



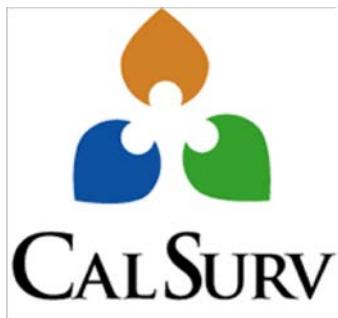
PACIFIC SOUTHWEST CENTER OF
VECTOR-BORNE DISEASES

PIHOA
PACIFIC ISLAND HEALTH
OFFICERS' ASSOCIATION

Support for the US Pacific Regional IVM Plan for Mosquito Surveillance

Christopher M. Barker, Ph.D.

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Co-Director, Pacific Southwest Center of Excellence in Vector-Borne Diseases



UCDAVIS
UNIVERSITY OF CALIFORNIA

PACIFIC ISLAND VECTOR MANAGEMENT IMPROVEMENT: A STRATEGY AND ITS IMPLEMENTATION

Dr. Grayson Brown

Public Health Entomologist

Pacific Island Health Officers Association



28 EPIDEMICS IN THE S. PACIFIC IN 2012 - 2014

Vector Borne Disease has been a continuing problem in the Pacific islands

Source: Roth A, Mercier A, Lepers C, Hoy D, Duituturaga S, Benyon E, Guillaumot L, Souares Y. Concurrent outbreaks of dengue, chikungunya and Zika virus infections – an unprecedented epidemic wave of mosquito-borne viruses in the Pacific 2012–2014. Euro Surveill. 2014;19(41):pii=20929.

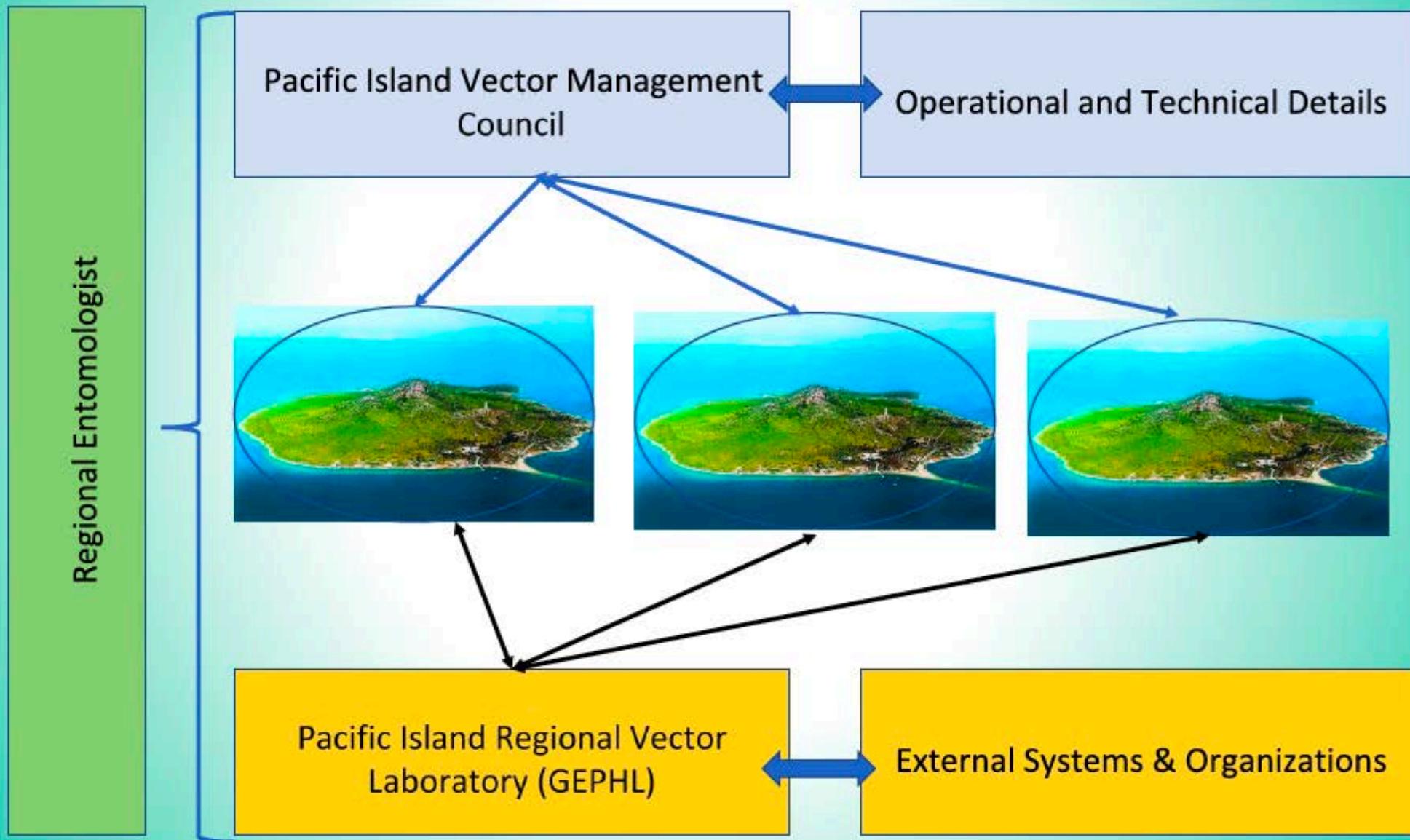


CURRENT SITUATION: FRAGMENTED

Island	Surveillance Method ¹	Vector Identification Capability	Control Options Used ²	Insecticide Resistance Testing ³	Virologic Vector Tests	Community Outreach Program	Legend
Saipan (CNMI)	Ov	Partial	PCC	No	No		Ov – Ovitrap
FSM -- Chuuk	No	No	MB, LC	No	No	Yes	GAT – Gravid Aedes Trap
FSM -- Kosrae ^a	Ov, GAT	No	MB, LC	No	No		xLT – Light Trap, incandescent, ultraviolet
FSM -- Pohnpei ^b	No/GAT	No	No	No	No		MB – Mist Blower
FSM -- Yap	No	No	No	No	No		LC – Lavicide
Guam -- Civilian	Ov, GAT, uLT	Yes	MB, LC, SR	CDCBT	No	Yes	SR – Source Reduction
Guam -- Military	Ov, iLT	Partial	SR, PCC	No	No	Yes	PCC – Pest Control Company
Palau	Ov	Yes	MB, SR, LC, ULV	WHOPES	No	Yes	ULV – Ultra Low Volume spray
RMI -- Majuro	No	No	MB, LC	No	No		



OVERALL PROGRAM ORGANIZATION





PACIFIC SOUTHWEST CENTER OF
EXCELLENCE IN
VECTOR-BORNE DISEASES



Pacific Southwest Center of Excellence in Vector-Borne Diseases

- One of five CDC regional CoEs
- Covers CA, HI, AZ, NV, UT, & USAPIs
- CDC-funded partnership between UCD, UCR and regional stakeholders in public health and mosquito control
- 2017 – 2021
- Goal: To enhance the capacity of our region to respond to VBDs that affect human health



Connect with us!
Website: pacvec.us
 @PacVecCenter

PacVec

At-A-Glance

vector genetics
vector control
cell biology computer science
epidemiology
entomology
ecology arbovirology
engineering toxicology
statistics environmental chemistry
public health



Recent Challenges in the Pacific Southwest

- Spread of invasive *Aedes*
 - 2011: 3 cities with *Ae. albopictus*
 - 2017: 150 cities with *Ae. aegypti*
 - 56 cities with *Ae. albopictus*
- Emergence of Zika virus
 - 2015-2018: > 600 infected travelers
- Dengue outbreaks in American Samoa, Palau
- West Nile virus
- Return of St. Louis encephalitis virus, 2015-present
- Emergence of *Rhipicephalus sanguineus* and RMSF in the Southwest
- Other tick-borne pathogens (*Rickettsia* 364D, *Borrelia miyamotoi*)
- Outbreak of *Rickettsia typhi* in southern California

Data Management, Analysis, Visualization, & Sharing

Data Sharing & Visualization: The CalSurv Family

- States/Territories

- California, Guam, Utah, New Jersey

- Agencies:

- CA: 78 agencies
 - PIHOA: 1 agency
 - UT: 13 agencies
 - NJ: 25 agencies

- Data:

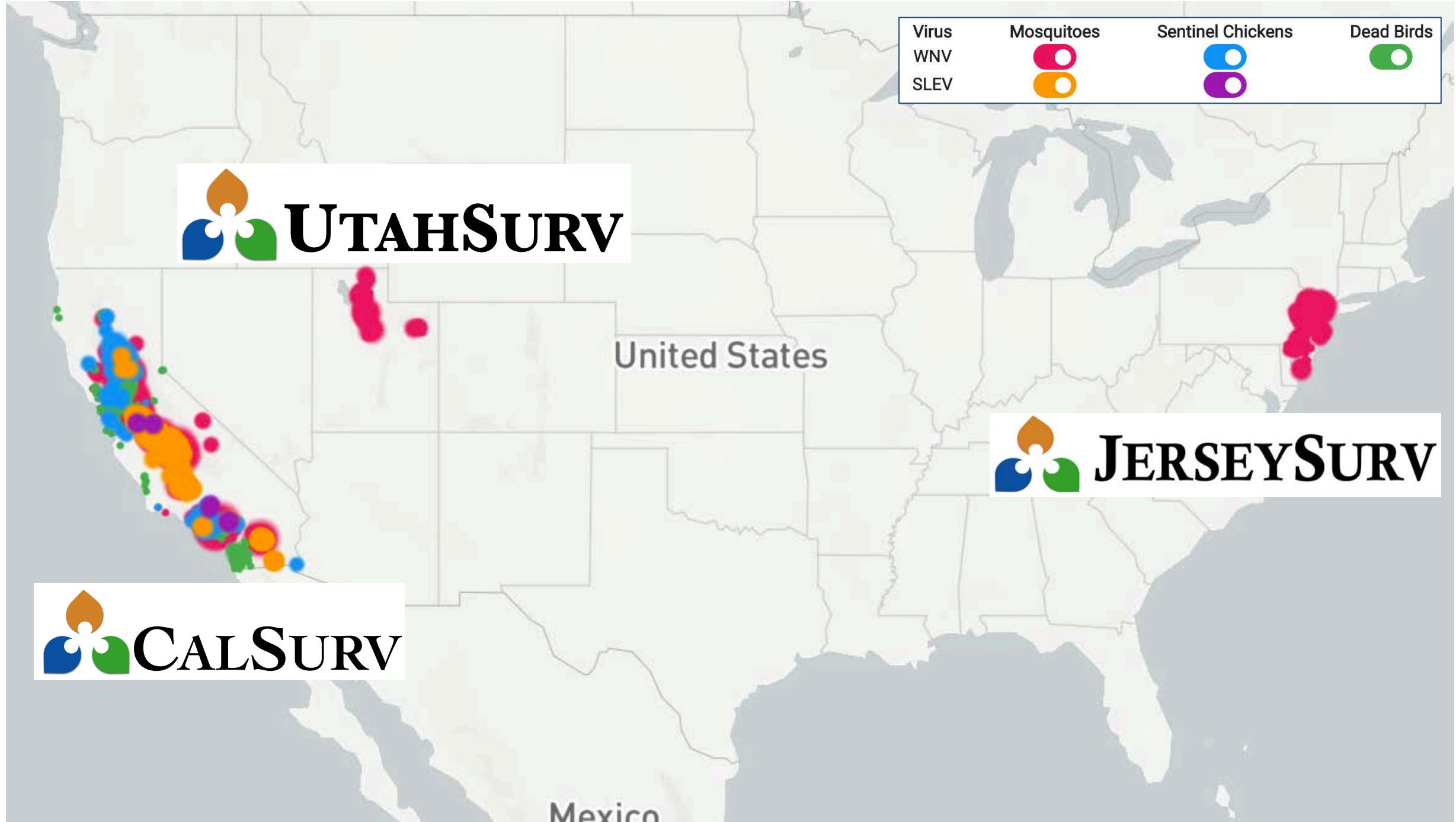
- 1.5 million collection events, 8.8 million trap-nights



Guiding Principles



- Rapid reporting
 - Immediate reporting of test results to source agency via email
 - Immediate updates to databases & maps
- “Value Added”
 - Integrates with daily workflows to make IVM easier
 - Tools for data analysis and visualization
- Global scalability
- Originating agencies retain all data rights
- User-level permissions and passwords
- Data import/export, exchange with 3rd party software





CALSURV

California Vectorborne Disease Surveillance Gateway

□ Online platform for management and analysis of VBD surveillance data

- Surveillance Sites
- Mosquito Collections
- Mosquito Testing
- Sentinel Animal Testing
- Insecticide Applications
- Insecticide Resistance

□ Established in 2006

□ Used by agencies large and small

- Direct data entry, analysis, and export
- API for connection to in-house software

Sites Arthropod Sentinel DiSen Carcass Diagnostics Application Resistance Tools Settings Help Logout

Config Abundance Pools

Update Collection

Collection ID 5674

*Trap Type CO₂

*Collection Date 2015-08-25 Trap started the evening of 2015-08-24.

*# of Traps 2

*# of Nights/Trap 1

Trap(s) at Site 243032 - Z42-Core Rd

DD DHS DM Map

Latitude 38.357533 If the Latitude is in the southern hemisphere, the value must be prefixed by the minus '-' sign.

Longitude -121.44697 If the Longitude is in the western hemisphere, the value must be prefixed by the minus '-' sign.

Identified By

Trap(s) ran with no problems?

Comments

Count of Species

Species	M	F - Mixed	F - Unfed	F - Bloodfed	F - Gravid	Σ F	Unknown Sex	Eggs	Larvae	Pupae
1 Culex tarsalis	1	56				56				
2 Culex pipiens	2	270				270				
3 Aedes melanimon		2				2				
4 Anopheles freeborni		1				1				
5 Aedes vexans		23				23				
6		0				0				
	3	352	0	0	0	0	0	0	0	0

→ Pools

▪ Current Agency
By changing agencies, settings may adjust to accommodate agency-specific rules.
SAYO (Administrator)
 Keep block collapsed.

▪ Link Pools
Click here to link unassociated pools to this collection.

▪ Last Collection #1
Collection #: 5764
Trap Type: GRVD
Trap at Site: 213009
Collection Date: 2015-08-25
of Trap Nights: 1
Identified By:
Trap Problems?: No
Add Date: 2015-08-25 01:54 PM

▪ Last Collection #2

▪ Last Collection #3

▪ Last Collection #4

▪ Last Collection #5

▪ Used 2015 Pool #s

▪ Open 2015 Pool #s
The following ranges are available for use for Surveillance Year: 2015
▪ 4485 - 150000

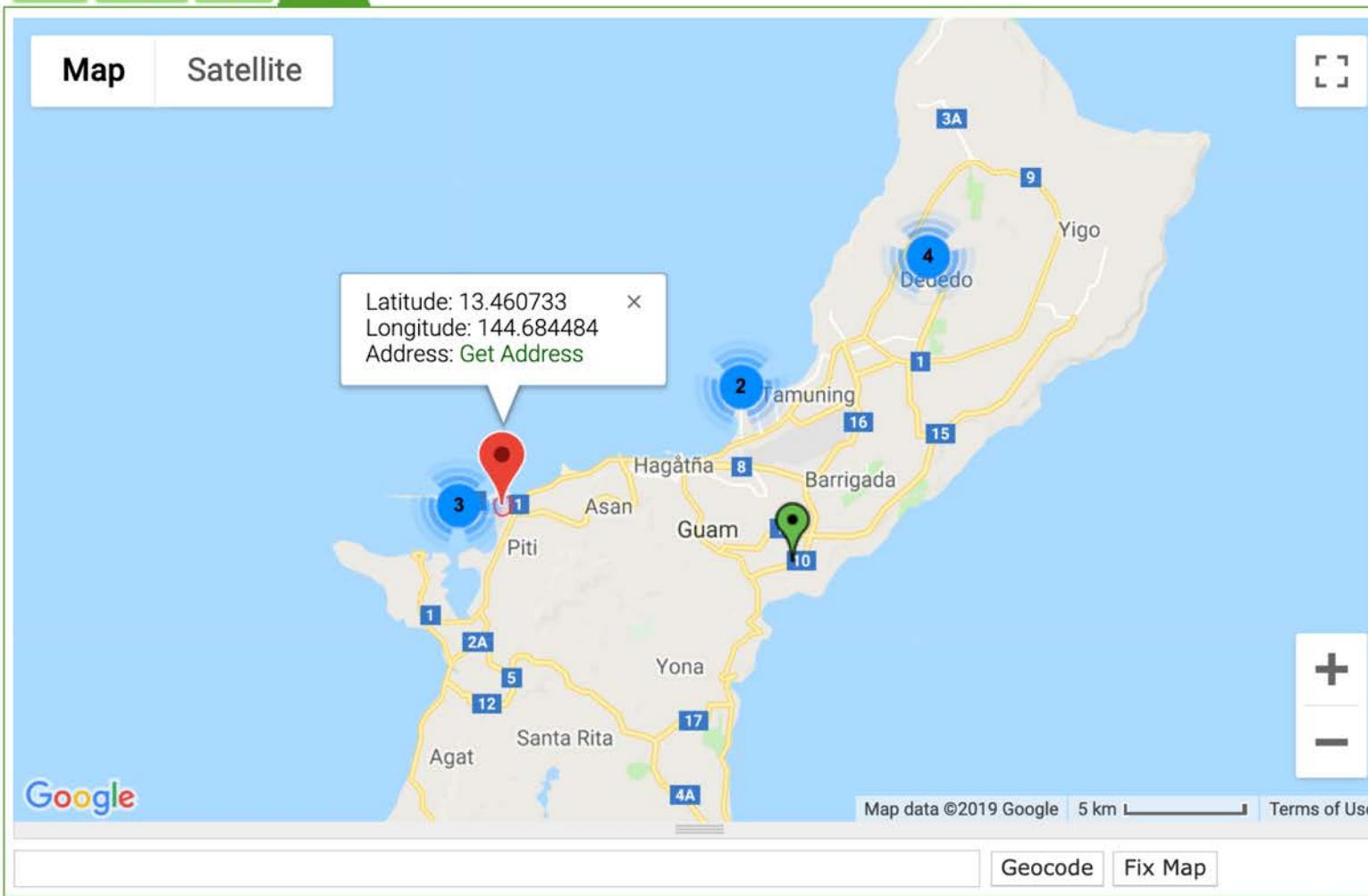
Surveillance Site Management

*Site Code **GUAM** 000024

Site Name Port Authority of Guam 004

*Coordinates

DD DMS DM Map



Mosquito Surveillance: Data Entry

Update Collection

Collection ID 5674

*Trap Type CO2

*Collection Date 2015-08-25 Trap started the evening of 2015-08-24.

*# of Traps 2

*# of Nights/Trap 1

Trap(s) at Site 243032 - Z42-Core Rd

DD DMS DM Map

Latitude 38.357533

If the Latitude is in the southern hemisphere, the value must be prefixed by the minus '-' sign.

Longitude -121.44697

If the Longitude is in the western hemisphere, the value must be prefixed by the minus '-' sign.

Identified By

Trap(s) ran with no problems?

Comments

Count of Species

	Species	M	F - Mixed	F - Unfed	F - Bloodfed	F - Gravid	Σ F	Unknown Sex	Eggs	Larvae	Pupae
1	Culex tarsalis	1	56				56				
2	Culex pipiens	2	270				270				
3	Aedes melanimon		2				2				
4	Anopheles freeborni		1				1				
5	Aedes vexans		23				23				
6							0		0	0	0
		3	352	0	0	0	0	0	0	0	0

→ Pools

Current Agency

By changing agencies, settings may adjust to accommodate agency-specific rules.

SAYO (Administrator)

Keep block collapsed.

Link Pools

Click here to link unassociated pools to this collection.

Last Collection #1

Collection #: 5674
Trap Type: GRVD
Trap at Site: 213009
Collection Date: 2015-08-25
of Trap Nights: 1
Identified By:
Trap Problems?: No
Add Date: 2015-08-25 01:54 PM

Last Collection #2

Last Collection #3

Last Collection #4

Last Collection #5

Used 2015 Pool #s

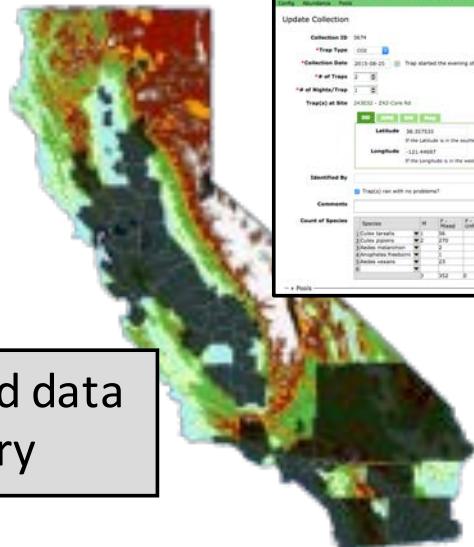
Open 2015 Pool #s

The following ranges are available for use for Surveillance
Year: 2015

- 4485 - 150000



California Vectorborne Disease Surveillance Gateway



Field data entry

Update Collection

Collection ID: 3674

• **Trap Type**: 002

• **Collection Date**: 2013-08-21 Trap started the evening of 2013-08-24.

• **# of Traps**: 3

• **# of Nights/Trap**: 3

Trap(s) at Site

Latitude: 36.703733 (The site is in the southern hemisphere, the value must be prefixed by the minus '-' sign.)

Longitude: -121.446667 (If the longitude is in the western hemisphere, the value must be prefixed by the minus '-' sign.)

Identified By

Comments: Trap(s) ran with no problems?

Count of Species

Species	H	F	Female	M	Brood	Grand	L.F.	Unknown	Spgs	Larvae	Phase
Culex tarsalis	1	0	0	0	0	1	0	0	0	0	0
Culex pipiens	2	2	2	0	0	2	0	0	0	0	0
Culex restuans	1	0	0	0	0	1	0	0	0	0	0
Anopheles vexans	2	0	0	0	0	2	0	0	0	0	0
Total	6	2	2	0	0	8	0	0	0	0	0

Current Agency

By changing species, settings, and filters, you can quickly find the data you need.

The Trap Pools

Click here to link unassociated pools to this trap.

Last Collection #1

Collection ID: 3744
Collection Date: 2013-08-22
Pool of Trap: 34032 - ZND Core Rd
Species: Culex tarsalis
Unknown: 1
Add Date: 2013-08-25 08:54

Last Collection #2

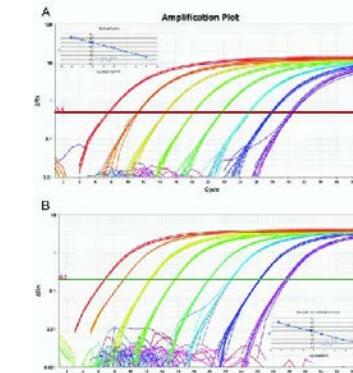
Last Collection #3

Last Collection #4

Last Collection #5

Open 2015 Pool #1

Species: Culex tarsalis
Unknown: 1
Add Date: 2013-08-25 08:54



Laboratory data entry

Test Results for Mosquito Pool Multiplex PCR-96 - #60															
Name Mosquito Pool Multiplex PCR-96															
Dimensions 8 x 12															
Direction of #s Top to Bottom, Left to Right															
Sort: Select															
1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121
2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122
3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128

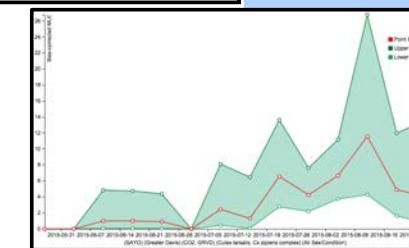
National Databases



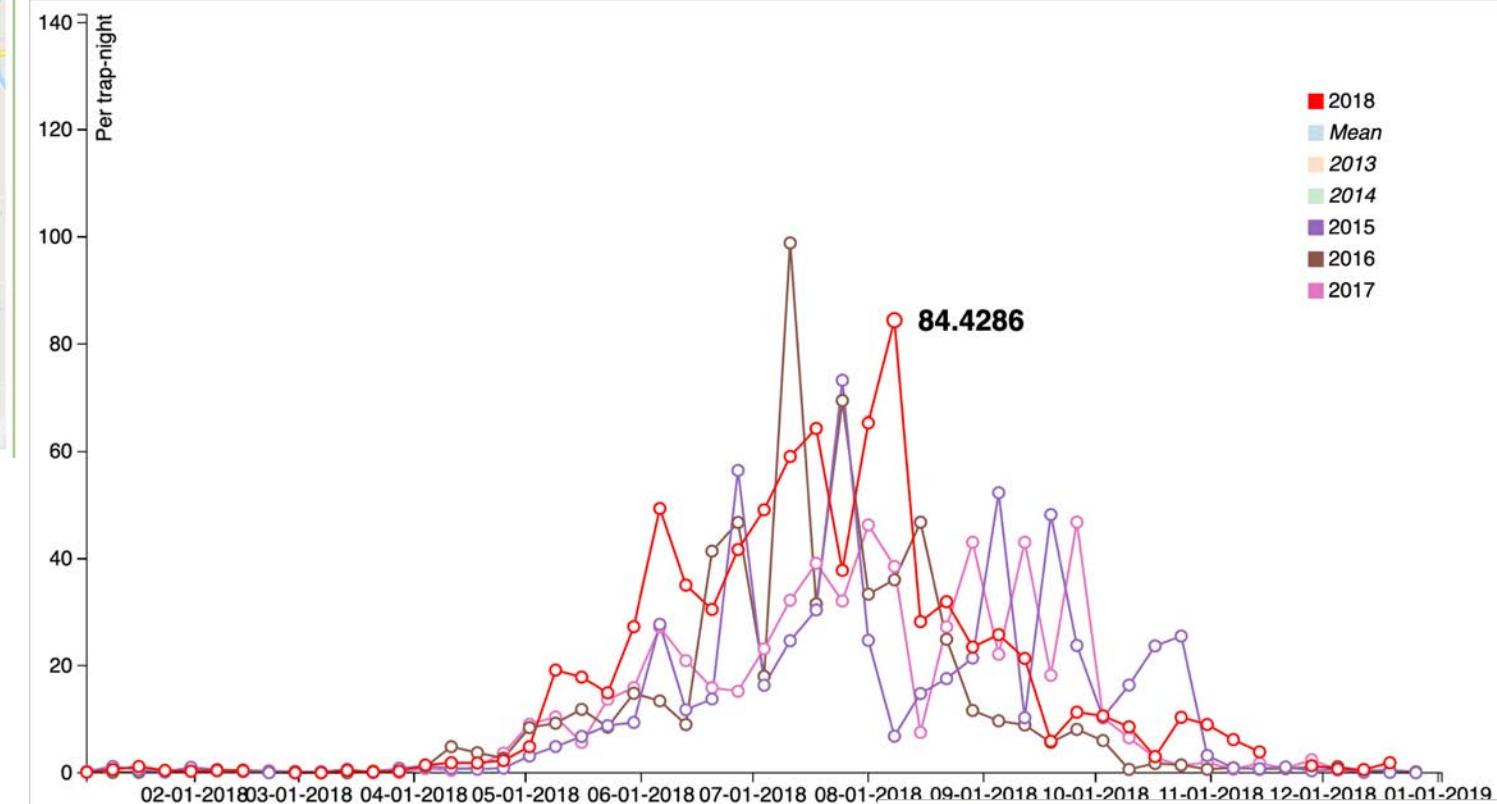
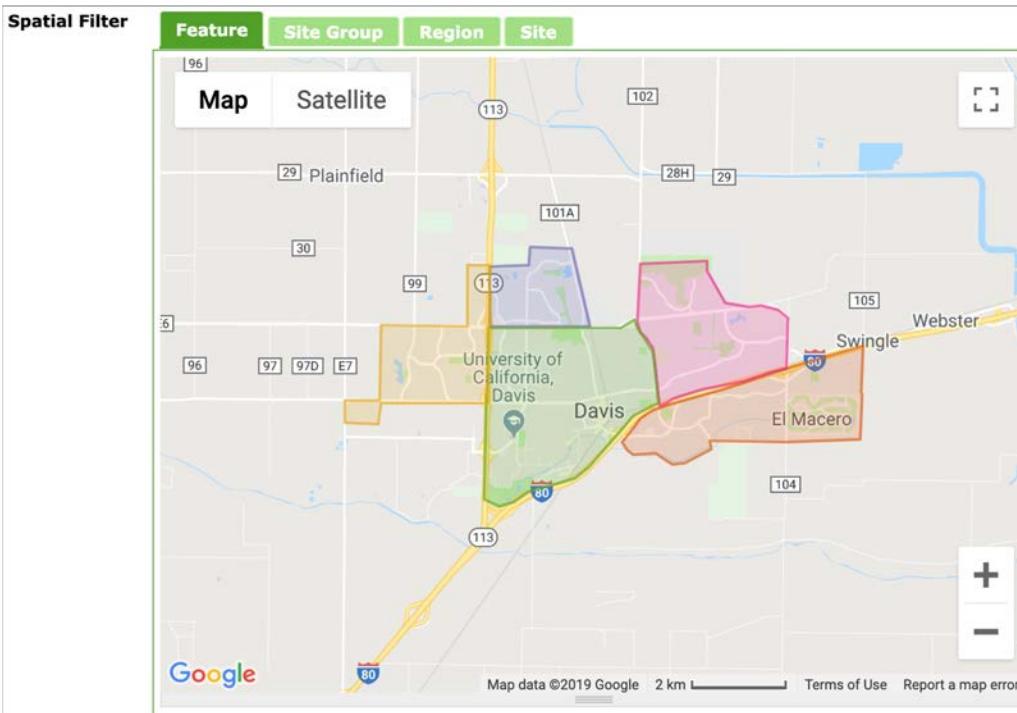
Arbovirus bulletins, Automated emails



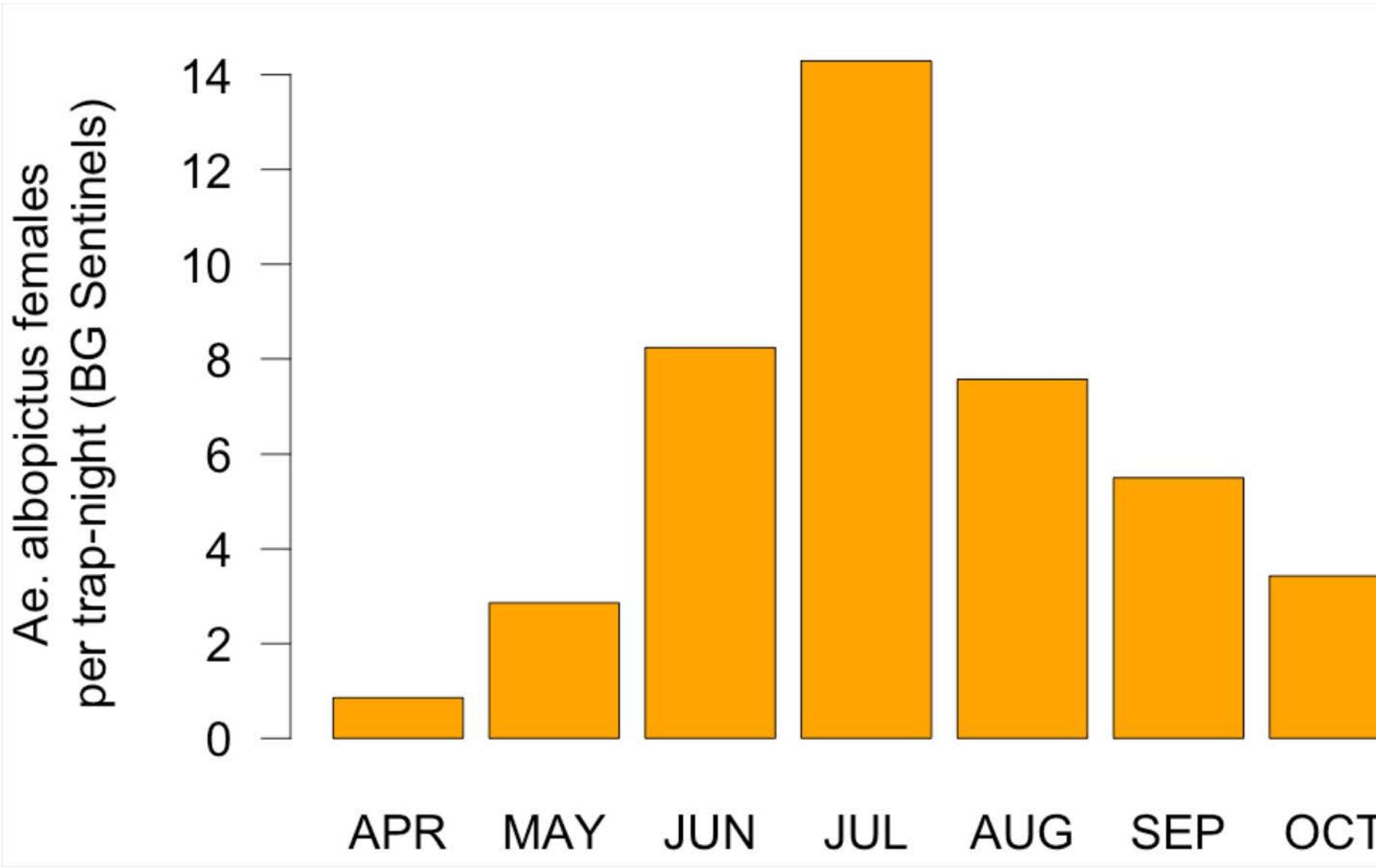
Interactive Maps and Tools



Data Visualization: Abundance Anomaly



Data Visualization: Guam DEH Mosquito Surveillance, 2018



Insecticide Resistance

- Bottle bioassays, Larval bioassays, KDR

New Bottle Bioassay

*Date 03-23-2018

*Material Deltamethrin Technical Grade

Lot # A130

*Species Aedes aegypti

*Mosquito Source Colony Field



Tested By

Description

Replicate	Control	1	2	3	4
Time	Alive	Alive	Alive	Alive	Alive
0 minutes	25	25	25	23	23
15 minutes	25	25	25	22	23
30 minutes	25	25	24	22	17
45 minutes	25	20	22	17	10
60 minutes	25	15	12	10	1
75 minutes	25	12	3	7	0
90 minutes	25	7	0	2	0
105 minutes	25	0	0	0	0
120 minutes	25	0	0	0	0
135 minutes	25	0	0	0	0
150 minutes	25	0	0	0	0
165 minutes	25	0	0	0	0
180 minutes	25	0	0	0	0

Add Additional Time Series Add Replicate

*Trap Type BGSENT

*Collection Date 05-23-2017 Trap started the evening of 05-22-2017.

*# of Traps 1

*# of Nights/Trap 1

Trap(s) at Site 000708 - Oasis

DD **DHS** **DM** **Map**

Latitude 33.732284
If the Latitude is in the southern hemisphere, the value must be prefixed by the minus '-' sign.

Longitude -116.22191
If the Longitude is in the western hemisphere, the value must be prefixed by the minus '-' sign.

Identified By

Trap(s) ran with no problems?

Comments

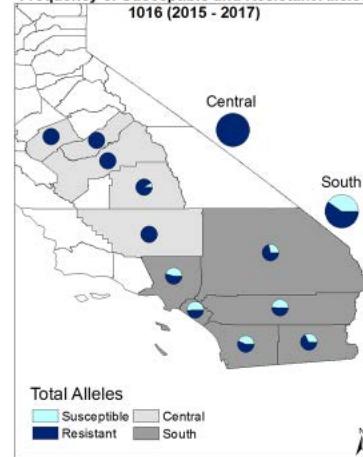
Count of Species

Species	M	F - Mixed	F - Unified	F - Bloodfed	F - Gravid	Σ F	Unknown Sex	Eggs	Larvae	Pupae
1	0	0	0	0	0	0	0	0	0	0

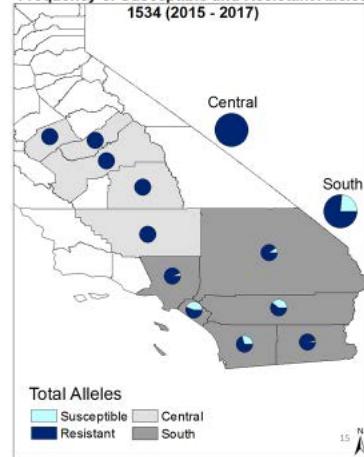
KDR Tubes

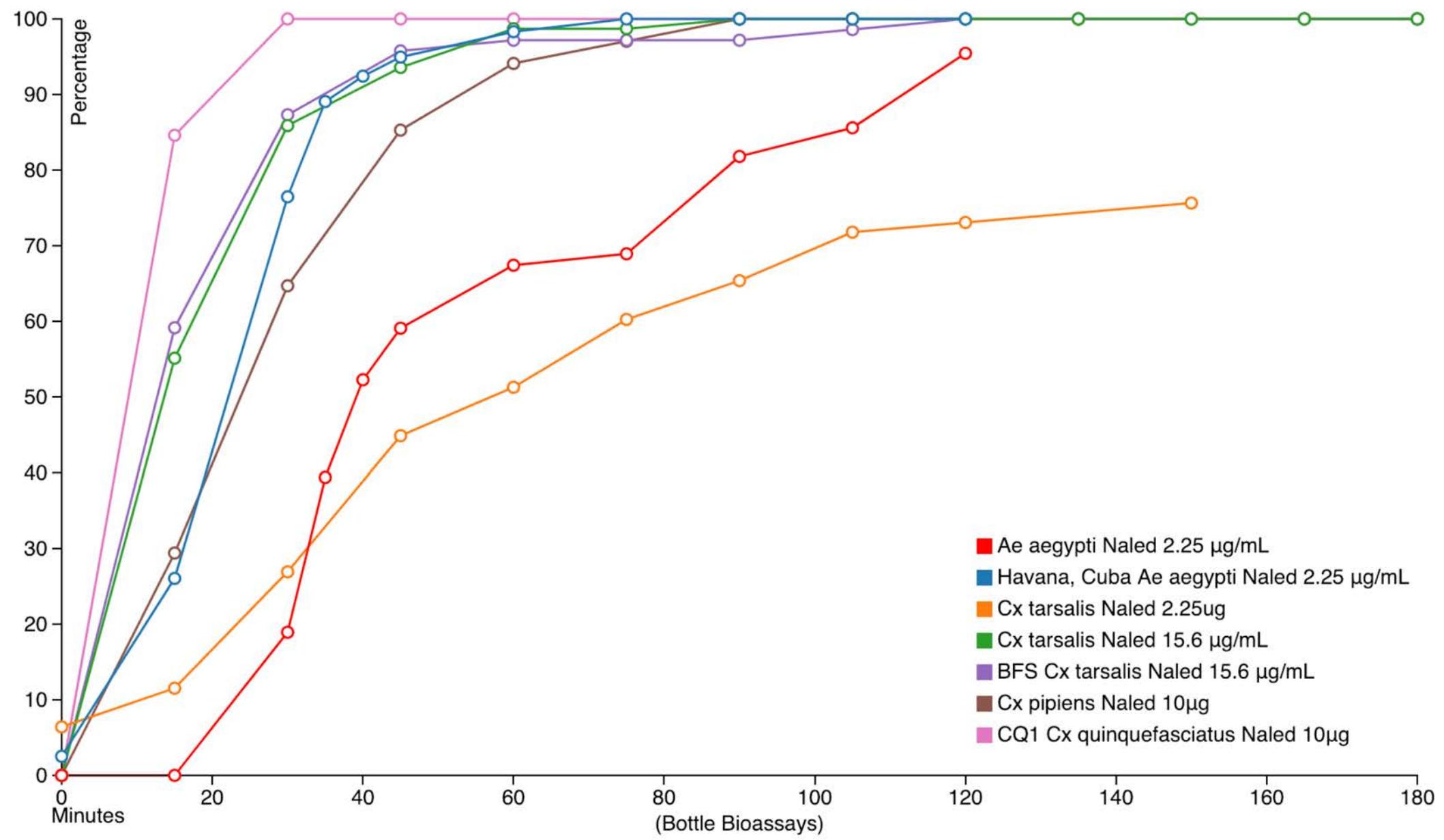
Include?	Tube #	Storage	Collected Live	Collection Date	Site Code	Trap Type	Life Stage	Sex	Species
<input checked="" type="checkbox"/>	COAV17- 120	Dry	Yes <input type="button"/>	05-23-2017	000708	BGSENT	Adult	M	Aedes aegypti

Frequency of Susceptible and Resistant Alleles
1016 (2015 - 2017)



Frequency of Susceptible and Resistant Alleles
1534 (2015 - 2017)





close or Esc Key

California Mosquito-borne Virus Surveillance and Response Plan

Risk Level	Avg. Daily Temperature	Adult mosquito abundance	Mosquito MIR/1,000	Chicken Seroconversions	Dead Bird Infections	Human Cases
1	<56°F	< 50% 5-yr. Avg.	0	0 in region	0 in region	
2	57-65°F	50-90% 5-yr. Avg.	0.1 – 1.0	≥ 1 in region, 0 in agency	≥ 1 in region, 0 in agency	
3	66-72°F	91-150% 5-yr. Avg.	1.1 – 2.0	1 flock in agency	1 in agency	≥ 1 in region, 0 in agency
4	73-79°F	151-300% 5-yr. Avg.	2.1 – 5.0	2 flocks in agency	2-5 in agency	1 in agency
5	>79°F	> 300% 5-yr. Avg.	> 5.0	>2 flocks in agency	>5 in agency	>1 in agency

SCORE	RISK LEVEL
1.0—2.5	Normal season
2.6—4.0	Emergency planning
4.1—5.0	Epidemic

On the web at
<http://westnile.ca.gov/resources.php>

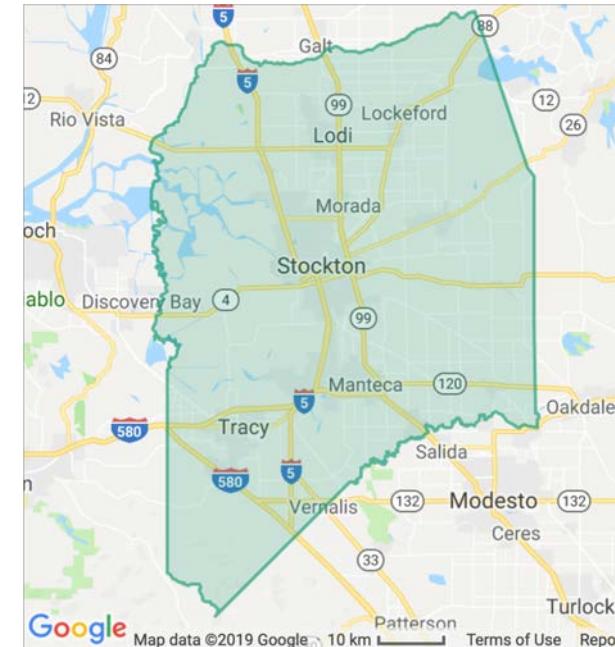
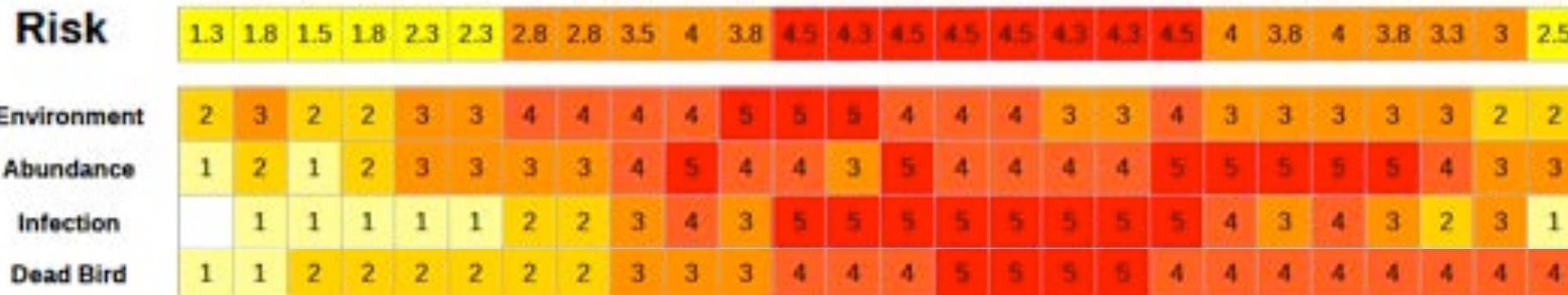
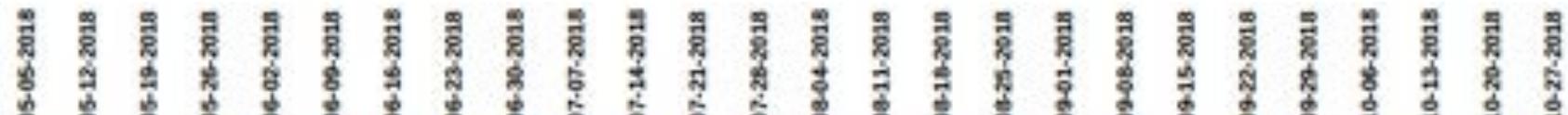
CalSurv Gateway Risk Calculator



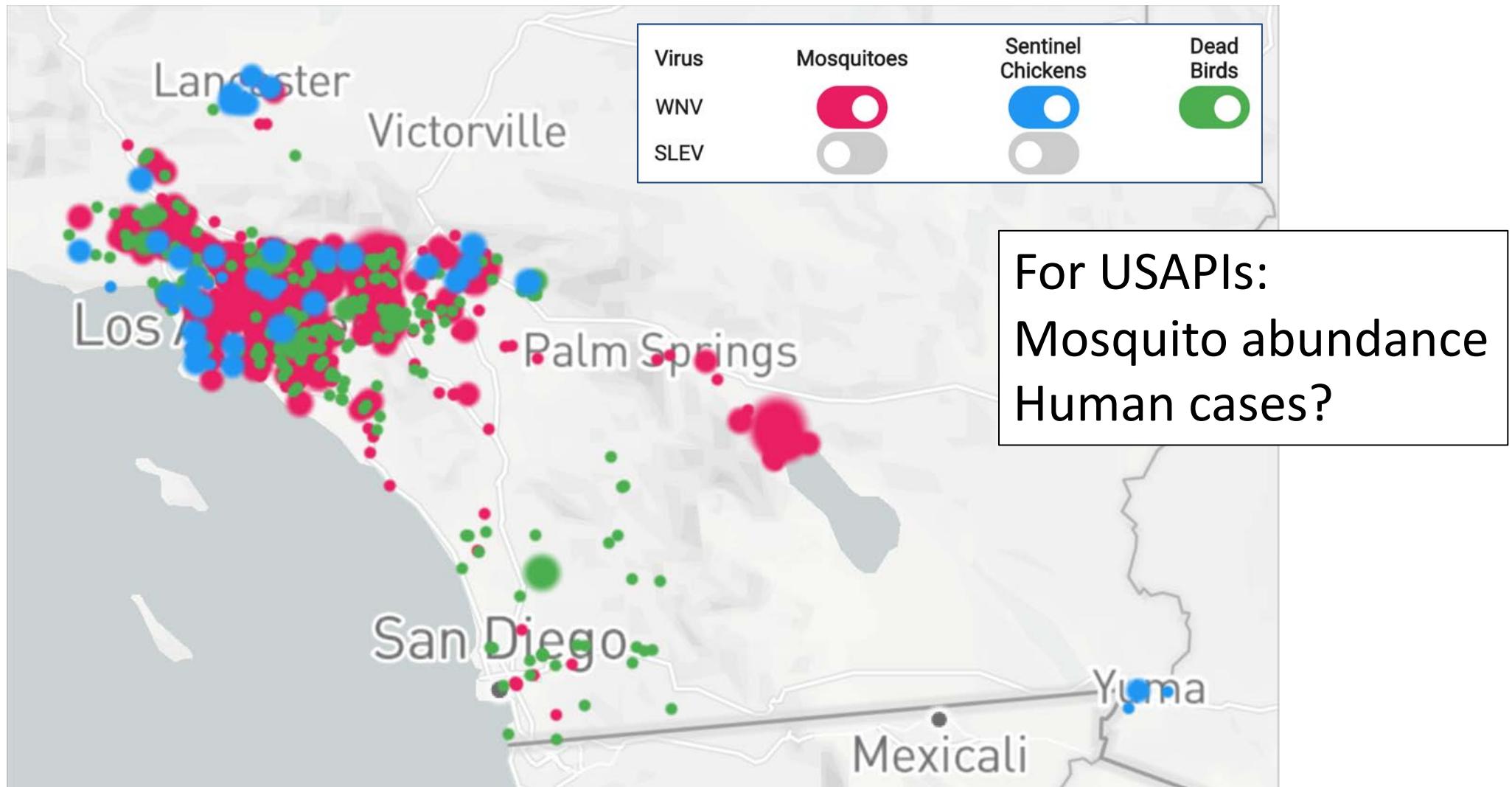
CALSURV

California Vectorborne
Disease Surveillance Gateway

Time Interval	2018 by Week
Agency	San Joaquin County MVCD
Spatial Filter	San Joaquin County
Target	WNV
Trap Type	CO ₂ -baited traps, gravid traps
Sex	Female mosquitoes
Species	<i>Culex tarsalis</i> , <i>Culex pipiens</i>

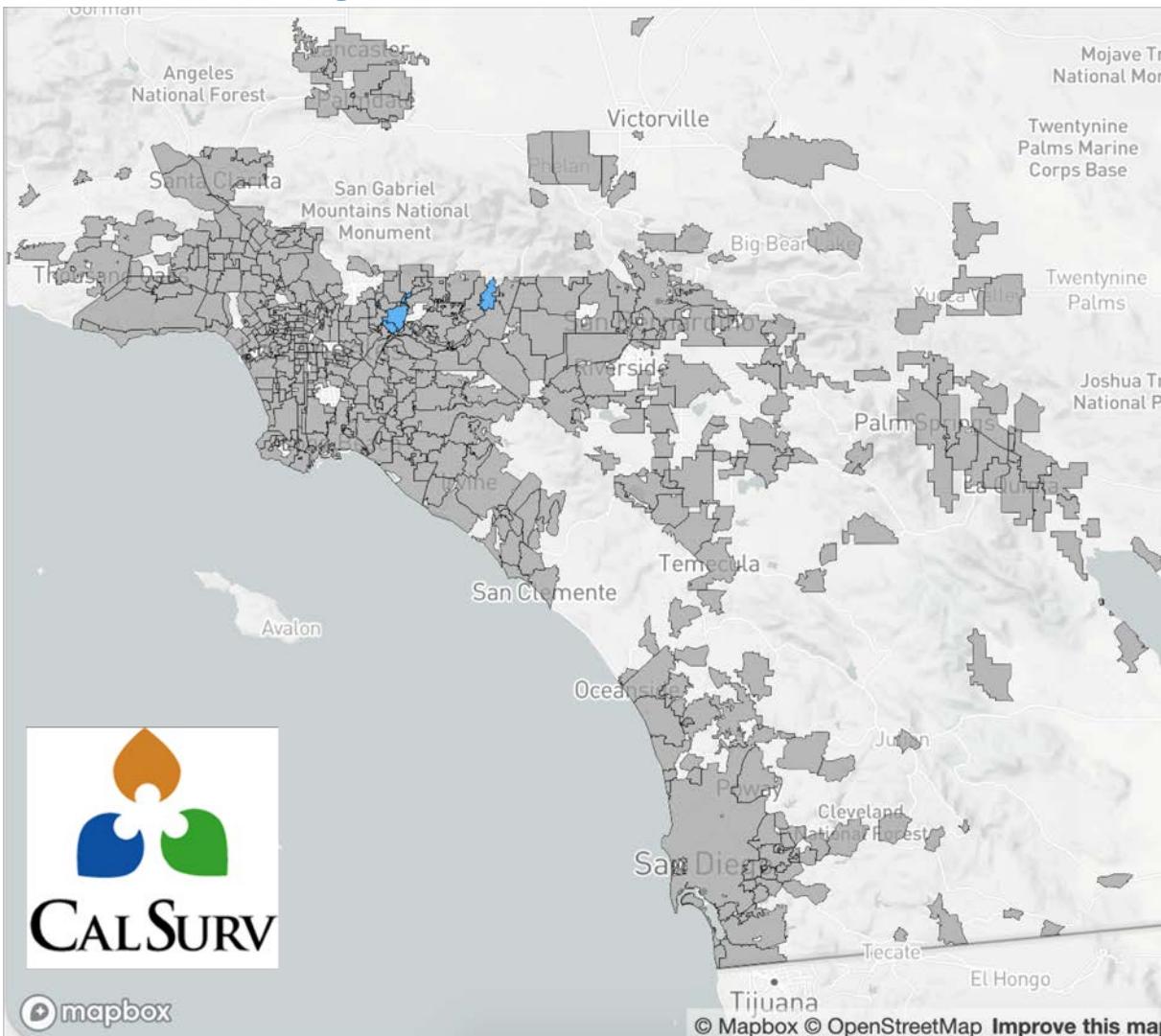


West Nile virus detections by method, 2017

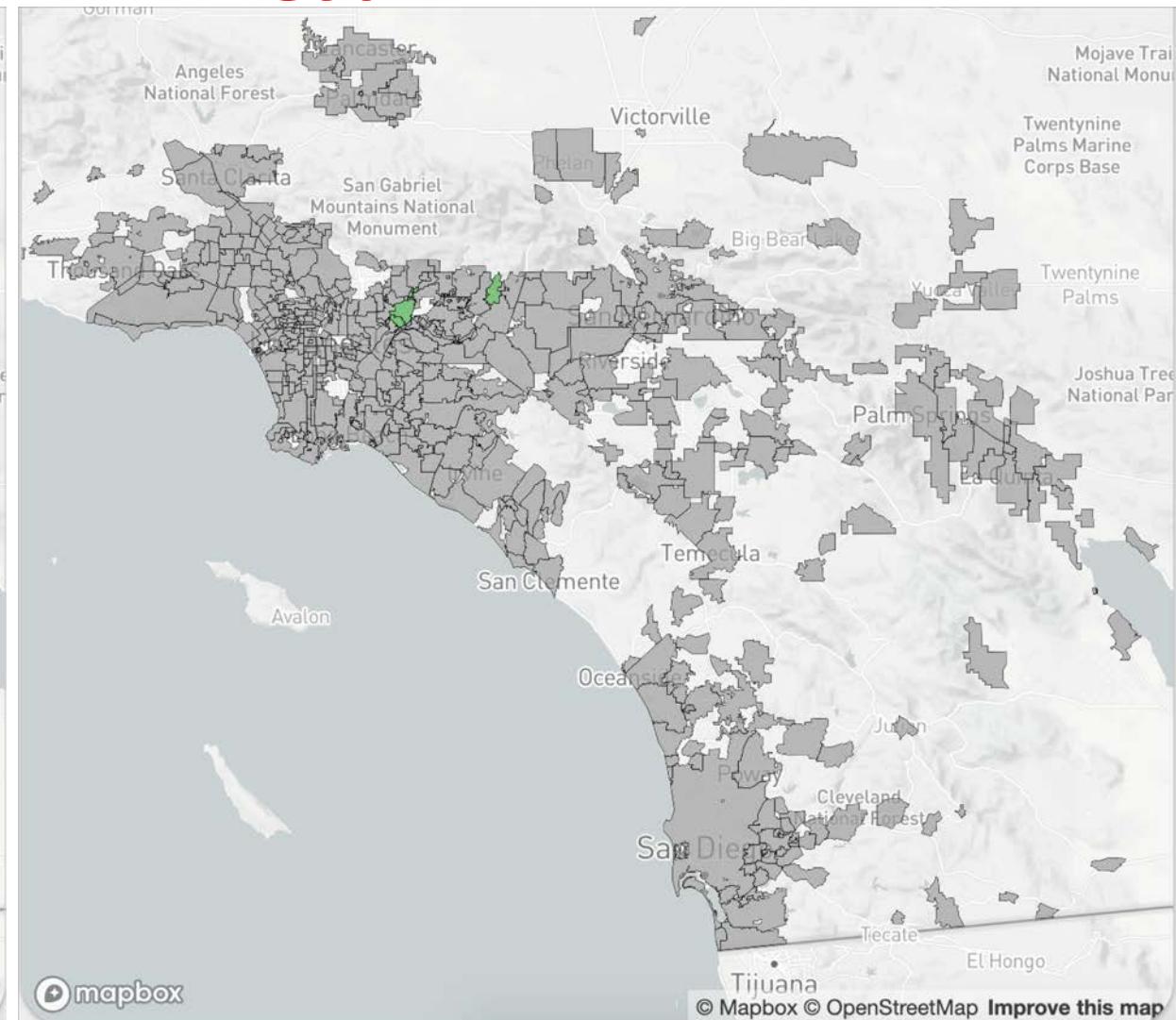


2011 2012 2013 2014 2015 2016 2017 2018

Ae. albopictus



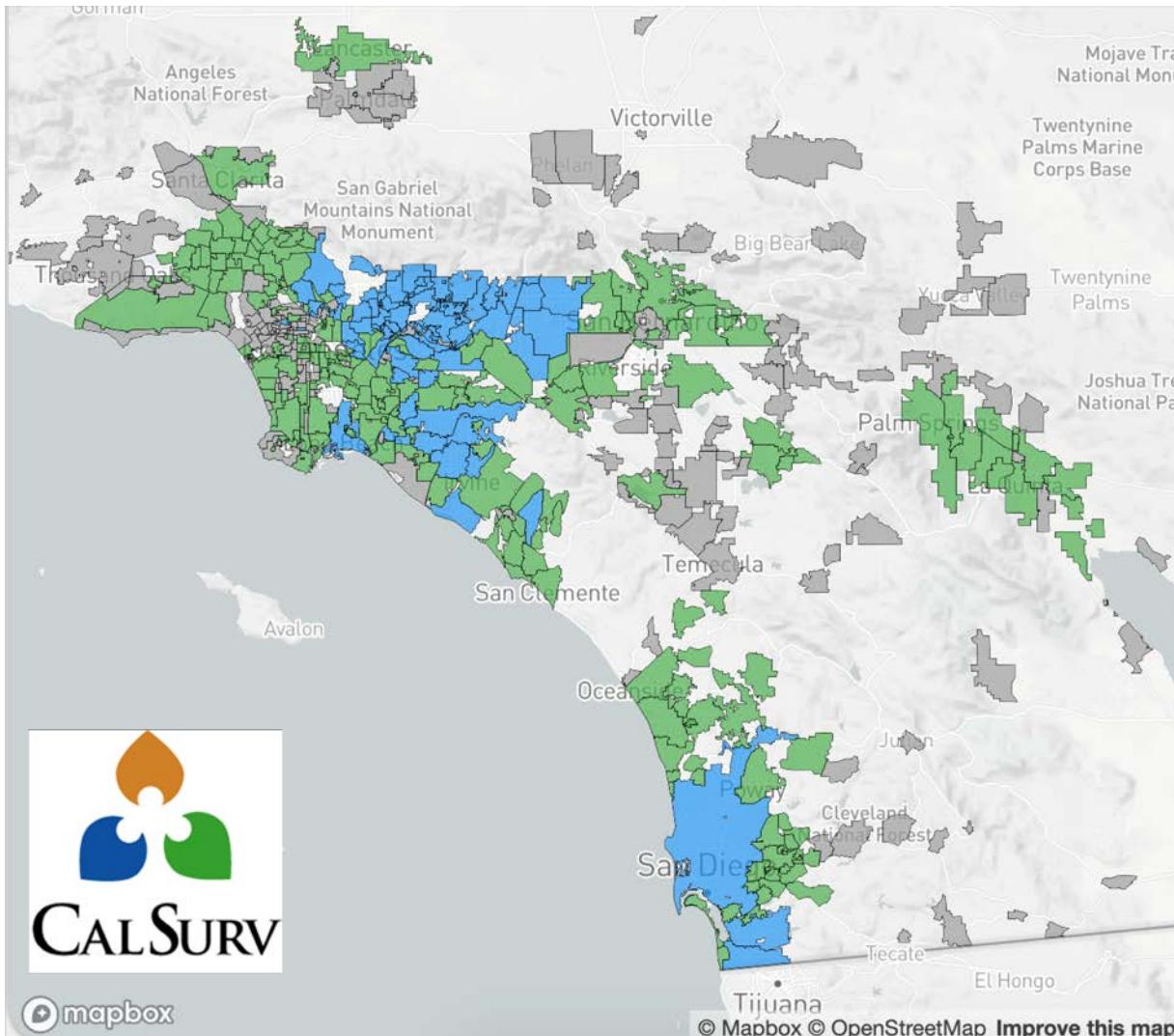
Ae. aegypti



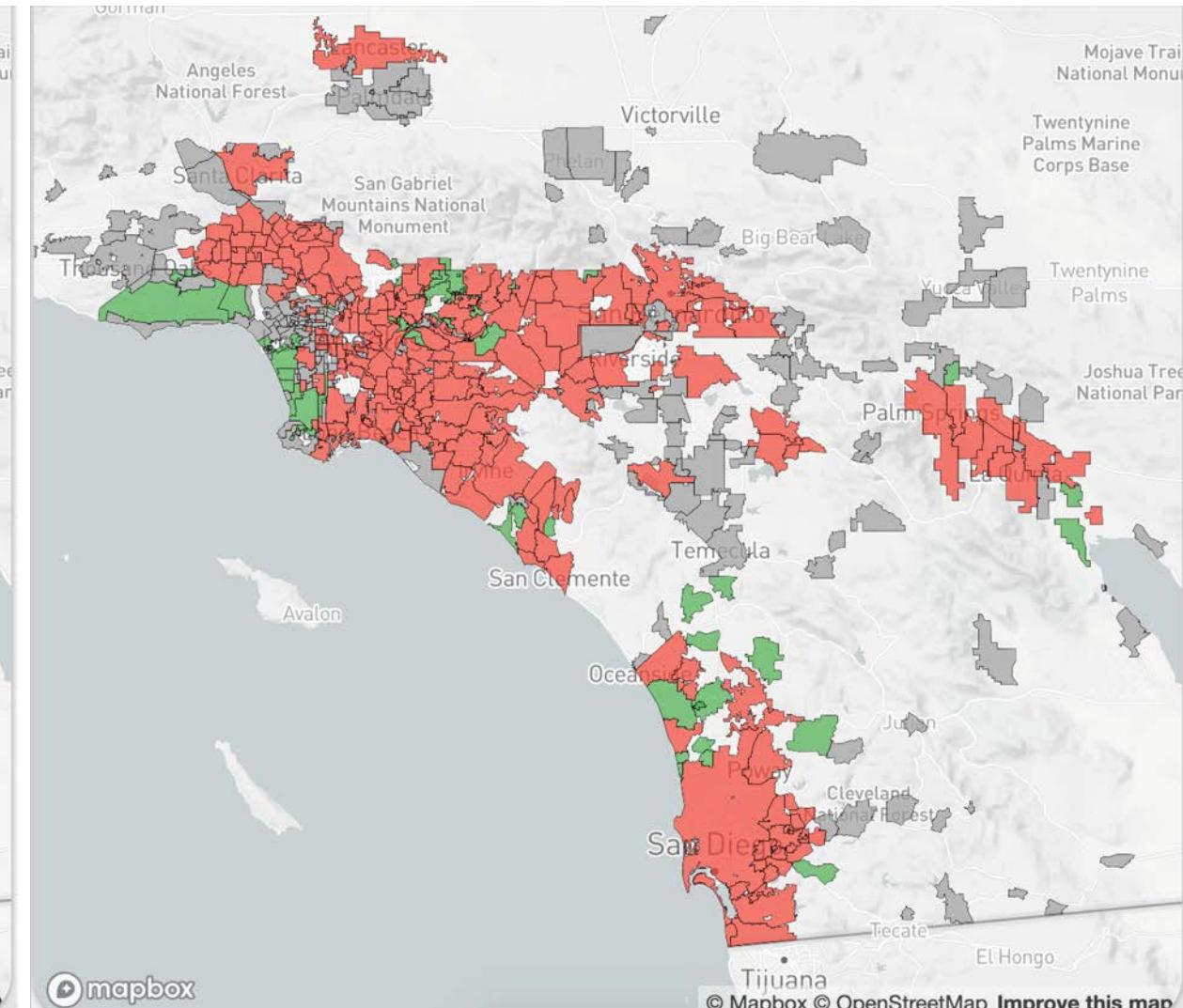
mapbox

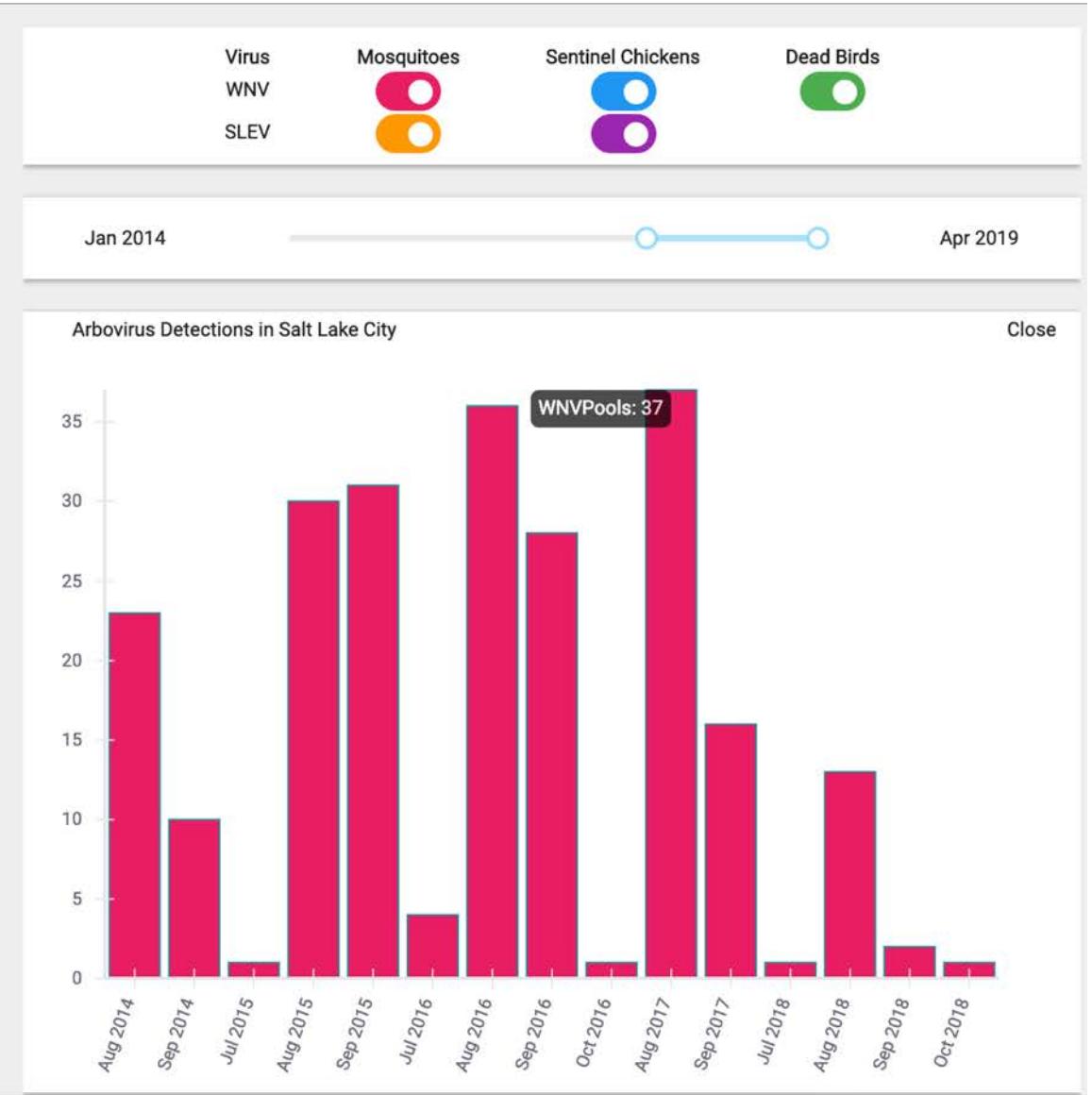
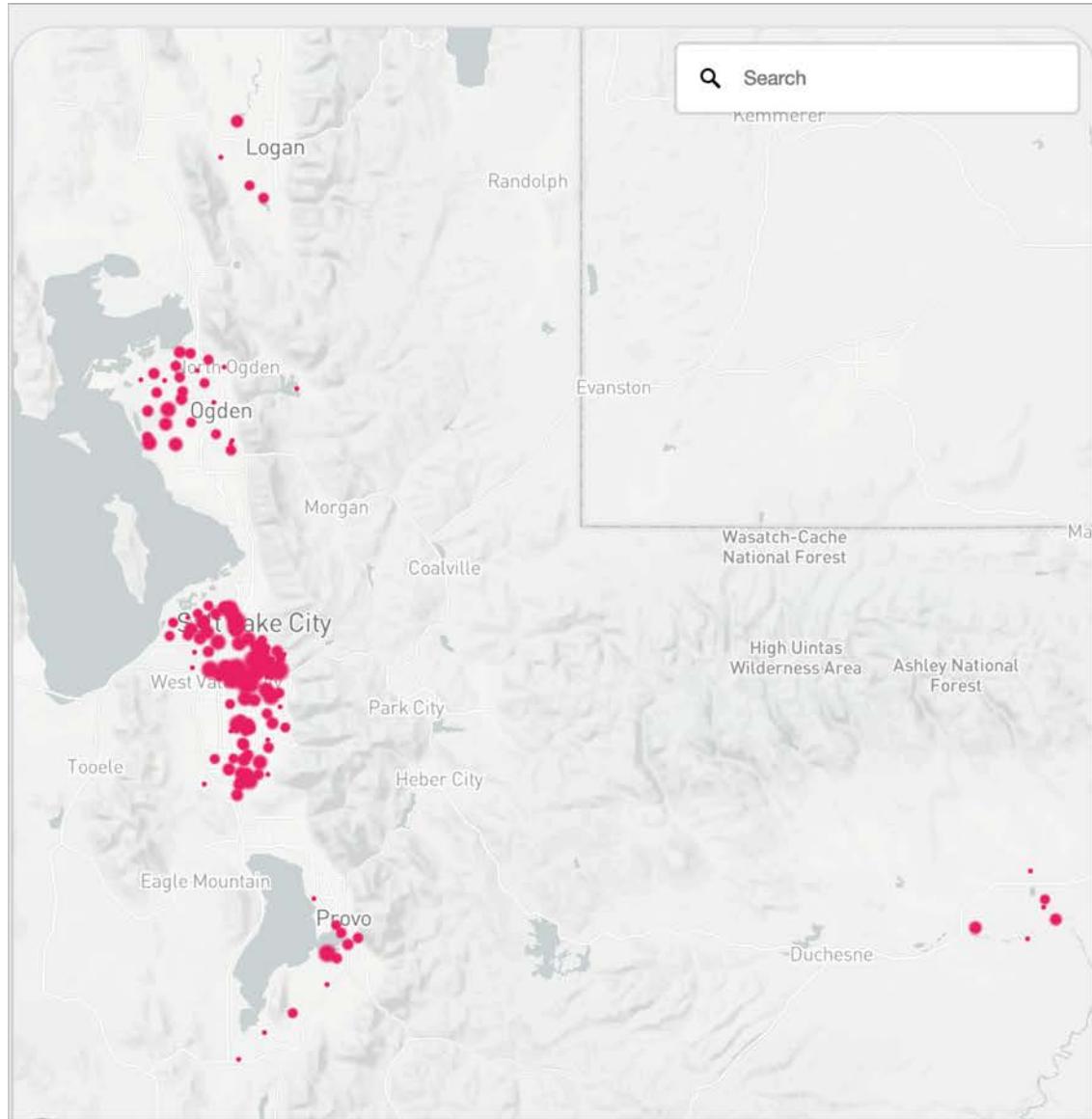
2011 2012 2013 2014 2015 2016 2017 2018

Ae. albopictus



Ae. aegypti





Training Opportunities



2019 AMCA “Train the Trainer” Certification Workshop for Best Practices in Mosquito Control April 25, 2019

- Honolulu, Hawaii
- Four representatives from USAPIs to attend through PacVec CoE travel support: Guam, CNMI, FSM, RMI

Training Opportunities



- Tiered approach
 - Short course(s) on insecticide resistance testing, vector biology and management
 - Shadowing program for early-career leaders from USAPIs to spend time with comprehensive vector management programs
 - Planned visits from CNMI and Kosrae
 - Summer 2019
 - ~ 2 week travel to Los Angeles and Houston
 - May include visit to CDC

Discussion Points for the Executive Board

- Pacific Island Vector Management Council off to a great start
 - Monthly meetings via Zoom
 - Sharing of resources, keys, guidelines
 - Assessing capacity and procurement needs
- Importance of PIHOA Regional Entomologist
- Vision and needs for regional data sharing
 - CalSurv to integrate human data
 - Region-specific risk model? Other tools?

Acknowledgements:

PIHOA:

Grayson Brown

Guam Division of Env. Health:

Claire Baradi, Rosanna Rabago

CNMI CHC Bureau Env. Health:
Esther Muna, Aileen Benavente

+ Members of the Pacific Island
Vector Management Council



PACIFIC SOUTHWEST CENTER OF
EXCELLENCE IN
VECTOR-BORNE DISEASES



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