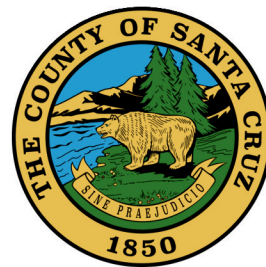


2024 ANNUAL REPORT

SANTA CRUZ COUNTY

MOSQUITO & VECTOR CONTROL

Agricultural Commissioner's Office

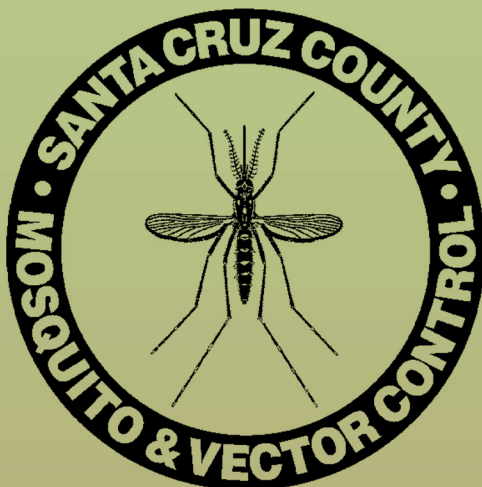




Dedicated in loving memory to Steven Driscoll, our cherished friend and colleague of 17 years. We honor his enduring legacy of service and commitment to the citizens of Santa Cruz County. Steve had a passion for helping people. His unwavering spirit and good humor inspired all who had the privilege of knowing him. As we reflect on his contributions to our community, we are reminded of the profound impact one individual can have through selfless service and genuine care. Though we miss him deeply, Steven's memory continues to guide and inspire us.

Table of Contents

- Preface
 - Manager's Statement 3
 - Mission Statement 4
 - Staff Members 5
- Free Public Services 6
 - Service Requests 7
- Mosquito Control 8
- Disease Monitoring 9
 - MVCAC Poster 10
- Invasive Species 11, 12
- Mosquito Fish 13
- Ticks and Lyme Disease . . . 14
- Rodents 15
- Other Pests 16
- Community Outreach 17
- Financial Position 18





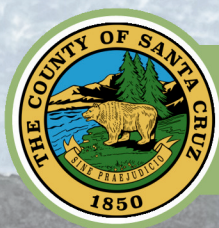
STATEMENT FROM THE MANAGER

Thanks to the hard work and dedication of the Santa Cruz County Mosquito & Vector Control team, I'm proud to share our 2024 Annual Report.

This year, our staff responded to over 600 public service requests and maintained nearly 3,500 mosquito breeding sites. Our surveillance team deployed nearly 900 traps to monitor for disease-carrying mosquitoes in every neighborhood we serve. After two full years of post-detection monitoring and control, we successfully eliminated the invasive mosquito population found in Watsonville in 2022. Our team conducted extensive surveillance through October 2024 without a single new detection of *Aedes aegypti*. With this species now established in neighboring counties — and known to have transmitted Dengue virus in Southern California during the last two summers — we remain on high alert for any local reintroductions.

This year also brought deep reflection. We celebrated the retirement of Ray Travers after 30 years of outstanding service to our agency. His knowledge and dedication have left a lasting legacy. We also experienced a profound loss with the passing of our teammate Steven Driscoll, who served our agency and community for 17 years. Steven was a valued colleague and friend, and his absence is deeply felt across our small team. We honor his memory and the many ways he strengthened our mission. As we look ahead, I remain deeply grateful for the professionalism and resilience of our staff. Together, we continue to adapt, respond, and serve the people of Santa Cruz County with integrity and commitment to protecting public health.

Amanda Poulsen
Assistant Vector Control Manager



Our Mission

Santa Cruz County Mosquito & Vector Control (MVC) is committed to protecting the public from pests capable of transmitting disease or creating a nuisance. Our service, consultation, and education enable residents to resolve problems and protect themselves with a better understanding of vector biology, behavior, and vector-borne diseases. MVC was established in 1993 as a County Service Area program within the Agricultural Commissioner's Office in response to public interest in mosquito relief. In August 2005, residents voted to enhance our services to include other vectors, as well as expand our service area to the entire county.

Our 2024 Team

The Santa Cruz County Mosquito and Vector Control team is dedicated to the protection of public health. Our team is comprised of five Vector Control Specialists, one Vector Ecologist, and our Assistant Vector Control Manager. We operate under our Director, the Santa Cruz County Agricultural Commissioner.

Each member of our staff brings a unique skillset that, together, form a highly efficient public service agency. It is our honor to serve the citizens of Santa Cruz County and protect them from vectors and vector borne diseases. We work to empower our residents to take control of their health, homes, and families' safety.



David Sanford
Agricultural
Commissioner



Amanda Poulsen
Assistant Vector
Control Manager



Stephen Bowling
Vector Control
Specialist



Steven Driscoll
Vector Control
Specialist



Ray Travers
Vector Control
Specialist



Michael Pini
Vector Control
Specialist



Nader Sidhom
Vector Control
Specialist



Emma McDonough
Vector Ecologist



Ivy Munnerlyn
Seasonal Ag.
Biologist Aide



Tony Cuevas
Environmental
Biology Intern



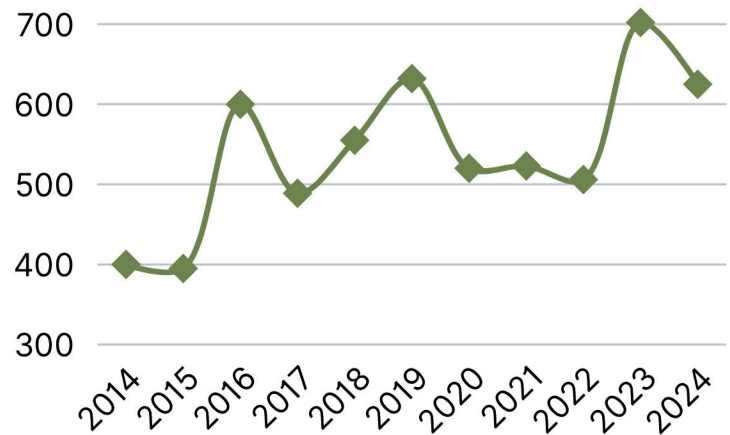
Weslyn Ramaekers
Vector Control
Specialist



Liam Ruff
Vector Control
Specialist

The public's demand for our services has increased by 56% over the last 10 years.

Fig. 1: Last 10 Years of Service Requests.

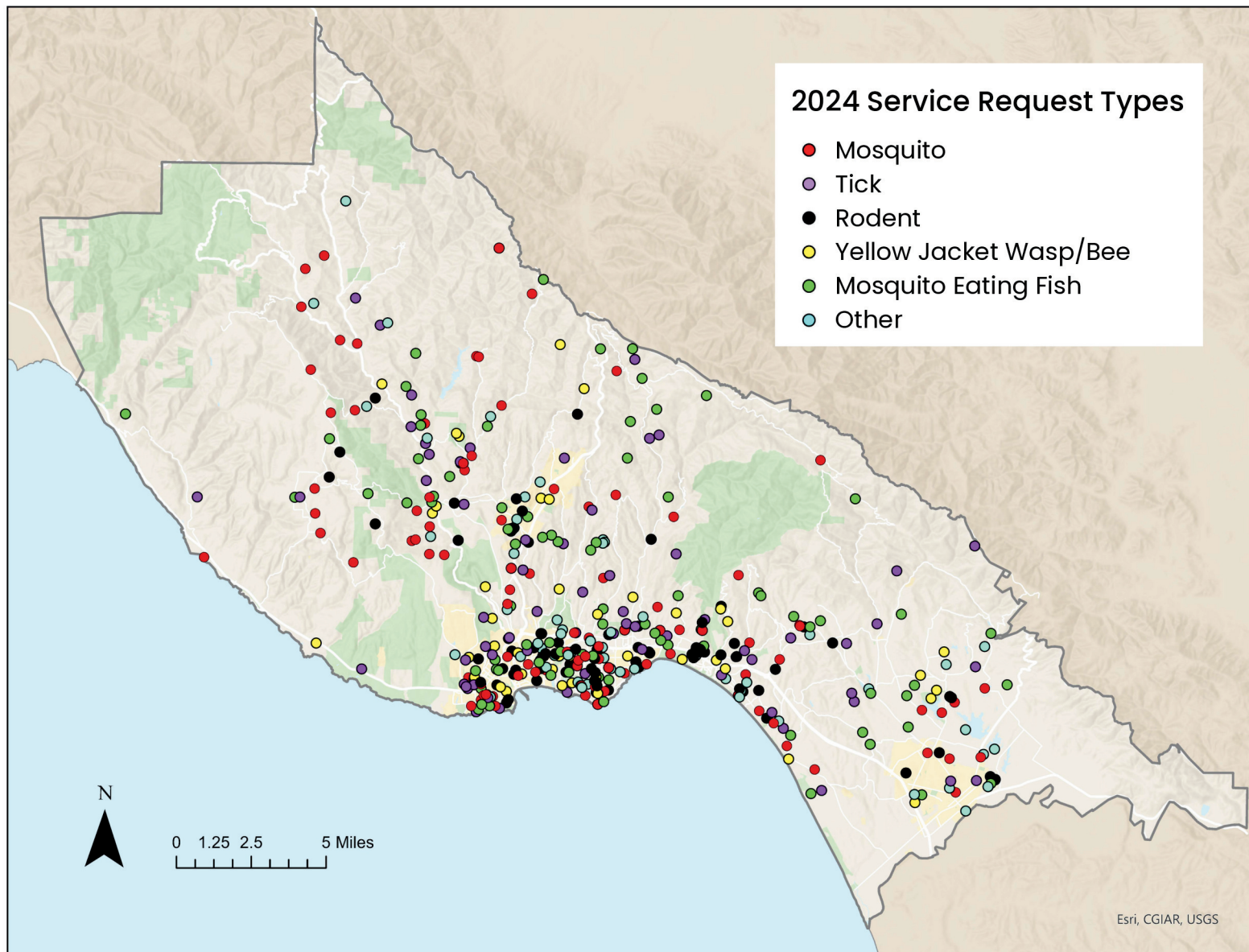


Our Free Services:

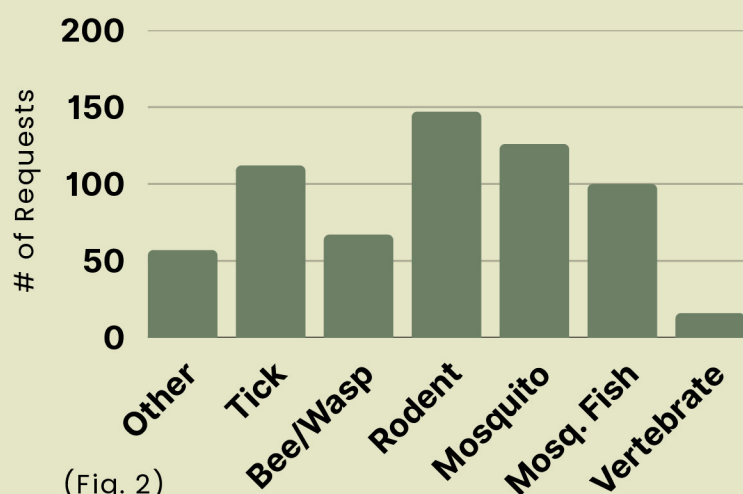
- Monitoring native and invasive mosquitoes and the diseases they may carry.
- Testing mosquitoes, ticks, and other vectors for diseases of public health concern.
- Inspections and advice to prevent and mitigate rodent infestations.
- Tick identification and disease risk consultation.
- Delivery of mosquito-eating fish for ponds and troughs.
- Rapid response to service request from the public related to mosquitoes, rodents, ticks, and other vectors.
- Environmentally responsible mosquito control when needed to protect public health.
- Engaging the community through education to promote vector safety and disease prevention.

Scan to Request Service →





Types of Service Requests in 2024



(Fig. 2)

Santa Cruz County Mosquito & Vector Control responded to **625 requests for service** in 2024. Over 36% of all service requests were about mosquito issues. Mosquito eating fish deliveries comprised 16% of all service requests. Rodent exclusion inspections comprised 24% of all service requests. Requests for tick identifications and consultations increased from 15% in 2023 to 18% in 2024. Service requests about bees and yellowjacket wasps made up 11% of all calls. The "Other" category made up 9% of all service request calls, which included: cases of mysterious biting/itching by mites, midges, flies, fleas, bedbugs, parasites, spiders, bats, and various vertebrates and invertebrates. (Fig. 2)

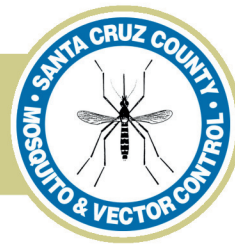
Mosquito Control

Decisions to control mosquitoes are made based on their species, abundance, potential to vector diseases, proximity to humans, and the presence of natural predators or protected wildlife species. Minimizing mosquito breeding potential is paramount to mosquito control. We provide water management advice to residents, stock mosquito-eating fish for backyard ponds, and consult on new development projects in the County. If mosquito breeding in an area reaches intervention thresholds, we use integrated vector management which may involve source reduction, biological control, or applying low toxicity larvicides.



In 2024 we treated **3,601** larval mosquito breeding sources. When controlling mosquitoes in the larval stage is not feasible, as with adult tree-hole breeding mosquitoes, we employ other methods like applying garlic oil-based sugar bait barrier treatments to shrubbery upon request. Targeting adult mosquitoes is a last resort for our program, as control of larvae is more selective and efficient. Wide area spraying (the dispersal of products via micro-droplets into the air) is not part of our current program and would require approval by the County Board of Supervisors as part of the Emergency Disease Response Plan.

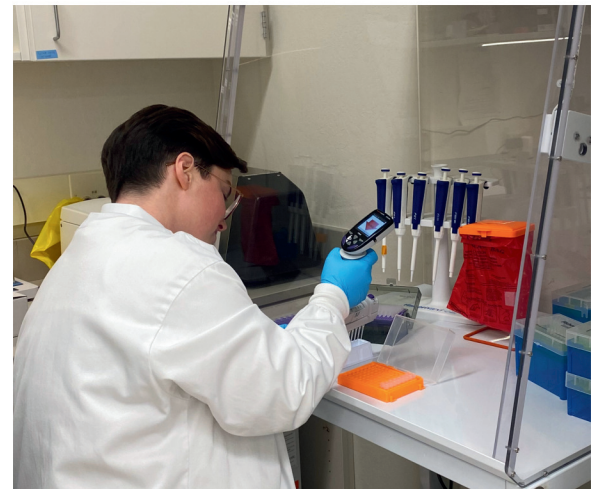
Disease Monitoring



Several types of traps were utilized to collect adult mosquitoes for population and disease monitoring. Over **844** CO₂-baited and **42** gravid traps were deployed from April to November 2024, in which **19,391** adult mosquitoes were captured and identified. Weekly trap data enables our staff to focus our control efforts on high-risk areas.

Of the mosquito species in our county capable of transmitting West Nile Virus (WNV) to humans, *Culex pipiens* made up **6.7%** (n = **1,291**) and *Culex tarsalis* made up **3.4%** (n = **658**) of total mosquitoes caught. *Culex erythrothorax* were the most numerous as they made up **55.6%** (n=**10,773**) of total mosquitoes caught (Fig. 3).

Of the **96** pools containing **1,002** mosquitoes that were tested for WNV, Saint Louis Encephalitis Virus, and Equine Encephalitis Virus, none were positive for viral agents of disease. Of the **62** dead birds that were reported by the public for WNV testing, none tested positive.



Total Adult Mosquitoes Caught by Species (Fig. 3)





YEAST VS. DRY ICE BAITED EVS TRAP EFFICACY COMPARISON

EMMA MCDONOUGH, JACK MILLS, ANTONIO CUEVAS, IVY MUNNERLYN, STEPHEN BOWLING, MICHAEL PINI, NADER SIDHOM, AMANDA POULSEN

Abstract

This study compares the efficacy of yeast baited vs. dry ice baited EVS traps. The study was replicated in two counties—Santa Cruz and San Benito—over 13 weeks from July to September 2024; however, this poster only represents data from Santa Cruz County. Carbon dioxide (CO₂) production, temperature, and humidity were measured by continuous data logging sensors while mosquito abundance and species diversity were measured by trap catch.

Introduction

The rising cost of dry ice makes yeast bait an attractive alternative for routine mosquito trapping. Our preliminary study with yeast bait showed that the catch would be fractional compared to dry ice. If we could quantify that difference, we could potentially use yeast traps in the future to lower cost while also being able to compare to historical trapping data.

Objective

To determine a ratio for how many yeast baited traps it would take to equal the adult mosquito catch of a traditional dry ice baited EVS trap.



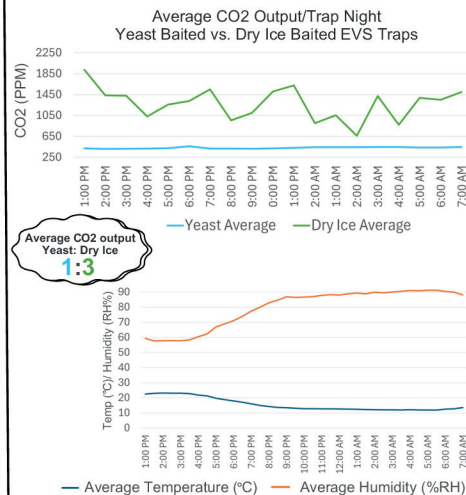
Materials and Methods

- (per site)
- Biogents® CO₂ Generator Yeast Kit
- Dry Ice
- 3 EVS Traps (yeast, dry ice, control)
- 2 TemTop® M2000 2nd Gen. CO₂/Temp/Humidity Meters



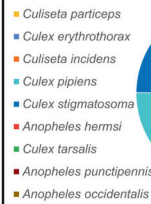
Three chronic mosquito breeding sites in south Santa Cruz County were selected: Rider Pond, Pinto Lake, and Lake Tynan. Over 13 weeks, 3 traps (yeast, dry ice, control) were set at each site (9 traps total) once per week. Traps were set overnight; 1 yeast and 1 dry ice trap set 150 feet apart with a control trap in the middle. CO₂ meters were set at both CO₂ producing traps to continuously log data overnight. Positions of the CO₂ traps were equidistant from the breeding source and were rotated weekly at all 3 sites.

Results: Sensor Data

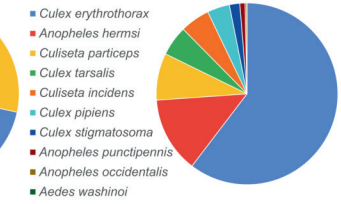


Results: Abundance Data

Yeast Baited EVS: Total Species Caught



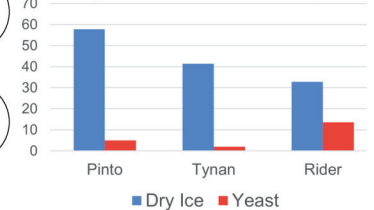
Dry Ice Baited EVS: Total Species Caught



Percentage of Total Abundance
that were *Cx. pipiens* & *Cx. tarsalis*
Yeast: 18% Dry ice: 9%

Average Catch/Trap night: All Sites
Yeast: 7 Adults Dry ice: 44 Adults

Average Adult Mosquito Catch/Trap Night Dry Ice vs. Yeast Baited EVS Traps



Discussion

Sensor data showed that the yeast mixture was producing only a third of the Carbon dioxide that dry ice was producing throughout the trap night. Abundance data showed that yeast baited traps caught on average one sixth the amount of adult mosquitoes/trap night when compared to dry ice. Species diversity varied between the two CO₂ baits, with dry ice baited traps capturing more *Culex* species overall, but less WNV target species (*Cx. pipiens* & *Cx. tarsalis*) than yeast baited traps.

Conclusion

While dry ice outperformed yeast bait in both CO₂ production and adult mosquito capture, the potential cost benefits of yeast make it a viable option for species specific or high-density trapping. Further cost benefit analysis may determine whether the low cost of yeast may be outweighed by labor costs for routine surveillance, as the yeast traps proved to be more time intensive to prepare and set than traditional dry ice traps.

Our poster was presented at the Mosquito and Vector Control Association of California's (MVCAC) 93rd Annual Conference and published in its proceedings.

Yeast vs Dry Ice Baited EVS Trap Efficacy Comparison

Emma McDonough,¹ Jack Mills,² Antonio Cuevas,¹ Ivy Munnerlyn,¹ Stephen Bowling,¹ Michael Pini,¹ Nader Sidhom,¹ Amanda Poulsen¹

¹Santa Cruz County Mosquito & Vector Control, 640 Capitola Rd, Santa Cruz, CA 95062

²University of California, Davis, CA 956161

Abstract:

Our study compared the efficacy of yeast vs dry ice baited EVS traps in Santa Cruz County. Three traps were set in each of three sites each week from Jul – Sep, including: 1 yeast baited EVS trap, 1 dry ice baited EVS trap, and 1 unbaited control EVS trap. At each site the 2 CO₂-baited traps were positioned 150 feet apart and the unbaited control trap was centrally located, equidistant from the mosquito source. Carbon dioxide (CO₂) production, temperature, and humidity were measured by continuous data logging sensors, whereas mosquito abundance and species diversity were measured by counts of each adult mosquito species per trap night. Sensor data showed that the yeast mixture produced only a third of the CO₂ that dry ice produced throughout the trap night. Abundance data showed that yeast baited traps caught on average one sixth the number of adult mosquitoes/trap night when compared to dry ice. Species diversity varied between the two CO₂ baits, with dry ice baited traps capturing more *Culex* species overall, but less WNV vector species (*Cx. pipiens* and *Cx. tarsalis*) than yeast baited traps.



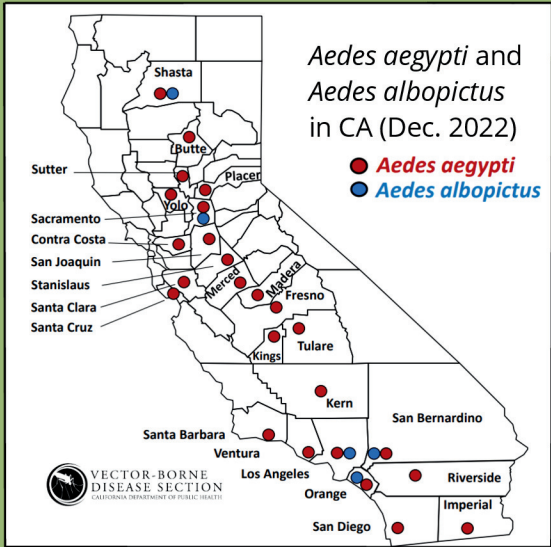
Jack Mills
Student Intern

University of
California, Davis

*Jack's Internship
with our agency
was sponsored
by The Pacific
Southwest Center
of Excellence in
Vector-Borne
Diseases.*



The first *Ae. aegypti* caught.



2022 *Aedes* spp. Infestation map.



In2Care Mosquito Trap

Invasive Mosquito: *Aedes aegypti*

Our battle against the Yellow Fever Mosquito

On October 13, 2022, Santa Cruz County's first invasive *Aedes aegypti* mosquito was detected in Watsonville. This mosquito is an aggressive, day-biting species capable of transmitting several serious diseases including Dengue Fever, Zika Virus, Chikungunya, and Yellow Fever. Nearly half (26) of the counties in CA are now experiencing well established *Aedes aegypti* infestations (Fig. 4). While only travel-related Dengue cases have been confirmed in our county, local transmission of Dengue Fever is now occurring in California. In immediate response to the 2022 detection, our team launched a comprehensive, high-density surveillance and control operation (Fig. 5). Over the course of two years, we:

- Conducted door-to-door inspections & source reduction in all properties within the 250meter buffer zone of the initial detection site every 6 weeks from Oct. to Dec. in 2022 & Apr. to Dec. in 2023. We inspected twice in 2024 while increasing surveillance.
- Trapped within the buffer zone weekly from Apr. to Dec. in 2024 while expanding our search throughout Watsonville via grid based trapping with human scent lure (Fig. 6).
- Submitted adult *Ae. aegypti* samples to UC Davis for genomic testing which determined they resembled Southern CA and Exeter populations.

Trapping & Inspection	2022 (Oct – Dec)	2023 (Apr – Dec)	2024 (Apr – Dec)
In2Care Refresh & Backyard Source Inspection	2 Rounds 140 in2cares	7 Rounds 120 in2cares	2 Rounds 120 in2cares
EVS (dry ice + HL)	38	121	98 Within detection buffer 67 Grid Trapping
BG Sentinel (dry ice + HL)	12	42	0
Ovicups	339	506	0
Gravid	4	2	0
# <i>Ae. aegypti</i> found	18 adults, 6 larvae	0	0

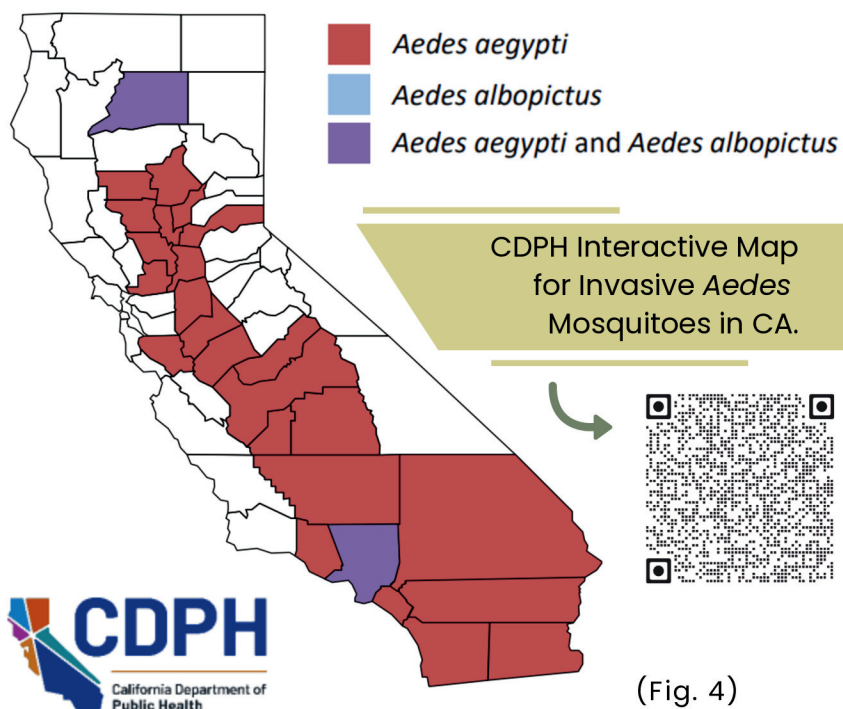
(Fig. 5)

The data from our sustained surveillance indicate that the 2022 detection was a new and isolated introduction. Our aggressive and layered response efforts combining field inspections, public outreach, surveillance, and integrated vector management (IVM) have resulted in no further detections of *Aedes aegypti* in 2023 or 2024. We fulfilled the California Department of Public Health's (CDPH) two-year post-detection surveillance requirement and currently consider the *Aedes aegypti* population in Santa Cruz County to have been successfully eradicated.

However, given *Aedes aegypti*'s continued regional spread and the increasing risk of locally acquired Dengue Fever transmission in California, we are not letting our guard down.

We continue to conduct weekly grid trapping (Fig. 7) in Watsonville and throughout Santa Cruz County, maintaining a state of heightened readiness for any future introductions. We anticipate that *Aedes aegypti* will eventually be detected again, and we are fully prepared to respond rapidly to prevent establishment.

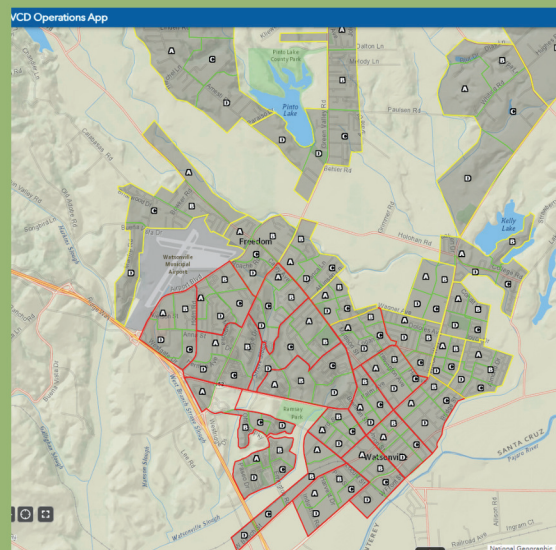
Invasive Aedes Mosquitoes in California by County (Updated 2025)



BG Pro Mosquito Trap

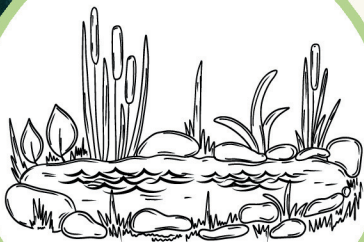


Human Scented Lure (Fig. 6)



Watsonville grid trapping (Fig. 7)

Mosquito Fish



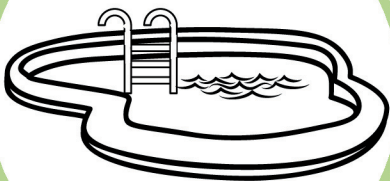
Control Mosquitoes at Home

Mosquito eating fish (*Gambusia affinis*) provide excellent control of mosquito larvae in many backyard water sources. They work well in ponds, fountains, animal troughs, and unused swimming pools. In the warmer months, they eat larvae. In the winter, they eat fish food.



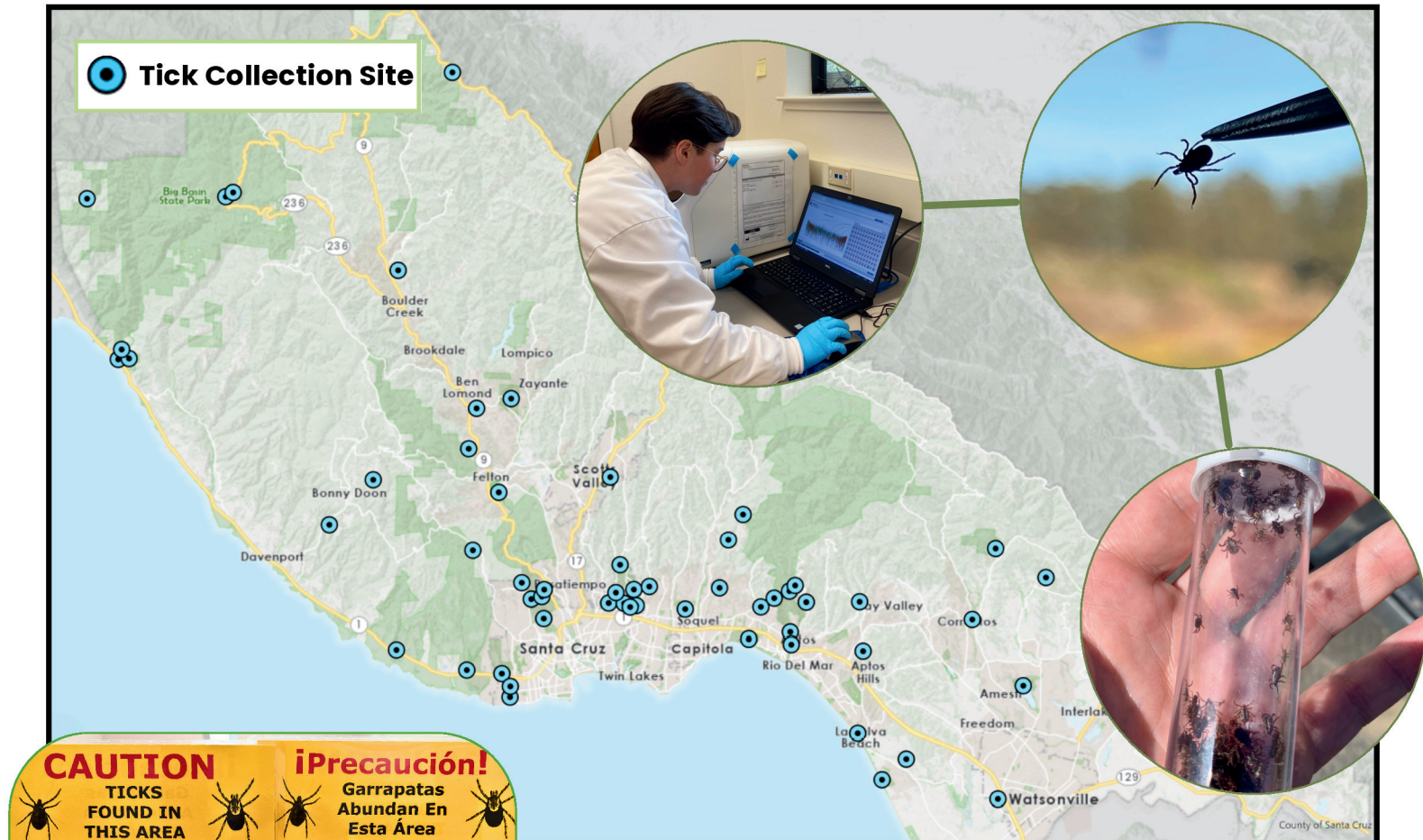
Biological Control

Mosquito eating fish are an important part of our Integrated Vector Management toolkit. Their use in Santa Cruz County pre-dates our program, having been established statewide for several decades. Each adult fish can eat hundreds of mosquito larva per day.



Free Delivery

Mosquito eating fish help us do our job, so we deliver them to your door. Delivery helps us know where our fish end up. Because they are not a native species, we don't put them in natural water bodies where they may compete with our native fish and amphibians.

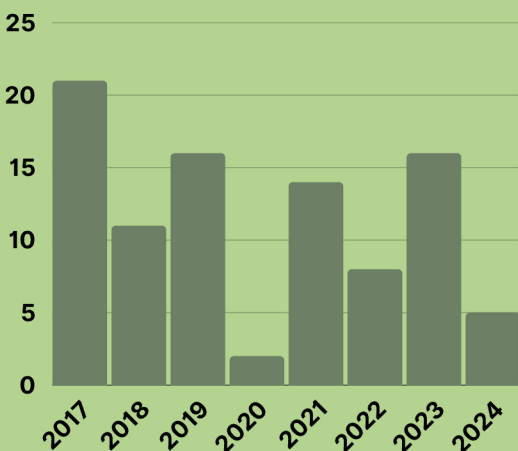


TICKS and Lyme Disease

Lyme Disease is the most important vector borne disease in Santa Cruz County. In 2024, we responded to **112** tick service requests, 12 of which were referrals from doctors. We provide both in-person and photo identification of ticks to determine species, life stage, and sex. We provide in-depth consultation on associated disease transmission risk and Lyme disease testing resources. We post warning signs in recreational areas of high tick exposure and collect ticks from public recreation areas throughout the county to assess species diversity, abundance, and pathogen prevalence. Lyme Disease is transmitted by the bite of an infected Western Black-Legged tick (*Ixodes pacificus*). In 2024, we tested **687** adult *Ixodes pacificus* ticks in our laboratory. Of those, **6 were positive** for either *Borrelia burgdorferi* the bacterial agent of Lyme Disease, or *Borrelia miyamotoi* which can cause related bacterial disease. All test results are reported to the California Department of Public Health. Santa Cruz had 5 confirmed human cases of Lyme disease in 2024; slightly less than the past 8 year average of 12 cases/year (Fig. 8).

HUMAN CASES OF LYME DISEASE (Fig. 8)

Reported to the Public Health Department in Santa Cruz County over the past 8 years.



We provide in-depth consultations on rodent eradication and exclusion methods, empowering Santa Cruz residents with the knowledge needed to solve their rodent issues. When additional assistance with exclusion work is desired, we refer residents to local pest control operators. Rodents and their ectoparasites can spread diseases to humans

including: Bubonic Plague, Salmonellosis, Rat-Bite Fever, Tularemia, Leptospirosis, Hantavirus Pulmonary Syndrome, and more. Rodent control should be taken seriously as they can also destroy personal property and cause electrical fires by chewing on wires. Exclusion and sanitation are most effective in preventing rodent activity.

We offer Free Rodent Exclusion Inspections for:



- Houses
- Mobile Homes
- Condos/Apartments
- Businesses
- New developments
- Chicken Coops

In 2024, 24% of our service requests regarded rodents, primarily rats. Our staff performed 147 rodent inspections this year.

Our Rodent Guide Book:



English



Spanish

Other Pests

Experiencing mysterious itching & biting? We can help.

Santa Cruz County Mosquito and Vector Control offers laboratory identification for all biting or nuisance pests, alongside expert consultation services to help residents effectively manage and eradicate infestations (Fig. 9). We commonly provide advice on bed bugs, various species of mites, biting flies, cockroaches, lice, fleas, or any source of mysterious biting or itching. If it is capable of spreading disease or causing significant discomfort, we can help.

One initiative of 2024 included assisting our Santa Cruz County Public Works, Sewer and Water Division in efforts to control American cockroach infestations in the sewer systems, which included treating sewage inlets in Santa Cruz. Cockroaches can cause allergies, food poisoning, dysentery, & childhood asthma.



(Fig. 9: Photo used with permission.)





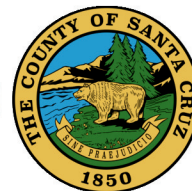
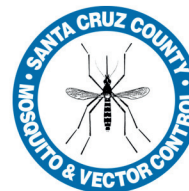
Serving our Community

For full details on the MVC budget, see the County website: <http://www.sccvision.us>, under "Department Budgets" and "Agricultural Commissioner".

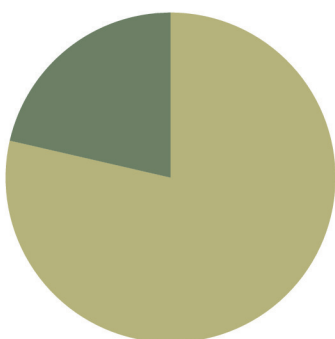
SCCMVC provides free services funded by special benefit assessments that appear on your property bill. For rates, please visit our website: www.agdept.com/mvc.html MVC cooperates with the Santa Cruz County Integrated Pest Management Departmental Advisory Group and receives oversight from the CA Department of Public Health and the Agricultural Commissioner. MVC applies aquatic larvicides under a National Pollution Discharge Elimination System permit as

required in waters of the United States, and reports use to the State Water Resources Control Board (WRCB) and County Agricultural Commissioner. MVC has a Mosquito Management Plan on file with WRCB, state and federal Fish and Wildlife agencies. We comply with Water Quality Control Board requirements, and are in a Cooperative Agreement with the CA Department of Public Health.

Budget for Fiscal Year 2024-2025



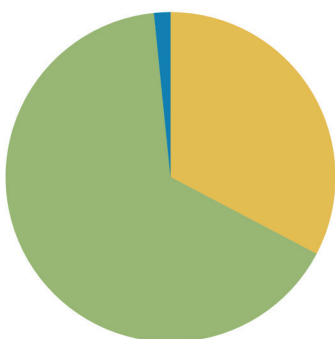
Santa Cruz County Mosquito & Vector Control is funded by Benefit Assessments: North County Mosquito and Disease Control Assessment (CSA 53-North) established in 2005, the original South County Mosquito Abatement/Vector Control Assessment (CSA 53) established in 1993, and the supplemental South County Mosquito and Disease Control Assessment (CSA 53-South) established in 2004.



Approved Revenue for Fiscal Year 2024

- Mosquito Abatement CSAs #53, 53S, 53N
\$1,649,781 (78.6%)
- Mosquito Reserve* Withdrawal
\$ 448,499 (21.4%)

Total Revenue: \$2,098,280

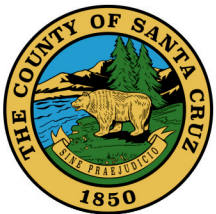


Approved Expenses for Fiscal Year 2024

- Salaries and Employee Benefits
\$1,377,470 (65.7%)
- Services and Supplies
\$685,823 (32.7%)
- Other Charges
\$34,477 (1.6%)

Total Expenses: \$ 2,097,770

*The Mosquito Reserves balance currently stands at \$1,340,474. For years where division expenses exceed revenues from the CSAs, reserve funds must be drawn to balance the budget. Due to increasing salaries and benefits, inflation, and the demands of invasive species, the division will continue to operate at a deficit in further fiscal years. For FY 2024-2025, \$448,499 were approved for withdrawal from the reserves balance to cover the difference between revenues and expenses and to prepare for a new benefits assessment.



SANTA CRUZ COUNTY MOSQUITO & VECTOR CONTROL



PestHelp@santacruzcountyca.gov



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<https://MVC.santacruzcountyca.gov/>



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