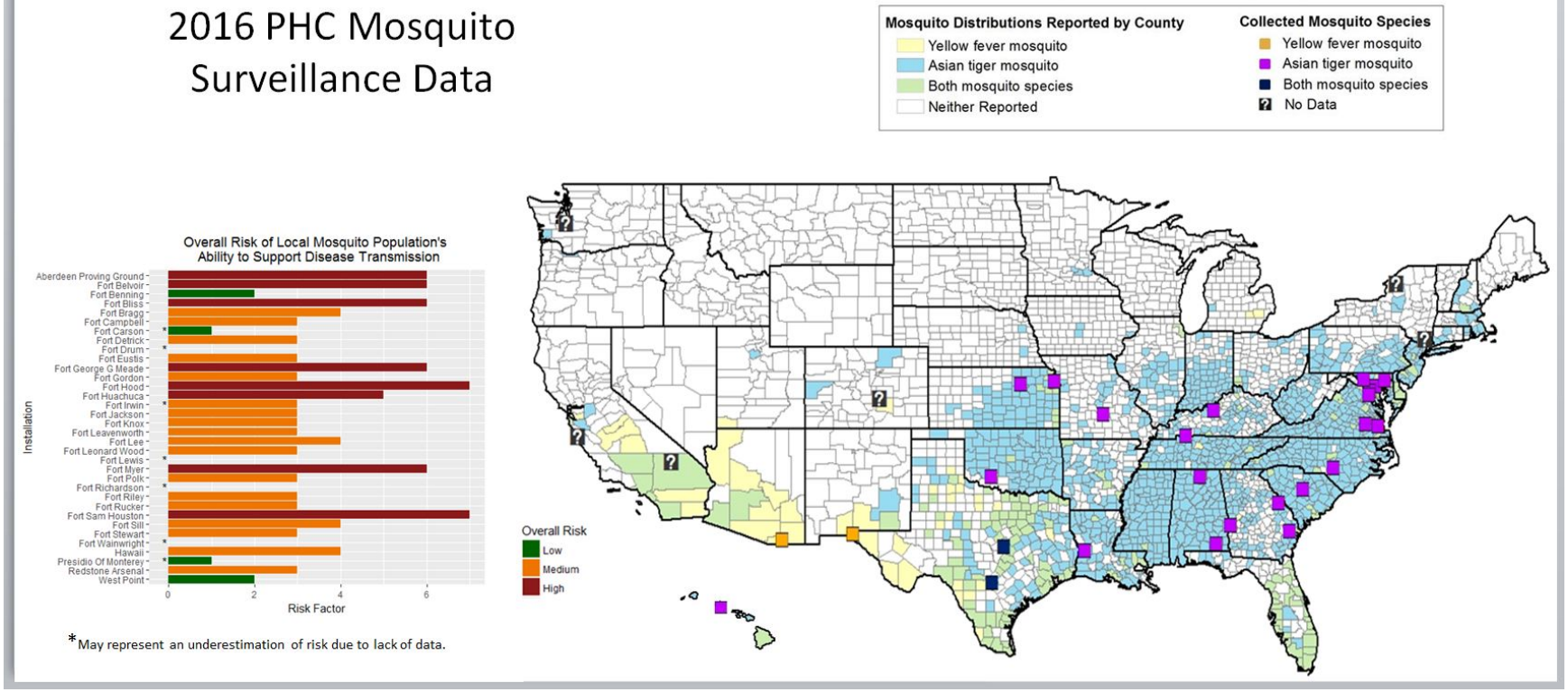
8

Total Numbers Submitted to PHC Labs for Testing by Genus



Genus by Region	Total
PHC-Atlantic	**16695**
Aedes	2351
Culex	14289
Deinocerites	53
Psorophora	2
PHC-Central	**553**
Aedes	553
PHC-Europe	**210**
Can't ID	5
Culex	205
PHC-Pacific	**2349**
Aedeomyia	1
Aedes	1992
Anopheles	3
Culex	352
Mansonia	1
Grand Total	**19807**

2016 PHC Mosquito Surveillance Data



Deployment Entomology

- Contingency/Defense Support to Civil Authorities operations
- Responsibility of “line” units that fall under Forces Command
- These Medical Detachments are housed on installations but are NOT responsible for any surveillance activities while on “home station”
  - Mission is to be prepared to deploy
  - May provide assistance in garrison to keep soldiers trained
- While deployed they are responsible for all surveillance and control activities on basecamps
  - Deployments may be overseas or in support of Joint Task Forces, e.g JTF-Katrina
- Data not captured externally for archival—HUGE GAP

R&D: WRAIR/WRBU

Walter Reed Army Institute of Research, Walter Reed Biosystematics Unit

- Interagency partnership with National Museum of Natural History, Smithsonian Institution
  - Identification resources
    - Traditional taxonomic tools
    - Molecular tools
  - Bionomic information
  - Mapping and modeling
    - Vector Hazard Reports
    - Surveillance data management
- Services provided to the DoD and partners with others through the Smithsonian
  - NEON: National Ecological Observation Network

Summary

- Rather disjointed entomological surveillance efforts
  - R&D community—detailed surveillance but limited to projects
  - Installation surveillance and control may or may not intersect
  - Operational surveillance often not captured
- During outbreak, Army would conduct surveillance on installations, may provide technical support through deployment of a MED DET but role is generally to cover down on areas occupied by troops
- Bottom line: We could probably benefit more from leveraging you than you leveraging us
  - R&D community could provide backdrop:
    - Utilize VectorMap to combine Army data with State/local data
    - Field Data Submission system?

Questions?

Collaborating with Mosquito Control Districts

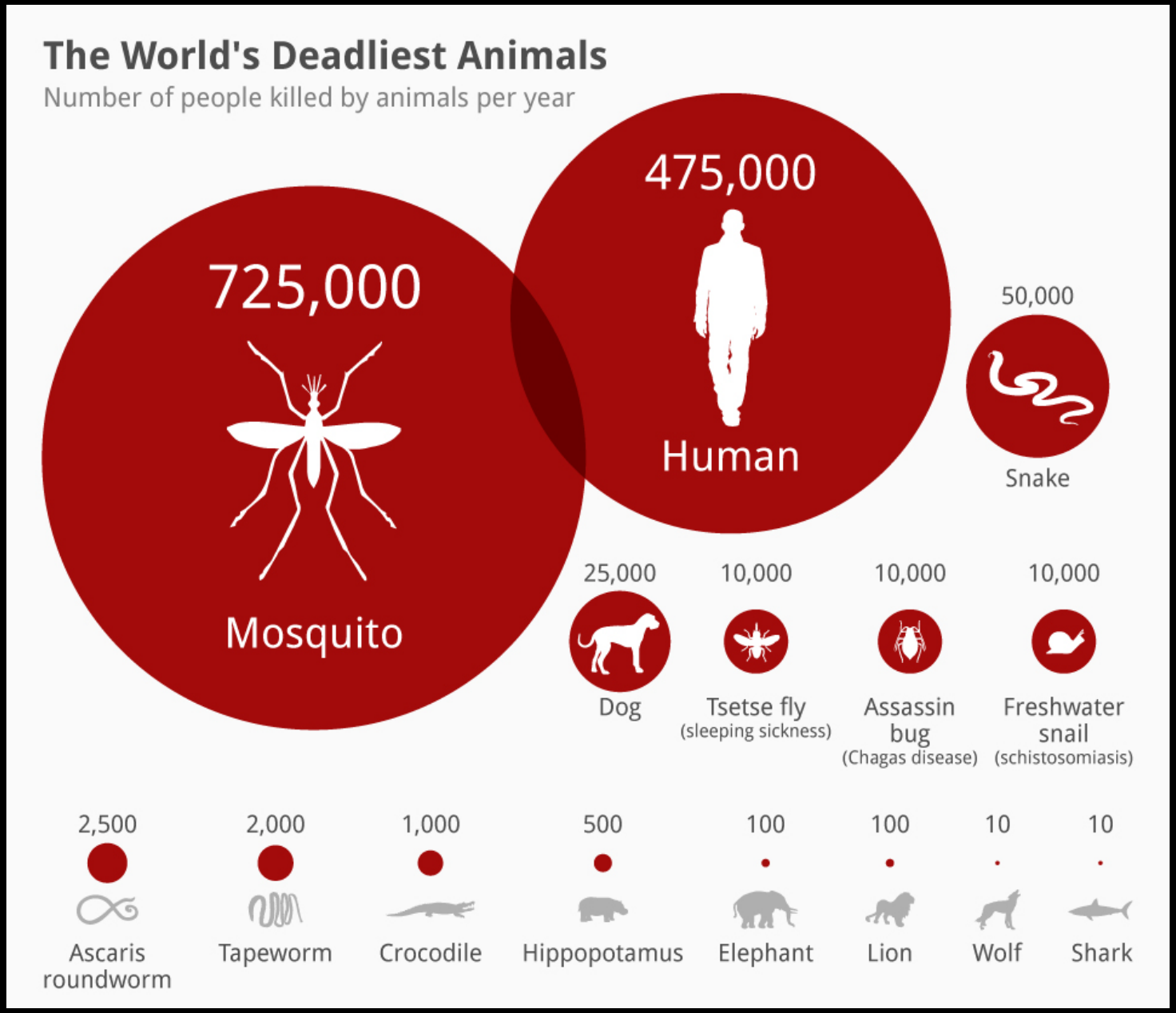
Ary Faraji, PhD

“Expanding Surveillance Related to Zika Virus”

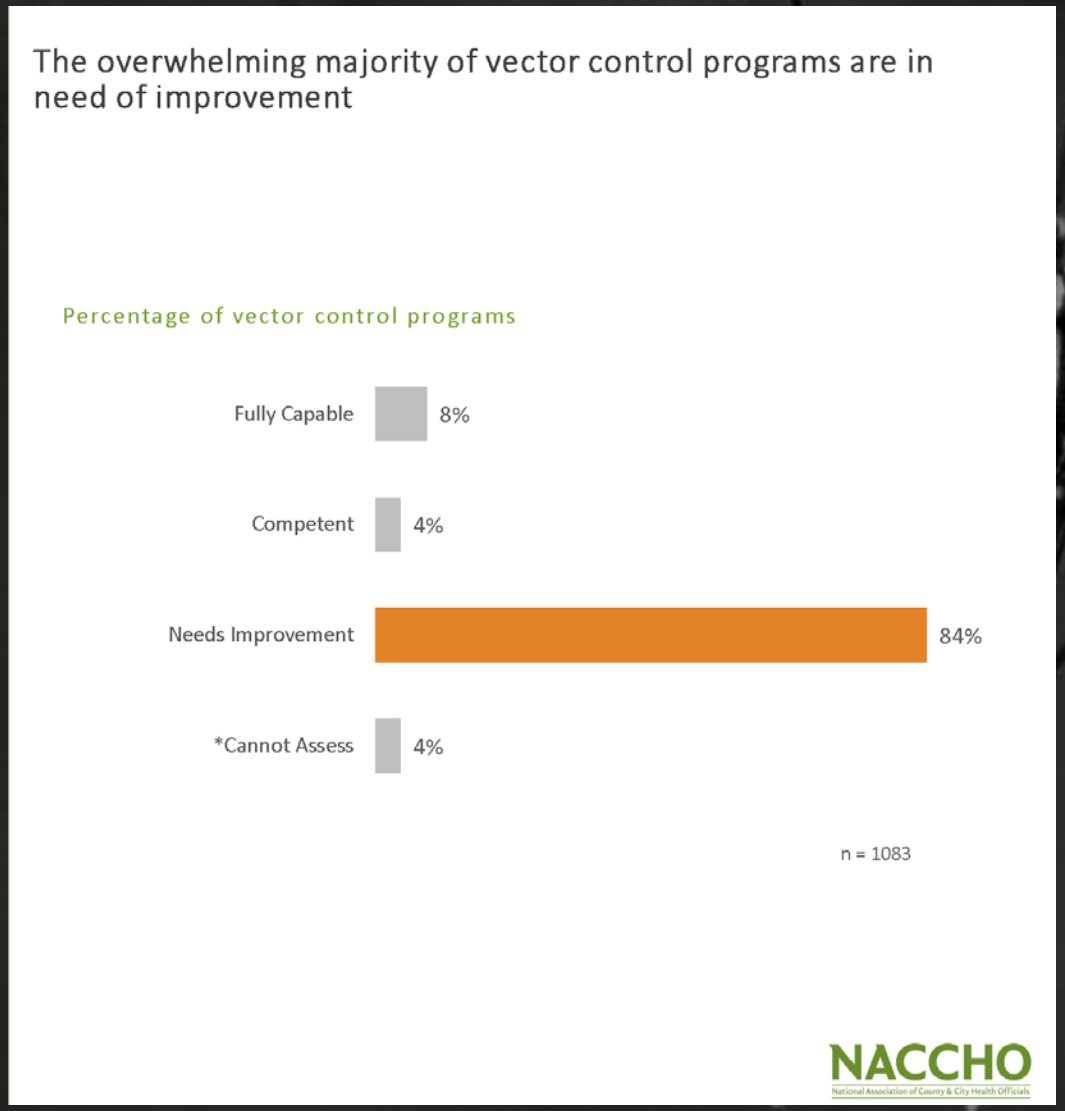
Council of State and Territorial Epidemiologists

7 February 2018

Mosquitoes are Deadly

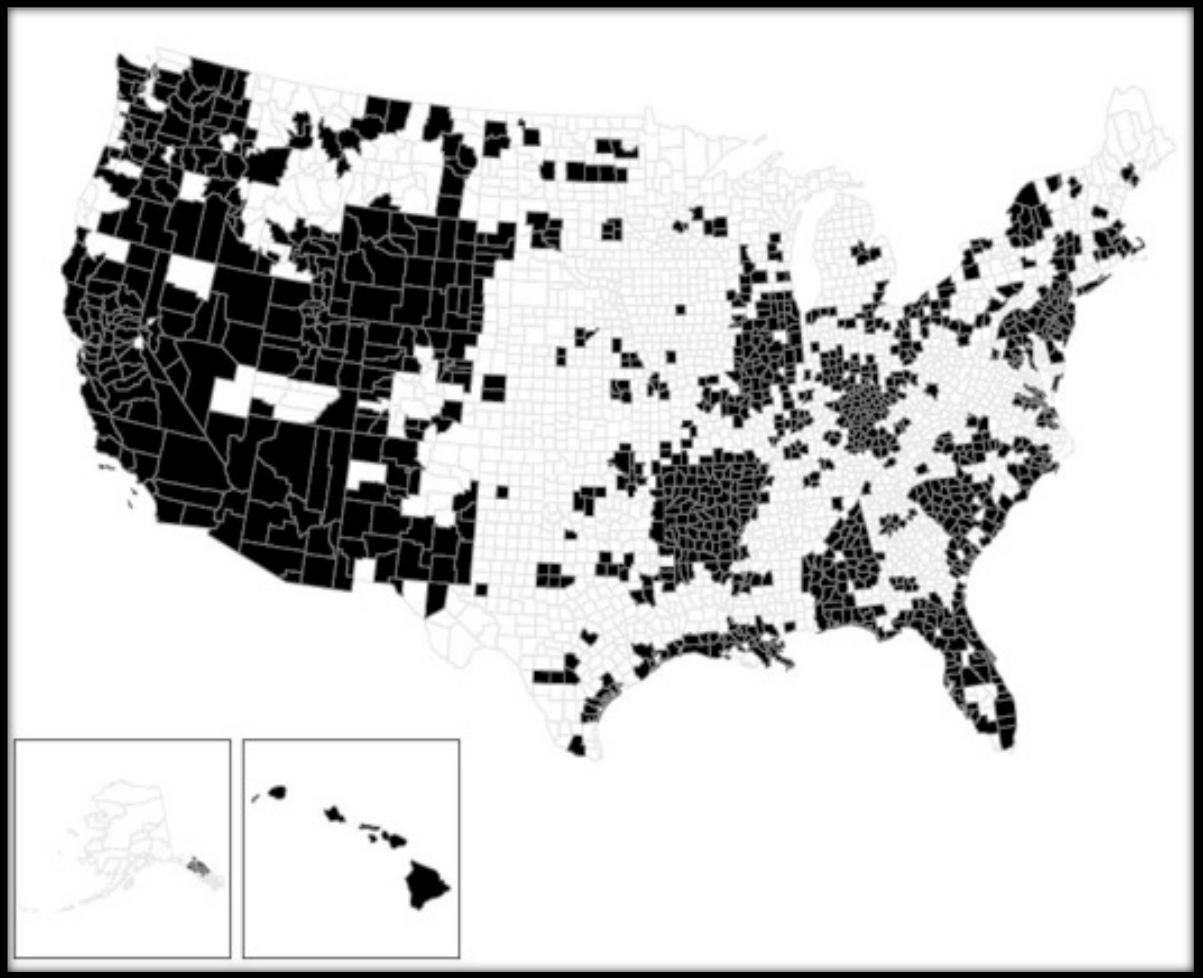


Mosquito Control Capabilities in the U.S.
NACCHO – October 2017



www.naccho.org/uploads/downloadable-resources/Mosquito-control-in-the-U.S.-Report.pdf

US Mosquito Control Programs



- Independent taxing districts
- County/City/Parish (Health Dept)
- Decentralized (DOT/DPW)
- Private

>950 ($400 mil) Government MCP's

FL >60 (~$165 mil); CA >80 (~$75 mil); LA 25 (~$35 mil); NJ 21 (~$12 mil)

Two Basic Types of Government Programs:

Dependent **Independent**

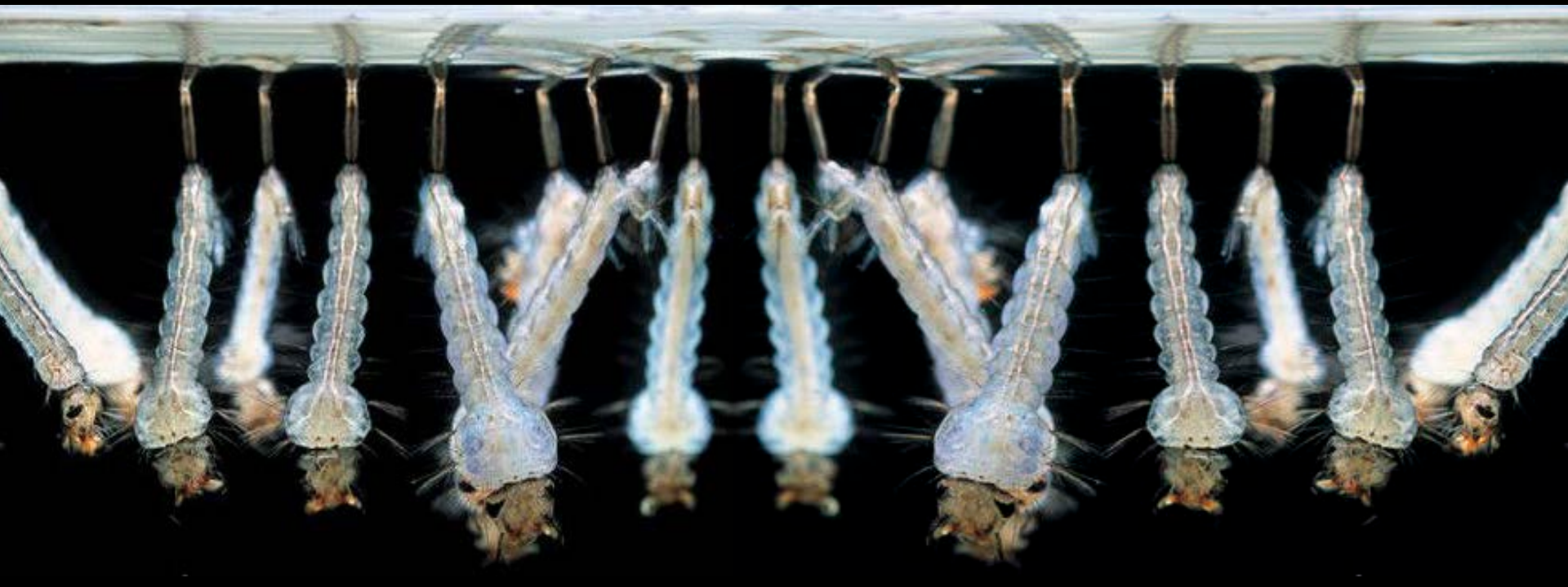
Integrated Mosquito Management (IMM)

Comprehensive preventive/control strategy

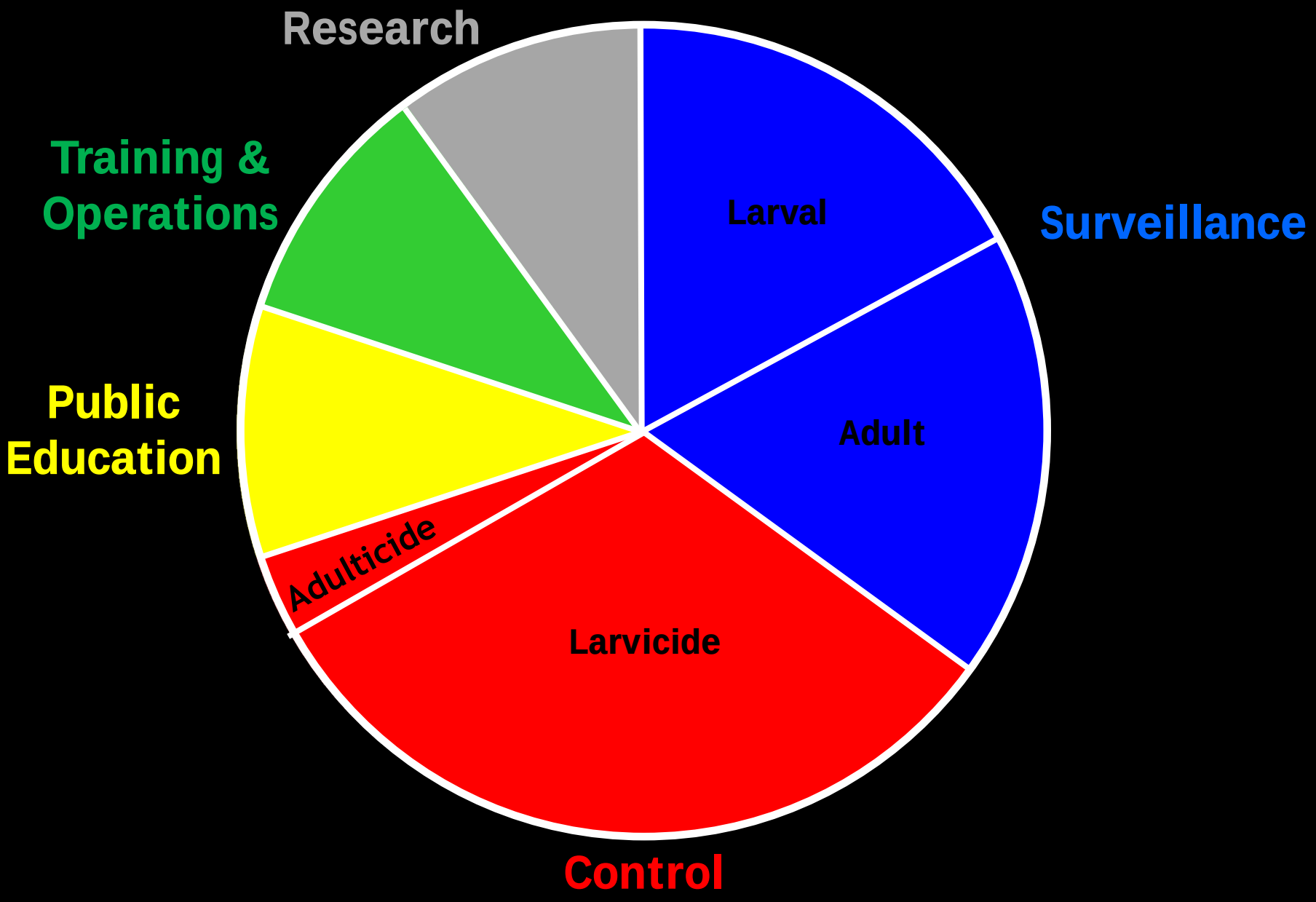
Knowledge based (bio/ecology of pests)

Surveillance (SCIENCE) driven

Resource ($) & environmentally dictated



Integrated Mosquito Management




John B. Smith
(1912 bill signed by NJ Governor Woodrow Wilson)


Urban Jungle

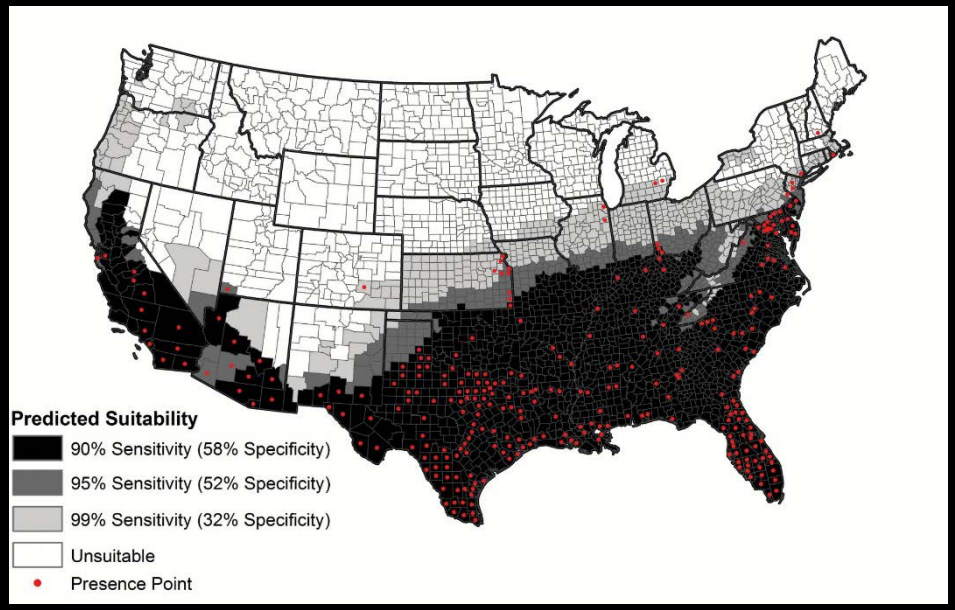

Suburban Jungle

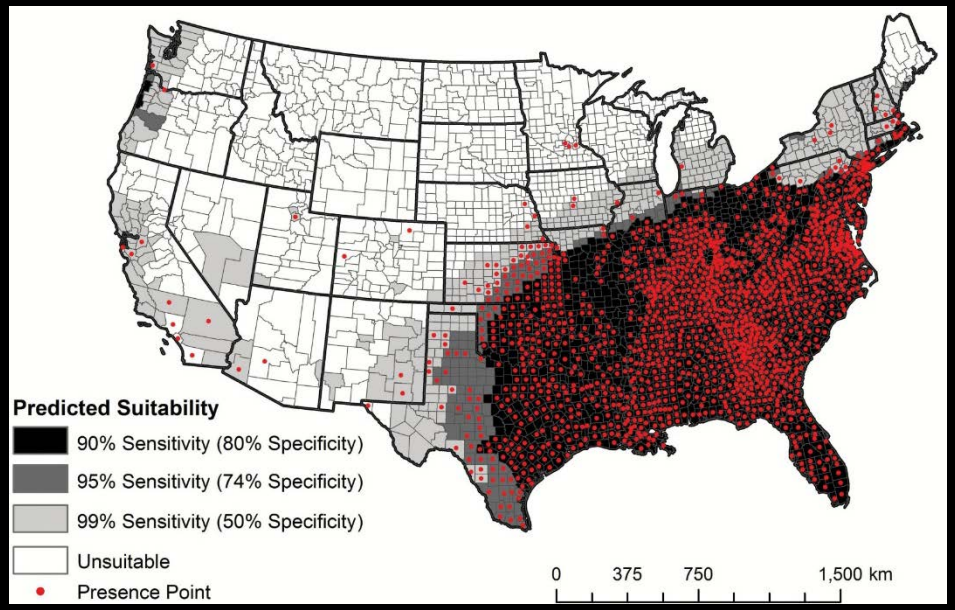
Aedes aegypti
(Yellow Fever Mosquito)

Aedes albopictus
(Asian Tiger Mosquito)

"Invasive *Aedes*"


Global Climate Change





Ae. aegypti

Ae. albopictus

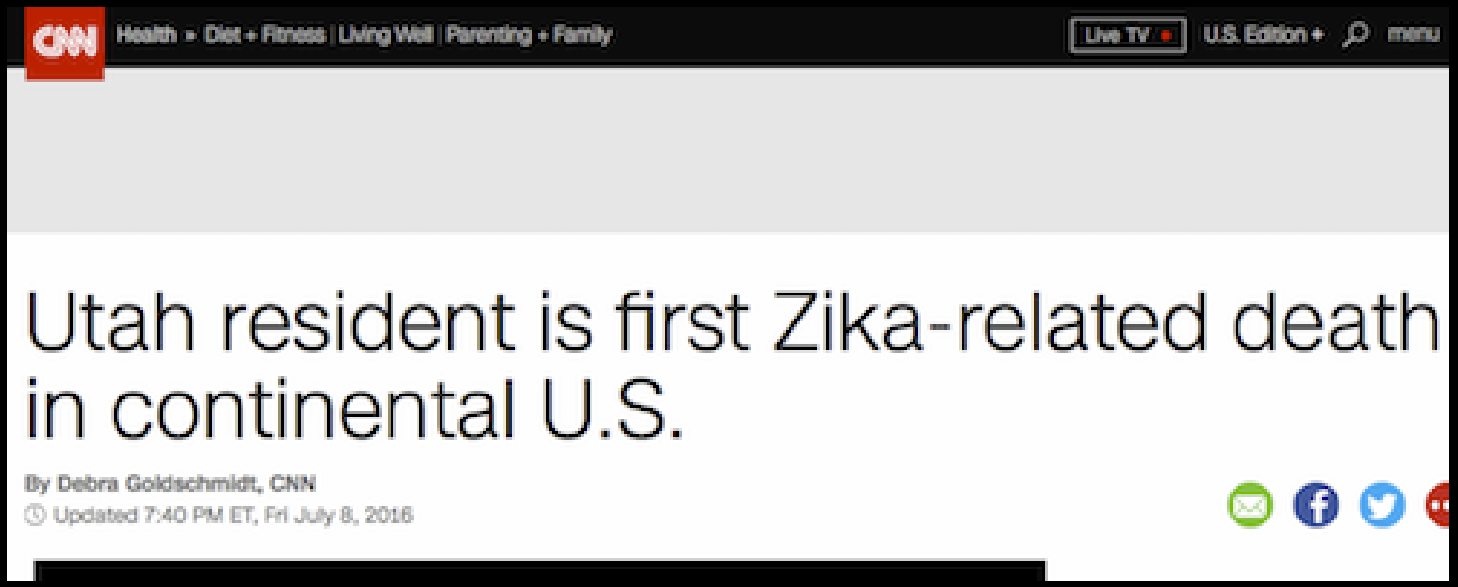
Maps created by CDC 2017 (Johnson et al. *Journal of Medical Entomology*. 54:1605-1614)

The New York Times

HEALTH

Zika Virus Case in Utah Baffles Health Officials

By SABRINA TAVERNISE JULY 18, 2016



July 29, 2016

The New York Times

NYTimes.com »

Breaking News Alert

BREAKING NEWS

Four cases of Zika in Miami appear to be the result of local mosquito transmission — the first such cases in the continental U.S.

Friday, July 29, 2016 10:23 AM EDT

Officials believe that the area of active transmission is limited to a one-square mile area just north of downtown Miami. No mosquitoes tested have been found to be carrying the Zika virus, and the department is going door to door in the neighborhood collecting urine samples to test residents.

Miami-Dade County is one of the biggest ports of entry into the United States from countries where the Zika virus is circulating, and experts have long described it as one of the areas most at risk for the spread of the disease.

The Coming Arbovirus Storm and Invasive Species

Pandemics more frequent…

Other insects and vectors…

Yellow Fever, Dengue, Japnanese Encephalitis, St. Louis Encephalitis, Powassan Virus, Rift Valley Fever, Usutu, Mayaro, O'nyong-nyong, Venezuelan Equine Encephalitis, Bwamba, Sindbis, Barmah Forest, Semliki Forest, Ross River, Rocio, Spondweni, Ilheus…

Mosquito Control Needs

COMMUNICATION!!!

Building Capacity: Train Next Gen Epis/Entos

Leadership/Coordination: Proactive Planning Beyond Zika, Building Partnerships (PCO, Industry, Public Health), Coordination of Surveys/Responses, State Med Ents

Public Education Initiatives (Make Mosquitoes Homeless)

New and Existing Tools

Generate/Facilitate Grants and Federal Funding

Caveats

Amounts not as important as utilization:
Optimize/leverage assets for IMM

Invest federal dollars in Public Relations

Plan to prevent/respond to all disease threats:
Plan beyond peridomestic mosquitoes
Communicate/cooperate across agencies

Funding must be sustained at baseline

THE AMERICAN MOSQUITO CONTROL ASSOCIATION

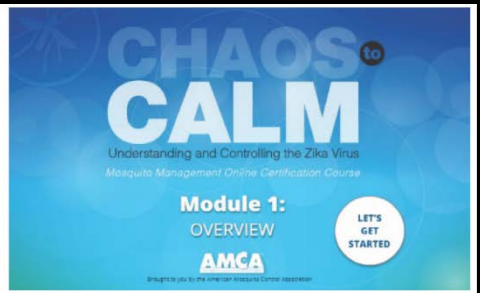
BEST PRACTICES FOR INTEGRATED MOSQUITO MANAGEMENT: A FOCUSED UPDATE

American Mosquito Control Association

January 2017

www.mosquito.org

Module 1: Mosquitoes and Disease: Aedes and Culex; **AVAILABLE!**



Module 2: What and Why of Aedes Species Ecology and Behavior; **AVAILABLE!**

Module 3: The What and How of Aedes Surveillance;

NOW AVAILABLE!

Module 4: The What and How of Aedes Control;

Coming soon.

To successfully complete the assessment scores need to be 85% or higher to advance to the next module. Upon successful completion of all four modules participants will receive a certificate of completion.

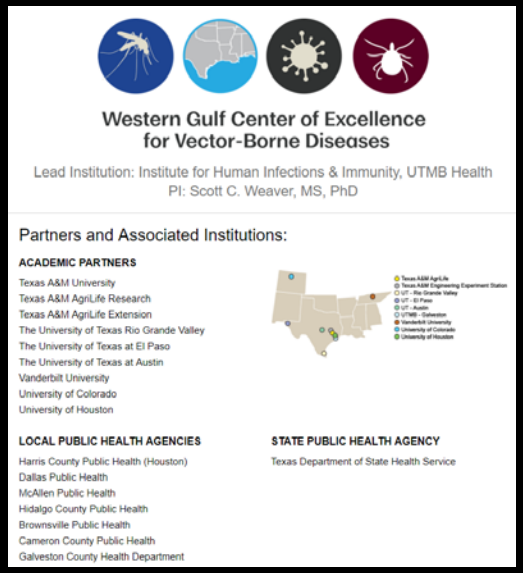
The e-modules serve as an onsite supplement and complement the onsite Train the Trainer workshop hubs.

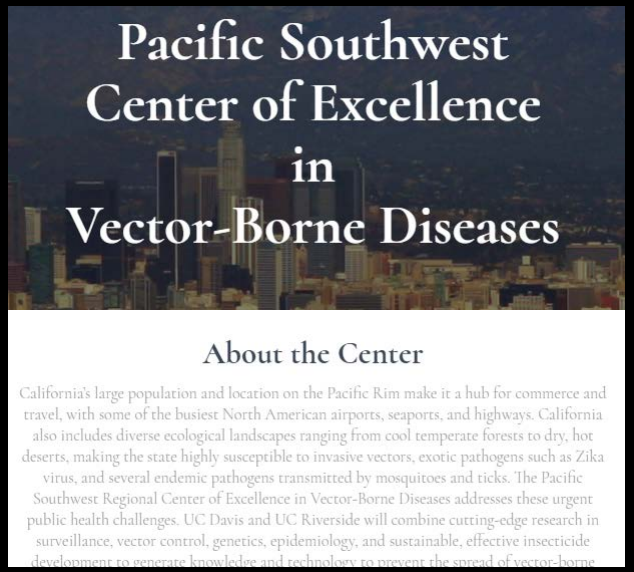
E-Modules are not just for those in the AMCA Train the Trainer program. All individuals within the mosquito and vector control industry can benefit from the online training! The online training is available for free for both members and non-members.

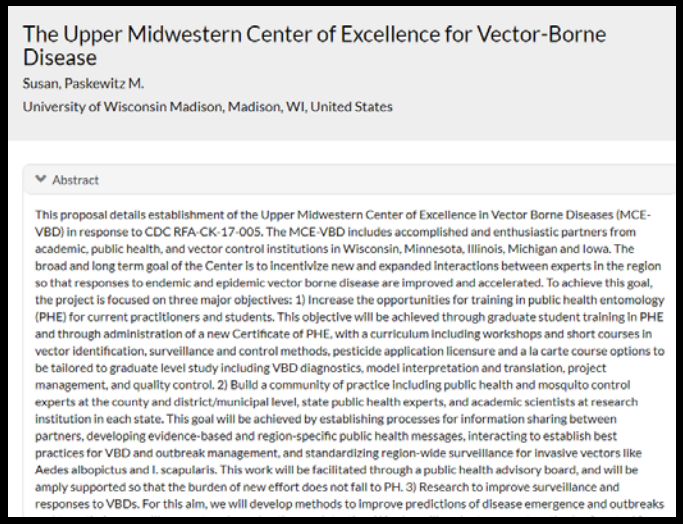
CDC Vector-Borne Disease Regional Centers of Excellence

The purpose of this Funding Opportunity Announcement (FOA) is to (1) build effective collaboration between academic communities and public health organizations at federal, state, and local levels for surveillance, prevention, and response; (2) train public health entomologists in the knowledge and skills required to address vector-borne disease concerns, and (3) conduct applied research to develop and validate effective prevention and control tools and methods and to anticipate and respond to disease outbreaks. The Centers of Excellence (COEs) to be supported by this FOA will provide regional capacity to enhance public health prevention and response for vector-borne diseases, pushing technology closer to sites of potential transmission.

CDC Vector-Borne Disease Regional Centers of Excellence








Animal Health
Human Health
One
Health
Ecosystem Health

The Invasive Mosquito Project: Using Citizen Scientists to Expand Public Health Surveillance Capacities

Lee Cohnstaedt
Council of State and Territorial Epidemiologists
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www.citizenscience.us

IMP on ABC

Invasive Mosquito Project

Thackrah et al. 2016
The Invasive Mosquito Project: A public education tool.
Wingbeats Spring 27:23-24

Cohnstaedt et al. 2016
Collecting mosquito distribution data from eggs as a citizen science research project.

The American Biology Teacher
78:317-322
doi.org/10.1525/abt.2016.78.4.317

750 submissions from around the United States

Invasive Mosquito Project

- Targeted at high school classes
- Students collect mosquito data around their homes
- Teach about public health and safety, mosquito transmitted illnesses, and the individuals role in safety
- Partner teachers with mosquito control, public health professionals, or biologists

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Invasive Mosquito Project

Is the data useful?

Analysis by Sara Paull, work supported by NASA under IGES award No. NNX17AG60A.

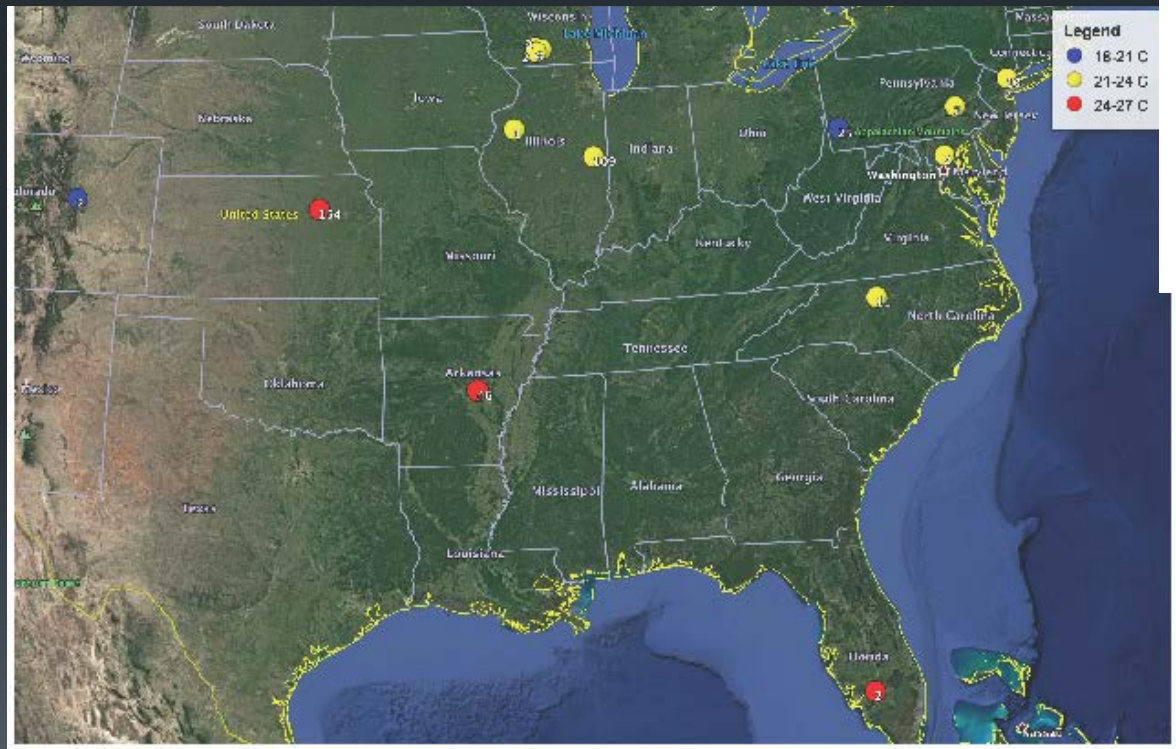


Fig. 1. Location of oviposition trap data sources. Colors represent the mean temperature during the collecting period, while numbers give the total number of samples submitted from each location.

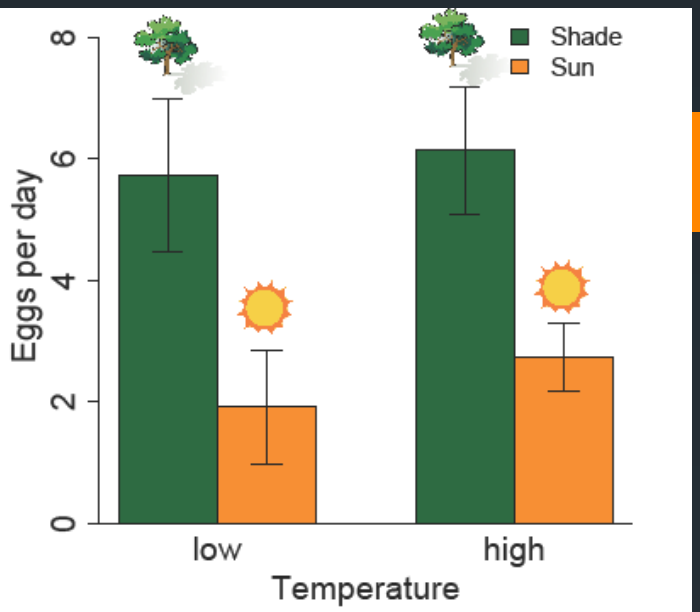


Fig. 2. Mean +/- SE of eggs laid per day in ovitraps that were placed in the sun (green) or shade (orange). Low temperatures were below the median collection period temperature of 25°C, high were above.

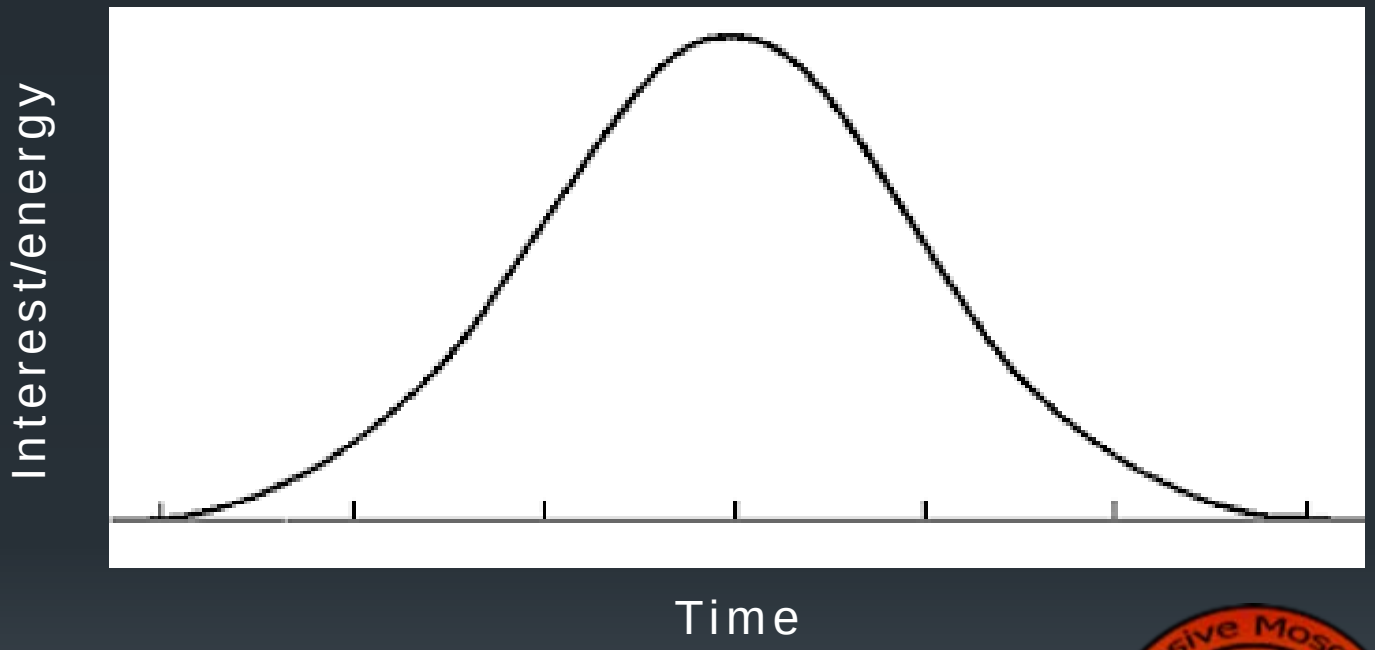
- Analysis of the egg data from 2016
- Regardless of latitude and temperature, statistically more eggs were laid in the shade vs the sun.

What makes the IMP different?

- Overworked and underpaid. Who needs one more thing to do?
- My challenge to you, contact your local schools and recruit the best high school student to run the project in your area.
- Since 2014, the program has sent 5 students to college on full ride scholarships.
- We are trying to expand this aspect of the program and think it will help you get a highly motivated worker to help with your public health surveillance and recruit the next generation of scientists.

Recruitment, reward, retain

The challenges of recruiting, retaining, and rewarding collaborators.



Cohnstaedt et al 2016. Crowdsourcing methodology: Establishing the Cervid Disease Network and the North American Mosquito Project
Veterinaria Italiana **52:**195-200.
doi: 10.12834/VetIt.577.2765.2

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Long-term plans for the IMP

- 20/20 plan
  - Long-term data set of yearly mosquito distributions
  - Detect invasive species/changing habitats

- Keep “public” in public health with active participation
  - Define the individual’s role in mosquito control
  - Help people determine their risks
  - Support mosquito control districts with a unified national education plan for community engagement and education
  - Recruit the next generation of scientists/entomologists

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Maki and Cohnstaedt 2015.
Crowdsourcing for large-scale mosquito (Diptera: Culicidae) sampling.
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