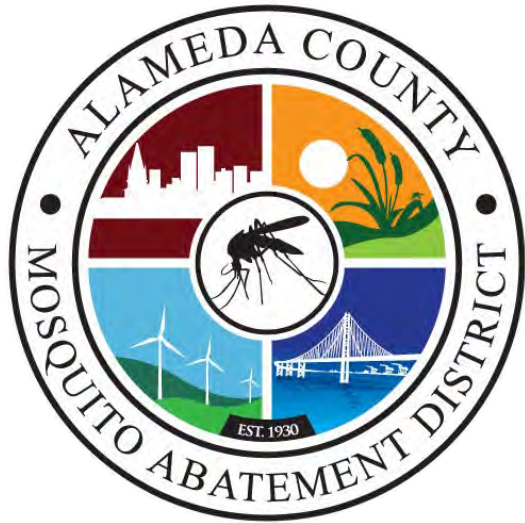


Alameda County Mosquito Abatement District

City of San Leandro 2023 update



Ryan Clausnitzer, MPA, REHS
General Manager

www.mosquitoes.org

3.6.2023

Overview

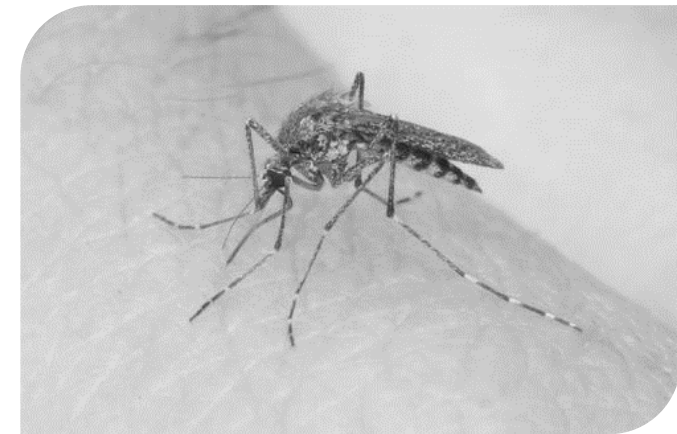
- Formation & authority of Alameda County MAD
- Organization & funding
- Mosquitoes of Alameda County and where they grow
- Integrated vector management
 - Requests for service from the public
 - Community engagement & research
 - Monitoring and reporting mosquito abundance
 - Current mosquito control practices
 - Upcoming technologies



Tax-funded mosquito control in SF Bay Area because of...



Aedes dorsalis



Aedes squamiger



120 years ago

Civic, scientific, and business leaders organized mosquito districts



Women in the San Rafael Improvement Club were foundational in organizing their mosquito control district during 1902

Eliza A. Neale, the first President, served for 12 years



107 years ago:

1915 Mosquito Abatement Act of California



Governor Hiram Johnson



1915 Mosquito Abatement Act of California

Authorized government agencies to “Take any and all necessary or proper actions to prevent the occurrence of vectors and vectorborne diseases.”

- o Gave power to tax, form boards, and abate (impose fines for mosquito control)

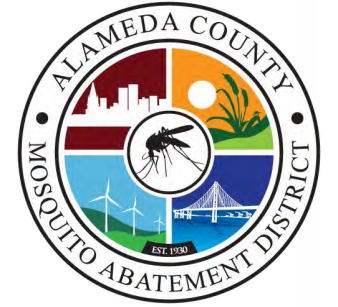
California Health and Safety Code

2063. In addition to abating the public nuisance and taking any necessary actions to prevent the recurrence of the public nuisance, a board of trustees may impose a civil penalty on the owner of the property for failure to comply with the requirements of Section 2061. The civil penalty may not exceed one thousand dollars (\$1,000) per day for each day that the owner of the property fails to comply with the district's requirements.

We have never charged or fined



Independent Special District of Alameda County MAD was formed 92 years ago



Farm tractors
repurposed by civil
engineers to modify
marsh habitat and limit
mosquito growth



ACMAD Board of Trustees

14 appointed by their City Council + 1 County-at-Large Trustee



Shawn Kumagai
Dublin



Victor Aguilar, President
San Leandro



Cathy Roache, Vice-President
County-at-Large



Dr. Robert Beatty
Berkeley



Tyler Savage
Alameda



Robin Lopez
Albany



Subru Bhat, President
Union City



Courtney Welch
Emeryville



George Young
Fremont



Elisa Márquez
Hayward



Steven Cox
Livermore



Dr. Jan O. Washburn
Oakland



Eric Hentschke
Newark



Valerie Arkin
Pleasanton



Hope Salzer
Piedmont



STRATEGIC PLAN

2021-2023

ALAMEDA COUNTY MOSQUITO ABATEMENT DISTRICT



**ENSURE ACMAD HAS THE TRAINING, EQUIPMENT, PERSONNEL,
PARTNERSHIPS, AND FINANCIAL SUPPORT TO LIMIT THE
INTRODUCTION OF INVASIVE AEDES MOSQUITOES**

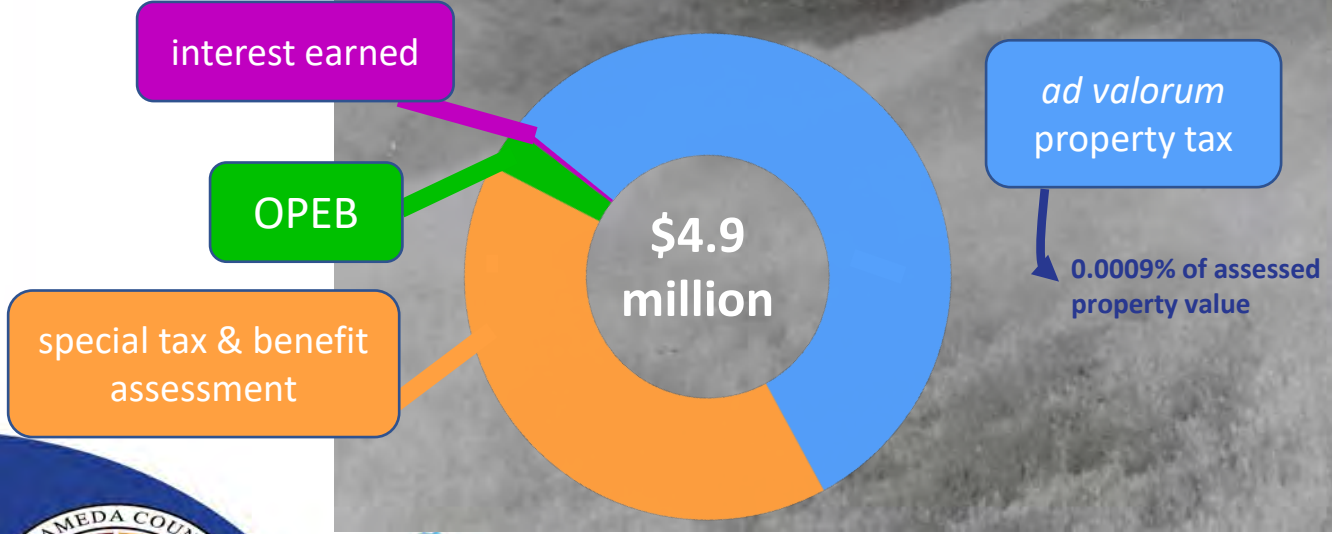
**LEVERAGE ACMAD ASSETS TOWARDS EFFICIENT APPROACHES
TO MOSQUITO CONTROL**

**EMPLOY THE BEST PRACTICES FOR MOSQUITO CONTROL
DISTRICTS AND LOCAL GOVERNMENTS**



Fixed Charges and/or Special Assessments		
Description	Phone	Amount
CSA ST LIGHTING	510-670-5212	21.80
CV SAN SEWER SVC	510-537-0757	439.00
MOSQ MSR K 1982	800-273-5167	1.74
CSA PARAMEDIC	925-867-3400	35.00
VEC CNTRL MSR A 84	800-273-5167	5.92
PARAMEDIC SUPPLMNT	925-867-3400	18.54
ALA CO CLEAN WATER	510-670-5212	7.10
HAYWARD USD MAINT	800-273-5167	28.00
SFBRA MEASURE AA	888-508-8157	12.00
FLOOD BENEFIT 2	510-670-5212	26.66
HAZ WASTE PROGRAM	800-273-5167	6.64
VECTOR CNTRL ASMT	800-273-5167	5.08
MOSQUITO ASMT 2008	800-273-5167	2.50
AC TRANSIT MEAS VV	800-273-5167	96.00
* HUSD MSR A 2017	844-332-0549	88.00
* EAST BAY TRAIL LLD	888-512-0316	5.44
HARD - PARK MAINT	510-881-6727	28.54

Funding mosquito control



18 full-time employees
with 2-5 seasonal
employees and/or
interns



Government Finance Officers Association

Certificate of
Achievement
for Excellence
in Financial
Reporting

Presented to

Alameda County Mosquito Abatement
California

For its Annual Comprehensive
Financial Report
For the Fiscal Year Ended

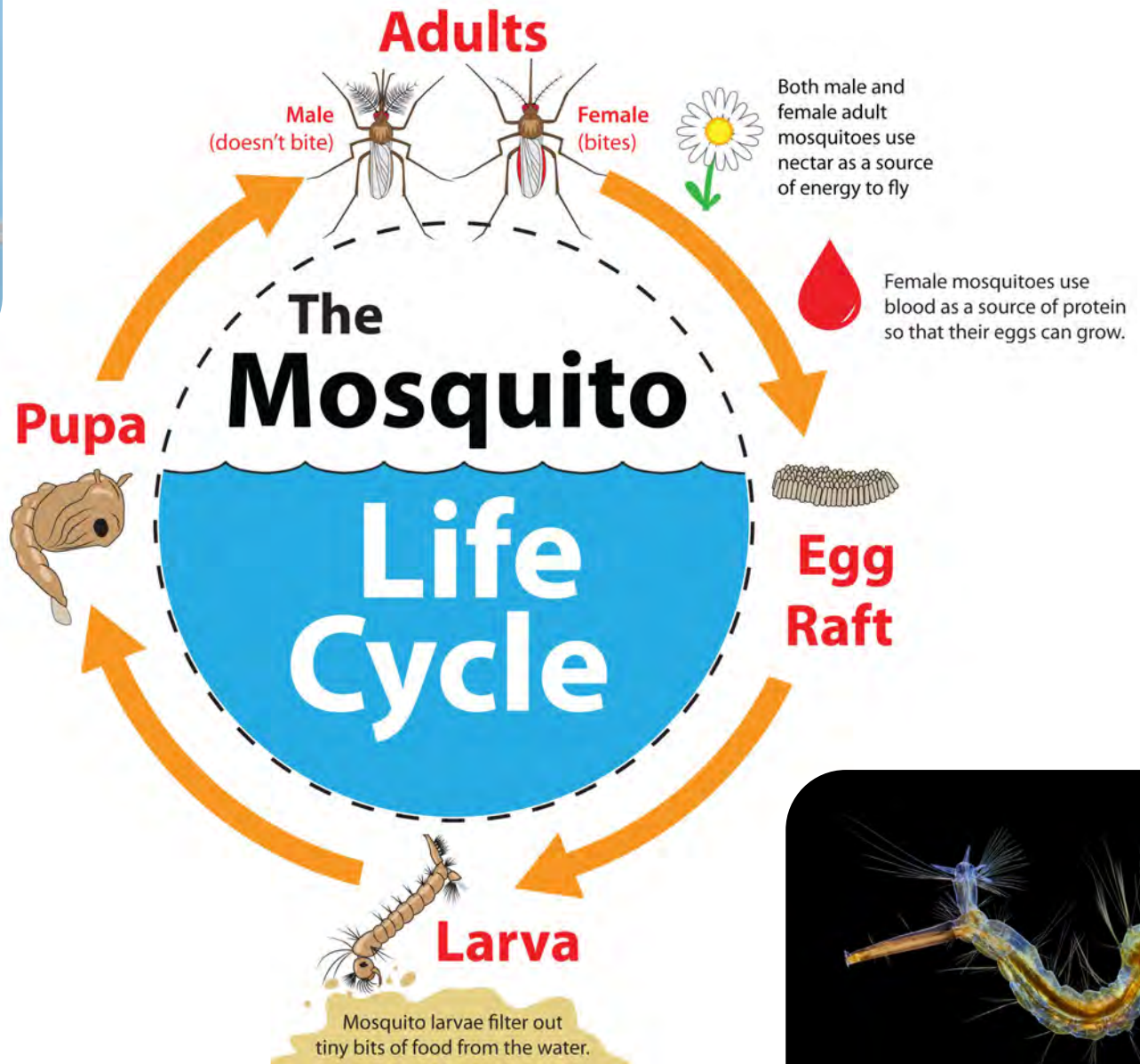


	Budget 22/23	Year to year % budget change	Budget 21/22	Actual 20/21	A vs B	Budget 20/21
REVENUES						
Ad Valorem Property Taxes	\$ 2,755,397	7%	\$ 2,580,814	\$ 2,624,188	14%	\$ 2,300,000
Special Tax & Benefit Assessment	\$ 1,981,814	0%	\$ 1,981,959	\$ 1,962,192	8%	\$ 1,821,600
Interest earned (restricted fund interest NOT included as revenue)	\$ 20,000	-33%	\$ 30,000	\$ 19,208	-36%	\$ 30,000
Sale of Property and Equipment & Misc.	\$ 2,500	-50%	\$ 5,000	\$ 1,038	-79%	\$ 5,000
Reimburse Retiree Health Benefits and fees from OPEB	\$ 140,946	-16%	\$ 168,091	\$ 163,355	-1%	\$ 164,913
Total Revenue	\$ 4,900,658	3%	\$ 4,765,864	\$ 4,769,981	10%	\$ 4,321,513
EXPENDITURES						
Salaries (including deferred comp.)	\$ 2,371,703	6%	\$ 2,236,282	\$ 2,037,043	-4%	\$ 2,116,177
CalPERS Retirement	\$ 534,559	13%	\$ 473,950	\$ 423,110	0%	\$ 423,350
Medicare & Social Security	\$ 38,763	17%	\$ 33,062	\$ 27,867	-11%	\$ 31,278
Fringe Benefits	\$ 564,969	-3%	\$ 579,596	\$ 502,898	-5%	\$ 527,031
Total Salaries, Retirement, & Benefits (pgs. 2,3)	\$ 3,509,995	6%	\$ 3,322,891	\$ 2,990,918	-3%	\$ 3,097,836
Service & Supplies (Clothing & Personal supplies)	\$ 9,000	-10%	\$ 10,000	\$ 4,859	-51%	\$ 10,000
Service & Supplies (Laundry services & supplies)	\$ 13,000	-13%	\$ 15,000	\$ 9,125	-39%	\$ 15,000
Utilities	\$ 21,700	28%	\$ 17,000	\$ 15,422	29%	\$ 12,000
Small tools and instruments	\$ 3,000	0%	\$ 3,000	\$ 2,189	-27%	\$ 3,000
Maintenance (Landscaping & Facility)	\$ 30,000	-14%	\$ 35,000	\$ 20,262	-19%	\$ 25,000
Maintenance (Equipment)	\$ 30,000	-14%	\$ 35,000	\$ 22,290	-36%	\$ 35,000
Transportation, travel, training, & board	\$ 119,840	-6%	\$ 127,630	\$ 74,653	-39%	\$ 122,400
Professional services	\$ 152,200	-25%	\$ 203,450	\$ 91,623	-48%	\$ 176,200
Memberships, dues, & insurance	\$ 37,000	54%	\$ 24,000	\$ 22,906	-2%	\$ 23,337
Insurance - VCJPA & EAP	\$ 179,436	19%	\$ 150,611	\$ 141,650	3%	\$ 137,524
Community education	\$ 55,000	39%	\$ 39,500	\$ 26,317	-32%	\$ 38,575
Operations	\$ 227,500	-5%	\$ 239,000	\$ 223,362	-7%	\$ 241,000
Household expenses	\$ 19,950	15%	\$ 17,350	\$ 15,881	-5%	\$ 16,750
Office expenses	\$ 12,000	0%	\$ 12,000	\$ 9,748	-19%	\$ 12,000
Information Technology/ Communication	\$ 107,400	-4%	\$ 112,400	\$ 71,771	-36%	\$ 111,400
Laboratory	\$ 132,500	-8%	\$ 144,000	\$ 64,136	-54%	\$ 139,000
Total Staff Budget (pg. 4)	\$ 1,149,526	-3%	\$ 1,184,941	\$ 816,194	-27%	\$ 1,118,186
Contingency	\$ 46,000	-8%	\$ 50,000	\$ -		\$ 50,000
Total Expenditures	\$ 4,705,521	3%	\$ 4,557,832	\$ 3,807,112	-11%	\$ 4,266,022
SURPLUS (DEFICIT)	\$ 195,136		\$ 208,032	\$ 962,869		\$ 55,491
CASH CARRIED OVER (pg. 5)	\$ 882,264		\$ 1,530,673			\$ 161,656
SURPLUS (DEFICIT) AFTER OPERATIONAL CASH NEEDS	\$ 1,077,400		\$ 1,738,705			\$ 217,147
RESERVE ACCOUNT ALLOCATIONS			Transfers			Transfers
VCJPA Contingency Fund	\$ (43,103)		\$ -			\$ -
PARS: Pension Rate Stabilization	\$ 269,350		\$ 434,676			\$ -
CAMP: Public Health Emergency	\$ (26,732)		\$ -			\$ -
CAMP: Repair and Replace (pg. 6)	\$ 537,912		\$ 1,311,625			\$ 314,315
CAMP: Operating reserve	\$ -		\$ -			\$ (25,000)
CAMP: Capital reserve	\$ 339,974		\$ (7,596)			\$ (72,168)
Total reserve allocations (pg. 7)	\$ 1,077,400		\$ 1,738,705			\$ 217,147
SURPLUS (DEFICIT) AFTER RESERVE ALLOCATIONS	\$ -		\$ -			\$ -



University of Florida

Obligate aquatic phase of mosquito life cycle



Nikon's Small World: 2019



From Marin-Sonoma Mosquito and Vector Control District

only female mosquitoes bite

males have feathery antenna

female antenna are thinner



adapted from www.theverge.com/



Mosquito producing habitats in Alameda County

Native mosquitoes



Salt marsh



Tule marsh



Unmaintained swimming pools



Storm water canals



Creeks and seepages



Ornamental ponds



Mosquito producing habitats of concern

Invasive mosquitoes



Grow in very small amount of water



Tires



Utility vaults



Plant saucers





Bromeliad plants



Arboviruses spread by mosquitoes in CA

invasive *Aedes*

Type of Mosquito	Viruses spread	Biting habits
 <i>Aedes aegypti</i> , <i>Aedes albopictus</i>	Dengue, Zika, Yellow fever, Chikungunya	Primarily daytime, but can also bite at night
 <i>Culex</i> species	WNV, SLEV	Evening to morning

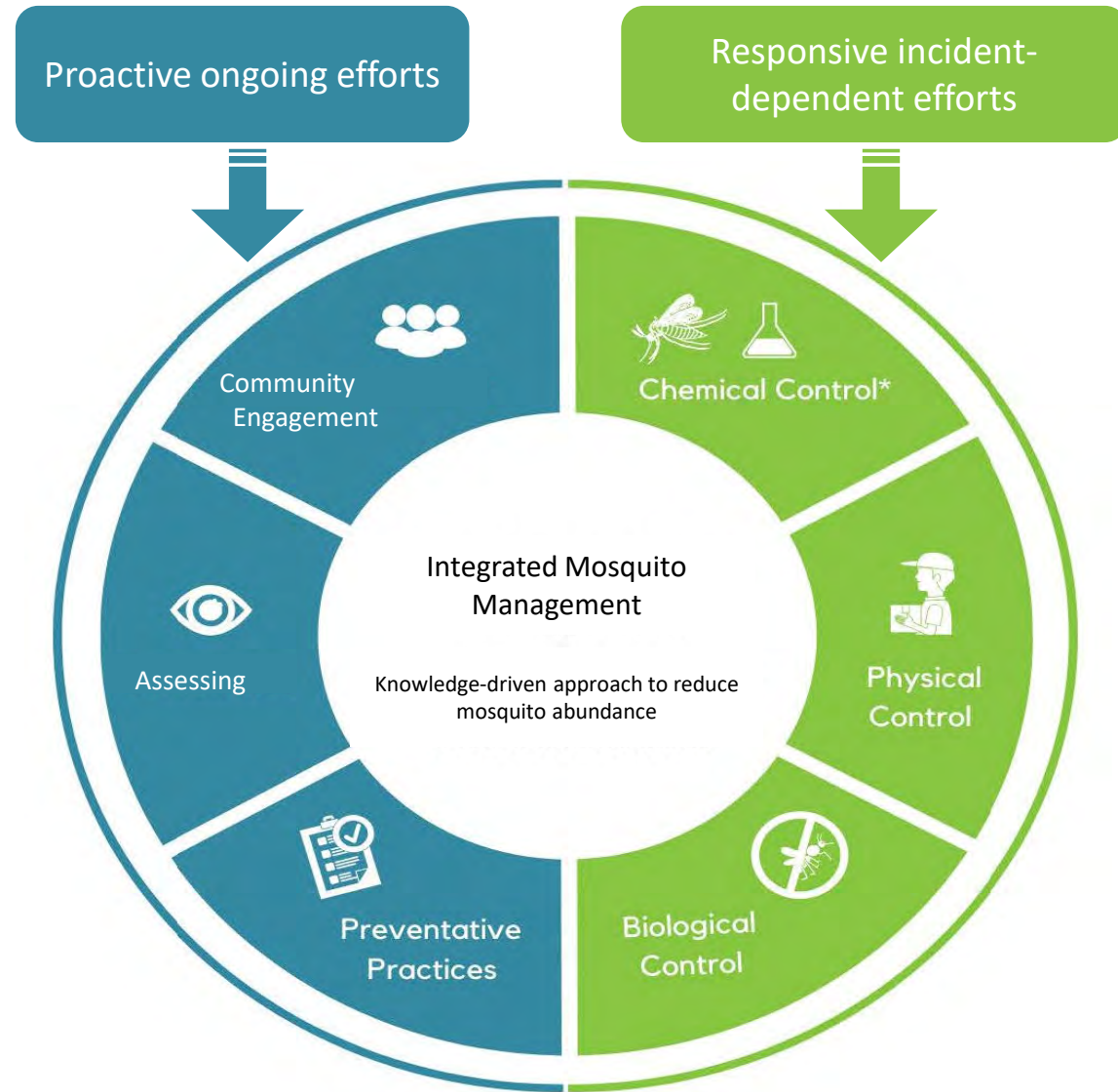


native to CA



Integrated mosquito management

- Data and institutional knowledge used to enact effective & sustainable mosquito control
- Proactive and responsive actions



Maintain water circulation channels in marsh habitats



Mosquito fish: *Gambusia affinis*



- We deliver them for free
- Love to eat mosquito larvae!
- Relatively small
 - 1.5 – 3 inches
- Live in shallow fresh water
- Can live in low oxygen water
 - Small ornamental ponds



Controlling mosquito larvae



Insect-specific toxin from
bacteria

Bacillus thuringiensis israelensis (Bti)

Insect growth
hormone

Methoprene

Surfactant

BVA-2



Larvicide application methods

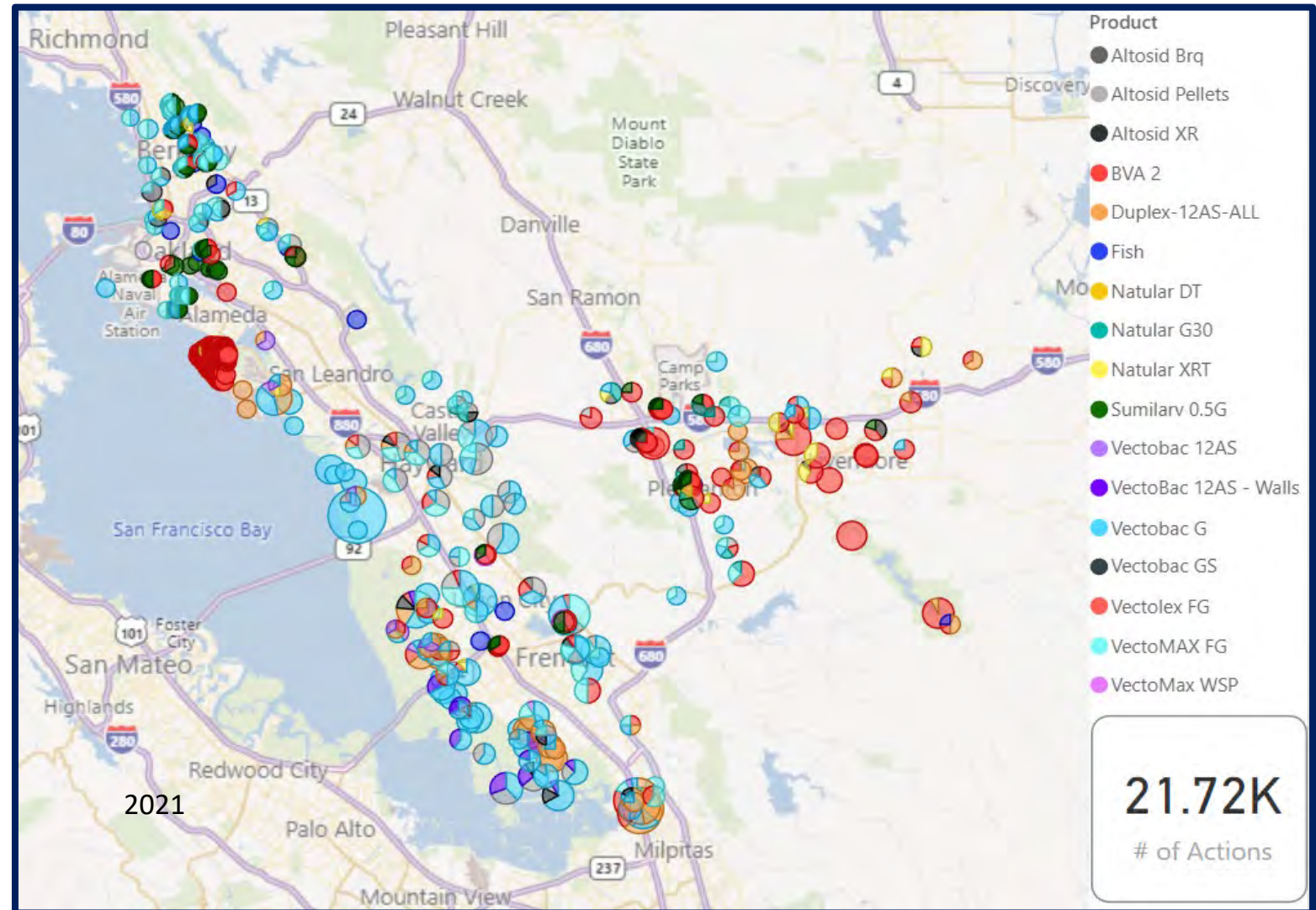


Larvicide applications by drone

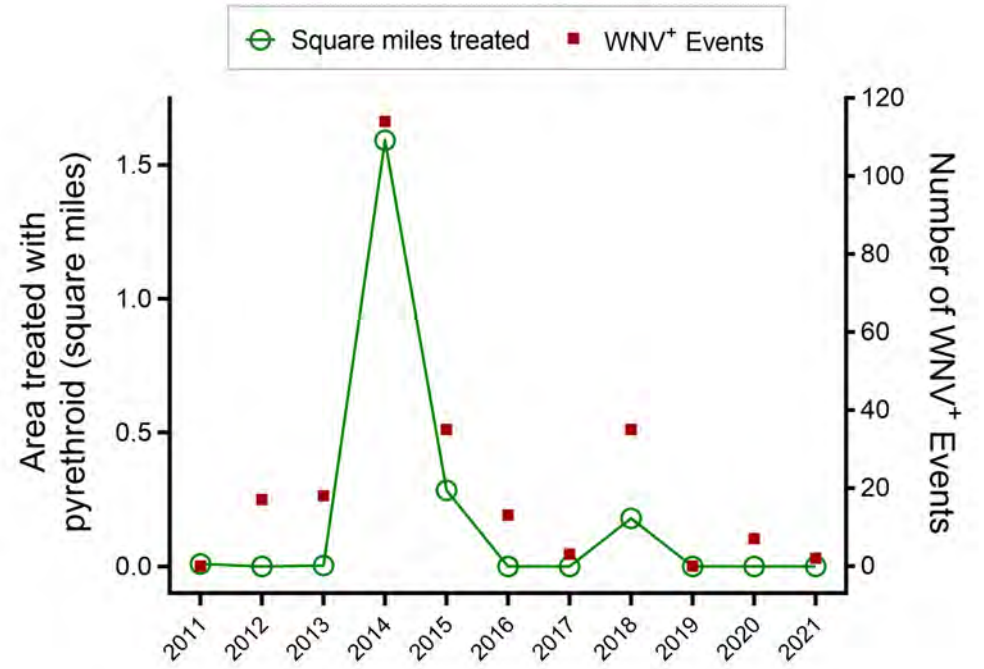


Where larvicide is applied in Alameda County

Most larvicide applications occur in marsh habitats that abut the SF Bay



Our very last resort for controlling infected adult mosquitoes



Ultralow volume pyrethroid
insecticide

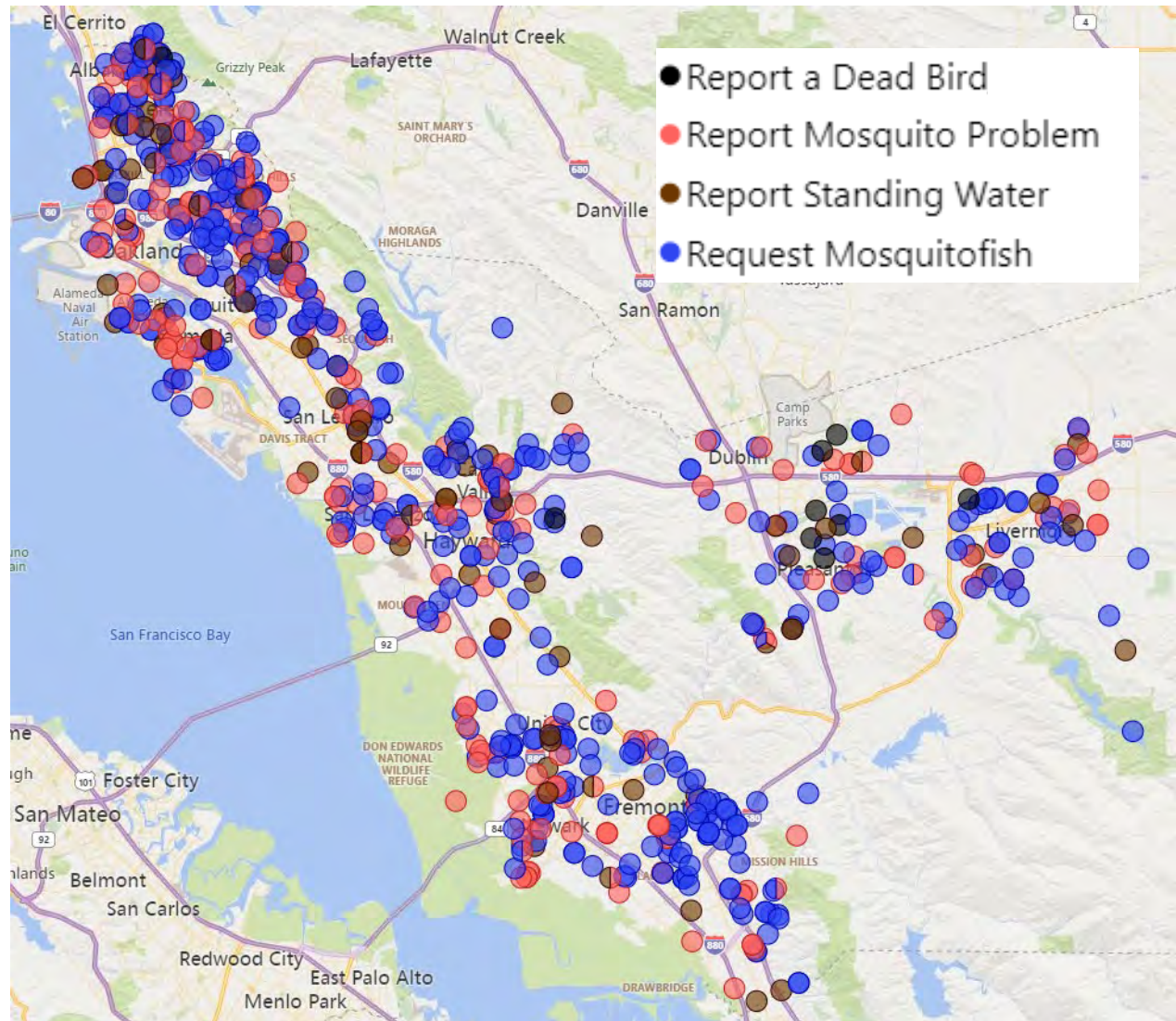
4 grams / square mile



Requests for service

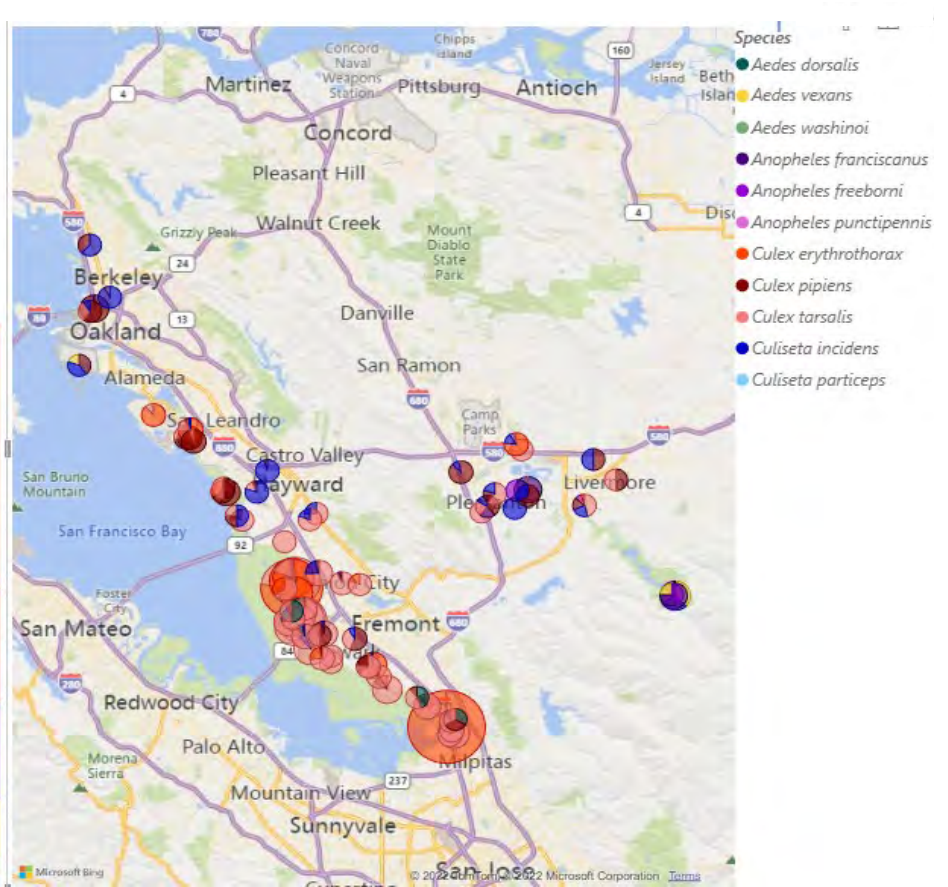
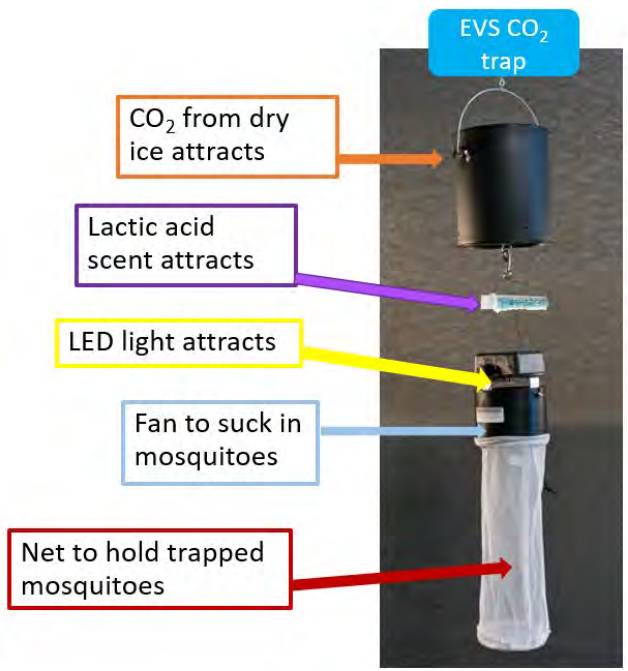
830
Service Requests during
2021

In-person response within a day



Assessing mosquito abundance & arbovirus prevalence

Adult mosquito abundance monitoring



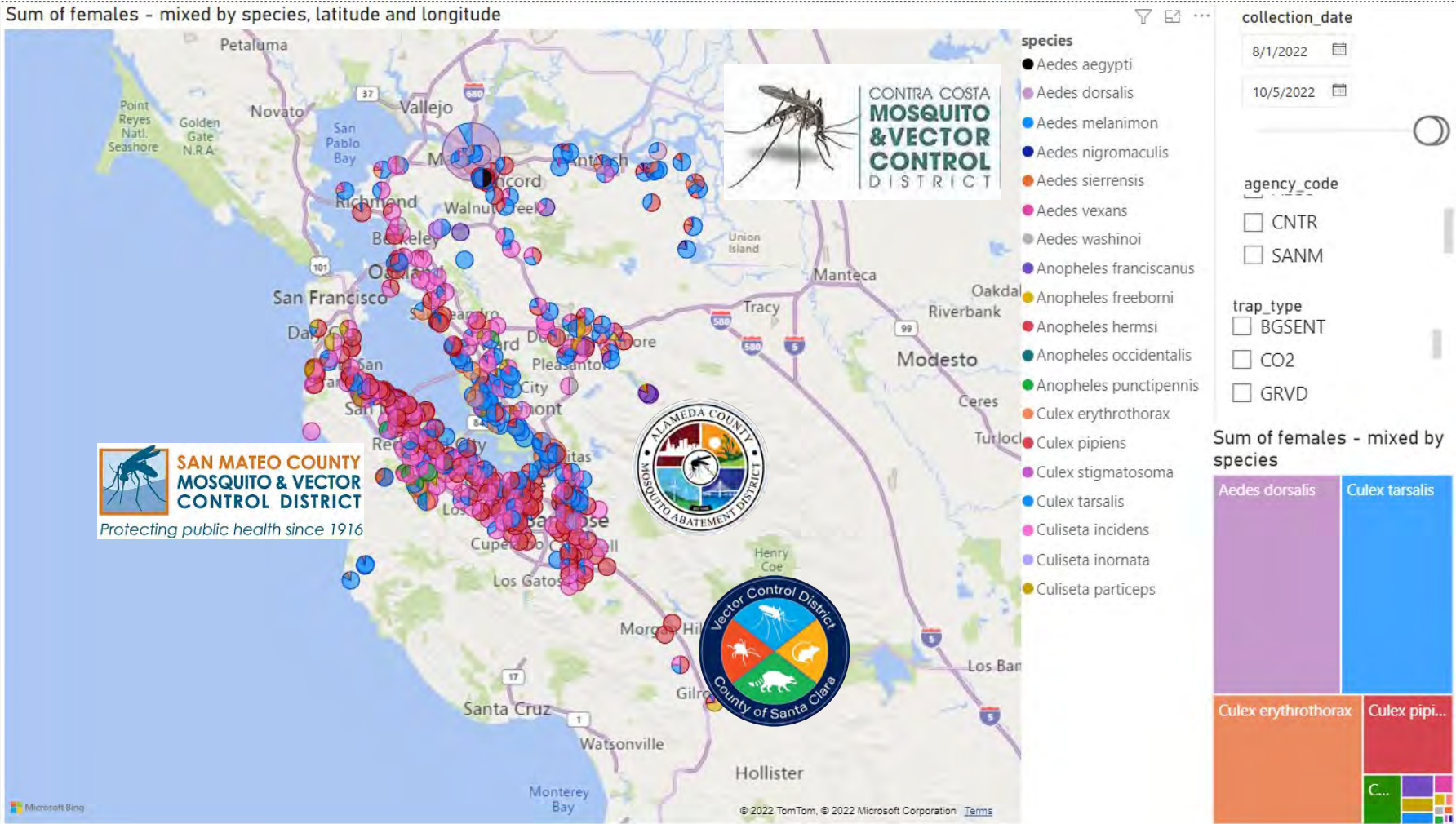
Power BI dashboard for 15 days (auto-updated)



Testing trapped mosquitoes for arboviruses in our lab using quantitative RT-PCR



Multi-agency dashboard to view high resolution data



Community engagement with the public

- Leverages a “show me” & discovery mindset
- Motivates an involved public



Cal State East Bay Students



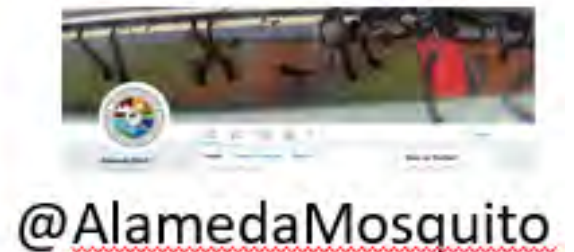
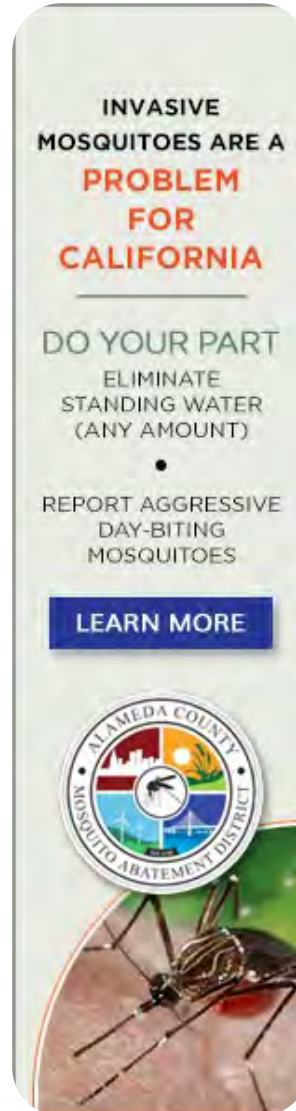
Oakland Garden Preschool



Alameda Watershed Symposium



Community engagement with the public



Community engagement with partner agencies & facilities

- Coordinate with land and facility managers
 - MOU with US FWS and EBRPD
- Engage public agencies
 - Cooperative agreement with CDPH
- Public & private lands
 - Mosquito Abatement and Vector Control Districts Principle Enabling Act (Health and Safety Code §2000 et seq.)

East Bay 
Regional Park District



Engaging with universities & research institutes



University of California
San Francisco



CHAN ZUCKERBERG
BIOHUB



Culex erythrothorax (Diptera: Culicidae): Activity periods, insecticide susceptibility and control in California (USA)

Allen T. Esterly, Dereje Alemayehu, Benjamin Rusmisl, John Busam, Theresa L. Shelton, Tina Sebay, Nayer Zahiri, Joseph W. Huston, Ryan J. Clausnitzer, Eric J. Haas-Stapleton

Published: July 10, 2020 • <https://doi.org/10.1371/journal.pone.0228835>



PACIFIC SOUTHWEST CENTER OF
EXCELLENCE IN
VECTOR-BORNE DISEASES

Quantitative reverse transcription PCR assay to detect a genetic marker of pyrethroid resistance in *Culex* mosquitoes

Kelli M. Hager, Erick Gaona, Amy Kistler, Kalani Ratnasiri, Hanna Retallack, Miguel Barretto, Sarah S. Wheeler, Christopher M. Hoover, Eric J. Haas-Stapleton

Published: August 8, 2022 • <https://doi.org/10.1371/journal.pone.0252498>



Assessing Mosquito Breeding Sites and Abundance Using An Unmanned Aircraft

Eric J. Haas-Stapleton; Miguel C. Barretto; Erika B. Castillo; Ryan J. Clausnitzer; Robert L. Ferdan

J Am Mosq Control Assoc (2019) 35 (3): 228–232.

Toys or Tools? Utilization of Unmanned Aerial Systems in Mosquito and Vector Control Programs

Ary Faraji , Eric Haas-Stapleton, Brad Sorensen, Marty Scholl, Gary Goodman, Joel Buettner, Scott Schon, Nicholas Lefkow, Colin Lewis, Bradley Fritz, Clint Hoffman, Greg Williams

Journal of Economic Entomology, Volume 114, Issue 5, October 2021, Pages 1896–1909,



MR. MISTER: ROCKIN' THE *Aedes* OF THE SAN FRANCISCO BAY SALT MARSHES

MARK WIELAND; JOSEPH HUSTON; RYAN CLAUSSNITZER; ERIC J. HAAS STAPLETON

J Am Mosq Control Assoc (2022)

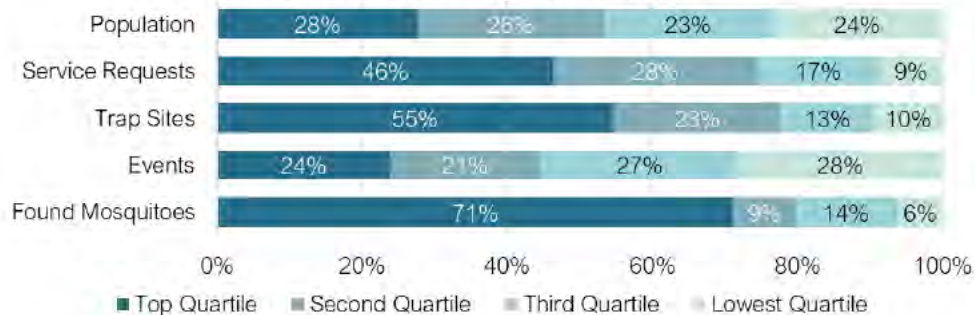
**Work Distribution Analysis for
Alameda County Mosquito Abatement**

Study conducted for
Alameda County Mosquito Abatement District

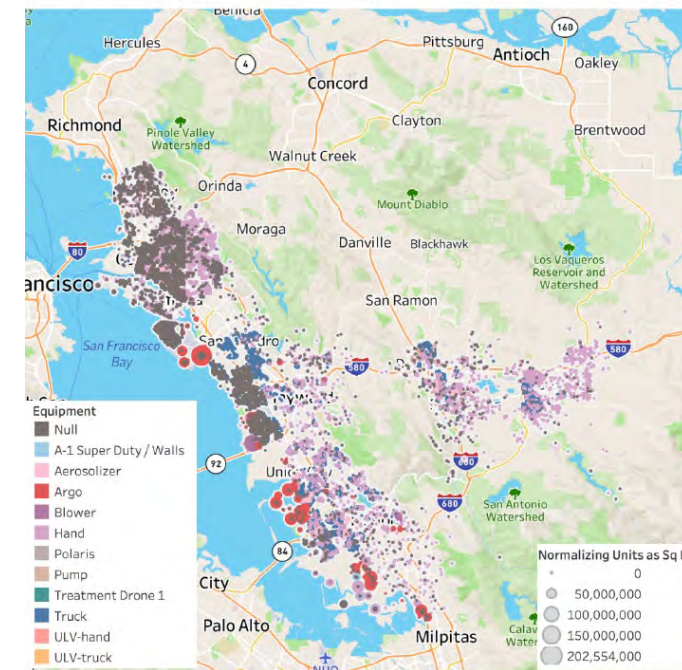
Equitable, Effective Practices for Mosquito Abatement in Alameda County: Challenges and Solutions

Emily Estus, MPP/MPH Candidate 2021
University of California, Berkeley
May 2020

Figure 9: Percent of Population, SR Calls, Traps, Events, and Found Mosquitoes by Income Quartile



Treatment Map (Without Seasonals)



by

Sky Mihaylo

SPRING 2022



sterile insects for *Aedes* control

non-biting males are released to mate with invasive female mosquitoes

no new female mosquitoes are produced

3 sterile insect techniques (SIT) to reduce abundance of biting & disease-spreading female mosquitoes



sterile insects for *Aedes* control

irradiated

bacteria-infected

genetically engineered

Invasive *Aedes* mosquitoes are not yet in Alameda County



1

Irradiate male mosquitoes

Medfly and Mexfly - USDA APHIS

Jun 2, 2020 — APHIS-International Programs Action Programs Staff m
breeding facilities for the Medfly and Mexfly. Flies are irradiated (ma

X-Rays sterilize male mosquitoes

25,000 sterilized at a time

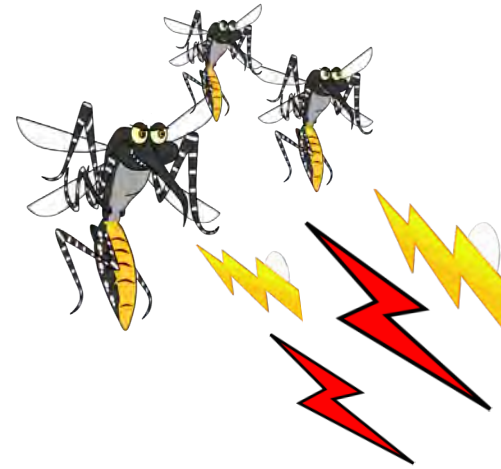
Use for any species (unpatented method)

One-time equipment purchase

Grow 100,000s of mosquitoes

Must separate male from females

Reduced mosquito health



2

Wolbachia bacteria infection

Male mosquitoes naturally spread bacteria

Multi-generation impact

Reduced mosquito reproduction and virus growth

EPA-registered non-GMO option

Must separate male from females

Identify / replace correct *Wolbachia* strain

Commercial provider = recurring cost

PLOS NEGLECTED TROPICAL DISEASES

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Open Release of Male Mosquitoes Infected with a *Wolbachia* Biopesticide: Field Performance and Infection Containment

Linda O'Connor, Catherine Plichart, Ayo Cheong Sang, Corey L. Brelsfoard, Hervé C. Bossin, Stephen L. Dobson



MOSQUITO
mate®

<https://mosquitomate.com/pricing>

3

Genetically modified

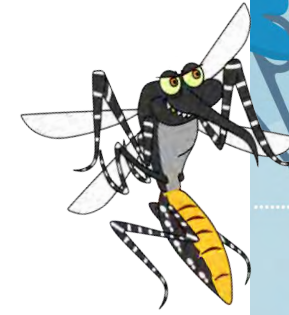
Female mosquitoes eliminated as immatures

EPA approved & monitored trial in Florida


Eggs-in-a-box simplifies adult release

Public hesitancy to GMO

Recurring cost



Successful suppression of a field mosquito population by sustained release of engineered male mosquitoes

Angela F Harris, Andrew R McKemey, Derric Nimmo, Zoe Curtis, Isaac Black, Siân A Morgan, Marco Neira Oviedo, Renaud Lacroix, Neil Naish, Neil I Morrison, Amandine Collado, Jessica Stevenson, Sarah Scaife, Tarig Dafa'alla, Guoliang Fu, Caroline Phillips, Andrea Miles, Norzahira Raduan, Nick Kelly, Camilla Beech, Christl A Donnelly, William D Petrie & Luke Alphey 

Nature Biotechnology **30**, 828–830(2012) | [Cite this article](#)



Thank you.

23187 Connecticut Street
Hayward, CA 94545

www.mosquitoes.org
510.783.7744

Ryan Clausnitzer, MPA, REHS
General Manager
ryan@mosquitoes.org



