SAN MATEO COUNTY MOSQUITO & VECTOR CONTROL DISTRICT

Protecting public health since 1916

BIENNIAL REPORT
FISCAL YEARS 2013-2015

Dear Residents,

I'm excited to share with you our biennial report for fiscal years 2013/2014 and 2014/2015. This report showcases some of our accomplishments during these years, as well as shares updates on some key issues affecting your risk of vector-borne disease in San Mateo County.

In the summer of 2013, routine mosquito population surveillance detected *Aedes aegypti* mosquitoes within the District boundaries. This mosquito is of particular concern because it can transmit a number of diseases not currently being transmitted in San Mateo County – Dengue hemorrhagic fever, Chikungunya virus and Zika virus. The District immediately launched an aggressive program to eradicate these invasive mosquitoes. The program consisted of house-to-house inspections, surveillance for adult and larval mosquitoes, and extensive larval control measures in areas where invasive mosquitoes were found. However, *Aedes aegypti* mosquitoes lingered in the area for nearly two years with the last detection occurring in May 2015.

In the summer of 2014, with invasive *Aedes aegypti* still present in two cities, the District made another discovery: West Nile virus was detected for the first time in adult mosquitoes in San Mateo County. Although this virus had been detected in dead birds in the county in the past, this was the first confirmed detection of the virus in mosquitoes. As a result of this detection, the District conducted a series of treatments for adult mosquitoes to reduce the risk of West Nile virus infection for local residents. Although infected adult mosquitoes were discovered on 13 separate occasions during the summer of 2014, the District's quick action and diligence ensured that there were no human cases of West Nile virus acquired in San Mateo County.

These and many other successes were made possible by the hard work and dedication of the District's staff and board of trustees. Thanks to their efforts, San Mateo County is a safer and healthier place to live, work, and visit.

Sincerely,

Chindi Peavey
District Manager
San Mateo County Mosquito and Vector Control District

BIENNIAL REPORT FISCAL YEARS 2013-2015

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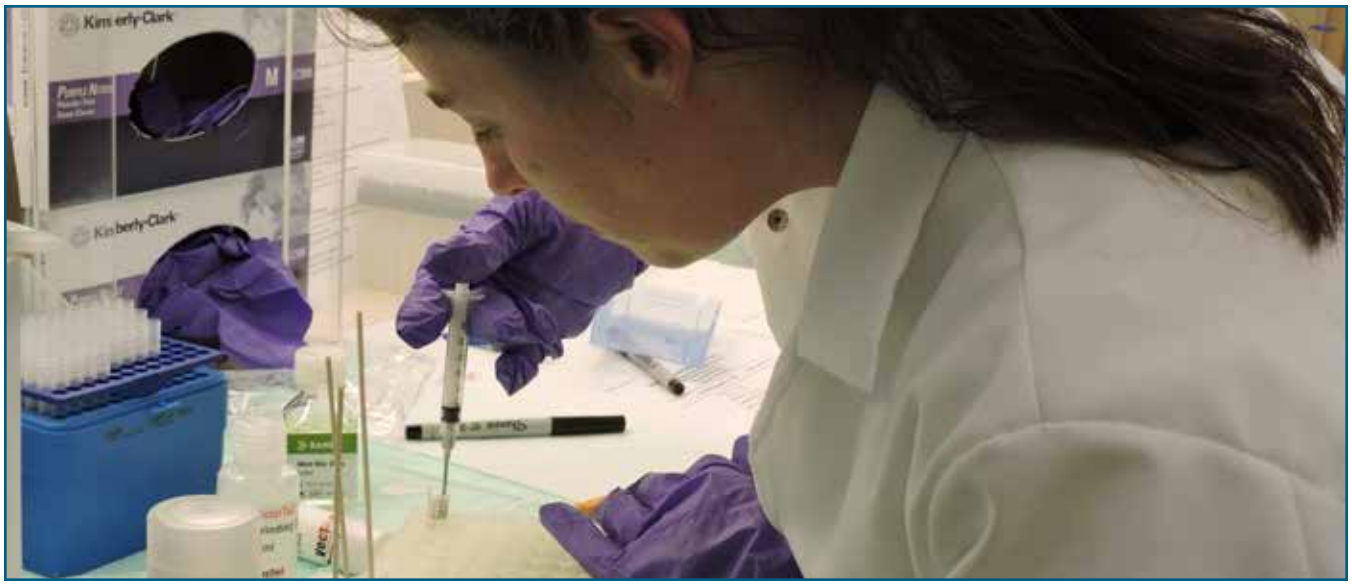


ABOUT THE DISTRICT

Our Mission

"To safeguard the health and comfort of the citizens of San Mateo County through a planned program to monitor and reduce mosquitoes and other vectors."

This report includes accomplishments from July 2013 through June 2015.

Our Goals

- Prevent the emergence of biting adult mosquitoes by applying control to the larval stage.
- Monitor adult mosquito populations to uncover new sites of larval development and assess the effectiveness of control.
- Monitor the distribution of vector-borne diseases and prevent the occurrence of these diseases among district residents.
- Evaluate new pesticides and methods of control for mosquitoes.
- Increase public awareness of District services with an active educational program.

History of San Mateo County Mosquito and Vector Control District

The mosquito control program in San Mateo County is one of the oldest in the United States. Control work was initiated in 1904, when the Burlingame Improvement Club asked entomologists from the University of California to assist them in developing a plan to fight the city's mosquito infestations.

H.J. Quayle, an entomologist with the University Experiment Station, conducted a preliminary survey. He determined that 95% of the mosquitoes biting residents were arising from diked reclaimed salt marshes along San Francisco Bay.

The Board of Trustees

As an independent special district, San Mateo County Mosquito and Vector Control District delivers specific services to citizens within its boundaries under the guidance of its own Board of Trustees. The District's Board of Trustees consists of one resident from each city, appointed by their respective City Council, to govern the Mosquito and Vector Control District knowledgeably and effectively. They serve for a term of two or four years and are highly dedicated to this community service.

CITY	REPRESENTED BY	YEARS
Atherton	Mason Brutschy *Sam Lerner*	Appointed 2014 *2009 to 2013*
Belmont	Wade Leschyn *Donelle O'Connor*	Appointed 2014 *2012 to 2013*
Brisbane	Robert Maynard	2009 to present
Burlingame	Joe Galligan *Barry Meinerth*	Appointed 2014 *2010 to 2013*
Colma	Louis Gotelli	2014 thru 2015
Daly City	Christine Fuller	2007 to present
East Palo Alto	Donna Rutherford	2007 to present
Foster City	Rick Wykoff	2012 to present
Half Moon Bay	Kati Martin	2013 to present
Hillsborough	Dr. D. Scott Smith	2012 to present
Menlo Park	Valentina Cogoni	2005 to present
Millbrae	Muhammad Baluom *Leon Nicholas*	Appointed 2015 *1996 thru 2014*
Pacifica	Peter DeJarnatt	2012 thru present
Portola Valley	Ray Williams *Steve Hedlund*	Appointed 2015 *2013 thru 2014*
Redwood City	Kathryn Wuelfing Lion *Maria Martinucci*	Appointed 2014 *2010 thru 2013*
San Bruno	Robert Reichel	2009 to present
San Carlos	Betsey Schneider	2005 to present
San Mateo	Ed Degliantoni *James Ridgeway*	Appointed 2015 *2007 thru 2014*
South San Francisco	Chris Cairo	2013 thru 2015
Woodside	Richard Tagg	1995 thru 2015
County at Large	Jason Seifer	2009 to present

BOARD OFFICERS

Jan 2013- December 2014
Board President
Donna Rutherford

Board Vice President
Rick Wykoff

Board Secretary
Kati Martin

Board Assistant Secretary
Kathryn Wuelfing Lion

Jan 2015 –Dec 2016
Board President
Rick Wykoff

Board Vice President
Joe Galligan

Board Secretary
Kati Martin

Board Assistant Secretary
Kathryn Wuelfing Lion

District Staff

During FY 2013-14 and 2014-15 there were a number of staffing changes. On September 1, 2014, District Manager Robert Gay retired. Finance Director Rosendo Rodriguez served as Interim Manager from September of 2014 through February of 2015. The District hired a new Manager, Dr. Chindi Peavey, on March 1, 2015.

In 2014, the District's Board created a position to build and enhance its Public Outreach Program. Megan Caldwell was hired in September 15th, 2014 to fill the position of Public Health Education and Outreach Officer.

ADMINISTRATION

Chindi Peavey, Ph.D., *District Manager*
Brian Weber, *Assistant Manager*
Rosendo Rodriguez, *Finance Director*
Megan Caldwell, MPH, *Public Health Education & Outreach Officer*
Mary Leong, *Accountant*
Devina Walker, *Office Administrator*
Paul Weber, *Facility Maintenance Technician*

LABORATORY

Nayer Zahiri, Ph.D., *Laboratory Director*
Warren Macdonald, *Vector Ecologist*
Cheryl Tina Sebay, *Vector Ecologist*
Theresa Shelton, *Vector Ecologist*

OPERATIONS

Casey Stevenson, *Field Operations Supervisor*
David Allen, *Vector Control Technician*
Walter Bruj, *Vector Control Technician*
Stephanie Busam, *Vector Control Technician*
Hector Cardenas, *Vector Control Technician*
Eric Eckstein, *Vector Control Technician*
Sean Jones, *Vector Control Technician-Mechanic*
Kim Keyser, *Vector Control Technician*
James P. O'Brien, *Vector Control Technician*
Ryan Thorndike, *Vector Control Technician*

SERVICE REQUESTS

Resident Services Overview

The District provides a variety of services directly to residents upon request, including residential mosquito surveillance and larval control, delivery of mosquito fish to backyard water features, control of ground-nesting yellowjackets and wasps, property inspections and information for rodent infestations and nuisance wildlife, pick-up of dead bird or squirrel specimens for disease testing, identification of insects or ticks, and presentations and public outreach at events.

The number of service requests increased by nearly 10% from FY 2013/2014 to FY 2014/2015, in part due to an increase in requests for removal of yellowjacket nests in 2015.

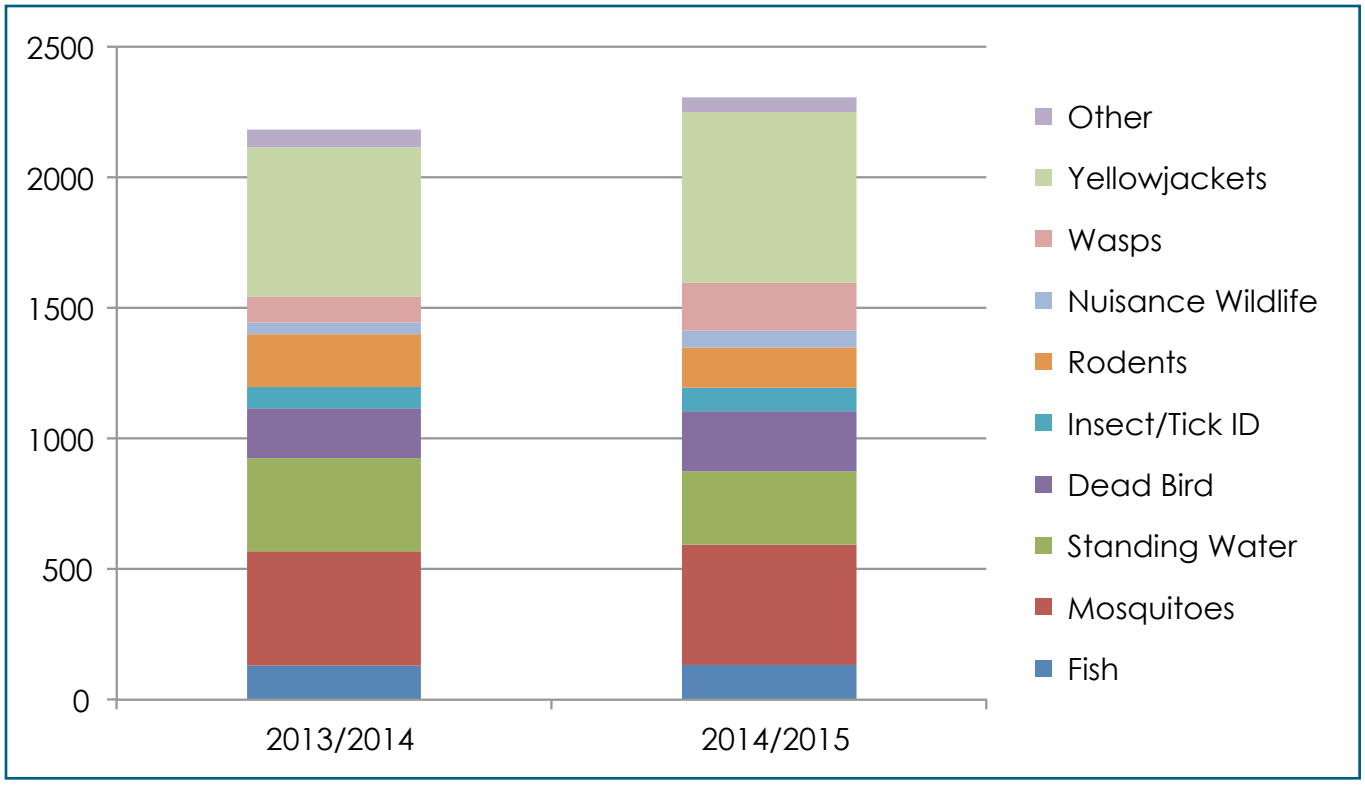


Figure 1: Service Requests by Category, FY 2013/2014 and FY 2015/2016


Theresa

MOSQUITO PROGRAMS

Mosquito Population Surveillance

The District laboratory conducts year-round mosquito population surveillance for both native and invasive mosquito species. These results are used to estimate population levels of various mosquito species in San Mateo County and provide comparative data on changing mosquito population levels of each species from year to year. This data is used to optimize mosquito control efforts and disease surveillance in response to the specific seasonal challenges throughout the year.

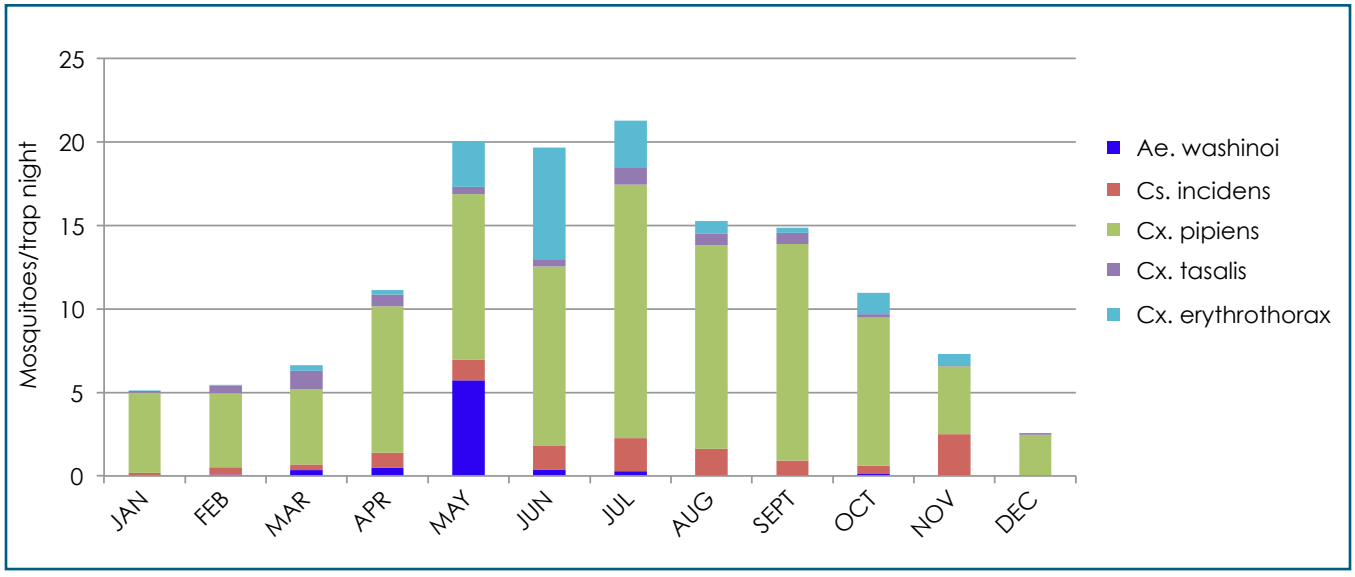


Figure 2: Average relative and total seasonal abundance of common mosquito species from CO2 traps, 2010-2015

Although mosquitoes are present in San Mateo County throughout the year, each season brings new challenges. For example, *Aedes washinoi*, which breeds in shallow woodland pools, is most common in May, while *Culex erythrothorax*, the tule mosquito, begins emerging in June and requires a large larvicing effort to prevent its natural peak in the fall. However, *Culex pipiens*, the mosquito that most commonly transmits West Nile virus, makes up a large portion of local mosquito populations year-round, and is the biggest cause of mosquito-related complaints.

West Nile Virus Surveillance

The District's year-round West Nile virus surveillance program is part of the California Department of Public Health's mosquito-borne encephalitis surveillance program, which includes surveillance for western equine encephalitis, St. Louis encephalitis, and other mosquito-borne viruses. Surveillance for these viruses is done in several ways. The District tests mosquitoes directly and also tests carcasses of dead birds and tree squirrels, as these animals are a source of virus for mosquitoes. In addition, the District maintains three flocks of sentinel chickens as a method for monitoring the transmission of virus by local mosquitoes.

During fiscal years 2013/2014 and 2014/2015 the overall risk of West Nile virus infection in San Mateo County remained low. However, the virus was detected in bird carcasses and mosquito samples in both years.

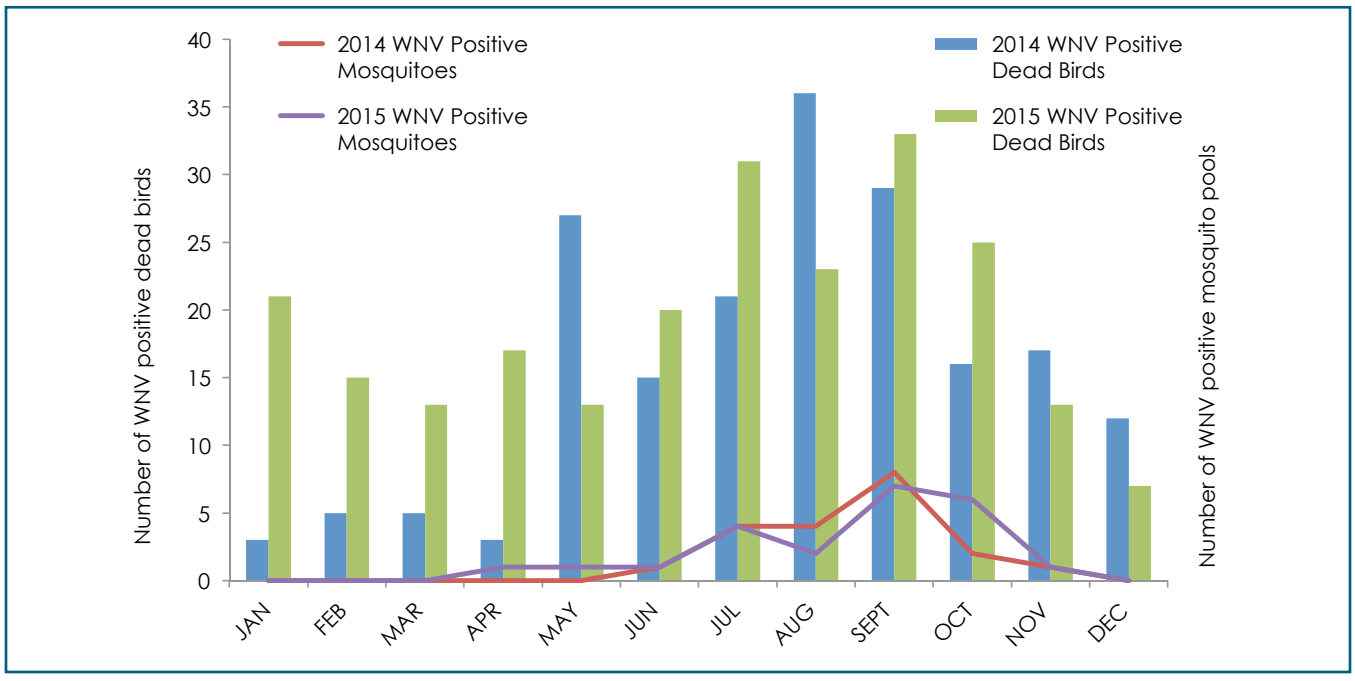
DETECTION TYPE	2013	2014	2015
Human Case	0	0	0
Sentinel Chicken Seroconversion	0	0	0
Mosquito	0	12	5
Bird	4	21	22
Squirrel	0	0	0

Figure 3: West Nile Virus Detections in San Mateo County 2013-2015

BIRD AND TREE SQUIRREL CARCASS TESTING

Dead birds and squirrels are often the first indicator that West Nile virus exists in an area. Certain species of birds, including crows, are very susceptible to West Nile virus and will die quickly after infection, while others can live with the virus. Information on the species and location of infected birds is used to make calculated decisions on mosquito control and other disease surveillance activities.

Bird and squirrel carcasses are tested year-round, but most West Nile virus detections occur between April and October. Although more birds were tested in 2015, the number of positive samples was approximately the same during both years.



SENTINEL CHICKEN FLOCKS

The District maintains three sentinel chicken flocks distributed throughout the county to detect West Nile virus and other mosquito-borne diseases. Sentinel chicken seroconversions due to West Nile virus exposure serve as an early indicator that the virus is present in an area. From May through October, sentinel chickens are sampled bi-weekly and their blood is sent to the California Department of Public Health laboratory, where it is tested for the presence of antibodies to West Nile virus and other mosquito-borne diseases. Since the arrival of West Nile virus in San Mateo County, no sentinel chickens have tested positive for West Nile virus.

MOSQUITO TRAPPING

Mosquito trapping for West Nile virus surveillance is typically conducted when there is reason to believe the virus is present in adult mosquitoes in a particular geographical area, such as when one or more bird carcasses tests positive for the virus or a human disease case is identified. The results of mosquito testing for West Nile virus are used to determine mosquito treatment techniques and schedules.

Control of Mosquito Larvae

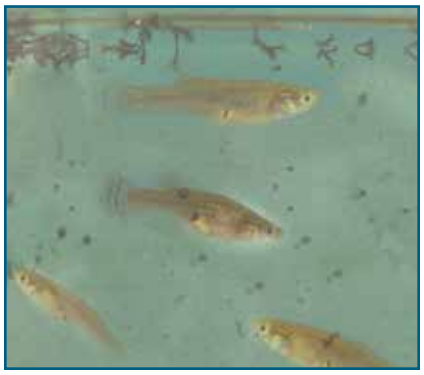
The vast majority of the District's mosquito control program consists of larviciding, or killing mosquitoes in the larval stage. Mosquito larviciding is both efficient and cost-effective. This tactic eliminates mosquito larvae before they develop into adult mosquitoes capable of transmitting diseases to humans. Products used for control of mosquito larvae include bacterial larvicides, insect growth regulators, and mosquito fish.

HAND LARVICIDING

Standing water around homes is one of the most common sources of mosquito breeding in urban and suburban San Mateo County. These sources range from small containers, fountains, and birdbaths to water under homes and abandoned swimming pools. The District maintains an extensive database of residential mosquito sources. Technicians work with property owners to permanently eliminate standing water, and return regularly to treat sources of standing water that remain. In fiscal years 2013/2014 and 2014/2015, technicians inspected nearly 30,000 properties, resulting in treatment of more than 12,500 residential mosquito sources each year.

MOSQUITO FISH

Mosquito fish, *Gambusia affinis*, are small fish used to control mosquito larvae in enclosed water sources, such as ornamental ponds, neglected swimming pools, and livestock troughs. A single adult mosquito fish can eat up to 500 mosquito larvae per day. The District stocks an average of 150 suitable water sources across the county each year and retrieves fish from properties that are eliminating their water features in order to recycle the fish to homeowners in need.



CATCH BASIN PROGRAM

Storm drain systems contain "catch basins," which are the storm water inlets to the system. The basins are designed to catch sediment and have a sump area which is lower than the rest of the drainage system. During winter months, storm drain systems are flushed out regularly by winter rainstorms.

However, during the summer, water from residential activities, such as watering lawns and washing vehicles, collects in the basins. In order to ensure that each catch basin is regularly treated throughout the summer, the District deploys a team of eight or more seasonal Vector Control Aides. Over 40,000 catch basins will be treated during the summer months and these applications are arguably the most important aspect of the fight against West Nile virus.

HELICOPTER LARVICIDING

The District uses a helicopter to apply solid granular larvicide to larger areas where there is dense vegetation or where applying the product on foot might harm sensitive wildlife and habitats. Currently, a helicopter is used at Searsville Lake, Mills Field near San Francisco Airport, and Sharp Park golf course in Pacifica.

During 2013-2015, each site was treated four times annually for an average of 350 acres of helicopter larviciding conducted each year. These treatments control populations of *Culex erythrothorax* (tule mosquitoes), reducing West Nile virus risk in the surrounding residential neighborhoods.

CREEKS

During summer months, creeks can serve as a source of mosquito development. Vector control technicians conduct regular inspections of creeks from May through October, treating isolated pools of standing water as needed. Only those sections of creeks that flow near residences or business are treated. Inspections begin after the water level in the creeks has fallen sufficiently to allow shallow pools of standing water to form.

Technicians use hand tools to open a walking path through creek vegetation. They will then conduct monthly inspections along this path for the rest of the summer. District technicians treat more than 35 miles of creek bed at 24 locations throughout urban areas of the county.

IMPOUNDS

During winter and spring, mosquito larvae often develop in rainwater that collects in low areas (seasonal impounds). Vector control technicians inspect seasonal impounds weekly, and apply larvicides as needed on foot or using small amphibious vehicles for areas covering 2 acres or more.

During 2013, technicians treated a total of 399 acres of impounds. In 2014 this dropped to 222 acres, but rose in 2015 to 651 acres, in part due to an unusually wet winter in late 2014 and early 2015.

TESTING FOR RESISTANCE TO MOSQUITO LARVICIDES

The District uses a number of biological materials to control mosquito larvae. These include *Bacillus sphaericus (Bs), Bacillus thuringiensis israelensis (Bti),* Spinosad, and the insect growth regulator methoprene. These products have been used for many years and mosquito populations may evolve resistance over time, limiting their effectiveness and hampering the District's ability to conduct effective mosquito control.

In 2014, the District conducted laboratory testing to establish a baseline of the susceptibility of local mosquito populations to these products. Overall, both the Laboratory mosquitoes and field caught populations were highly susceptible to all of the products currently in use. Tests revealed that products containing *Bacillus sphaericus*, a mixture of Bs and Bti, or Spinosad produced mortality in mosquito larvae at lower doses than those containing Bti alone. The susceptibility of mosquito larvae collected from the field was similar to that of a laboratory strain of mosquitoes known to be susceptible to these products. These tests provided information on in the baseline level of susceptibility of our local mosquito populations to the materials currently in use for control of mosquito larvae. The District will continue to test field-caught mosquitoes periodically to monitor their susceptibility to the products to detect the appearance of resistance if it arises in the future. The District regularly rotates products in the field to minimize the risk of the development resistance.

The table below shows the results of these laboratory tests on susceptibility or resistance. Susceptibility/ resistance is expressed as a Tolerance Ratio. This is the ratio of the concentration that kills field-caught mosquito larvae divided by the concentration that is lethal to the laboratory colony of mosquitoes known to be susceptible to the material. Tolerance ratios for resistant mosquito populations can be as high as 400, ratios above 6 indicate that resistance may be beginning to develop and the populations should be closely monitored in the future.

PRODUCT	ACTIVE INGREDIENT (AC%)	LABEL RATES	TOLERANCE RATIO	
			LC50	LC90
VectoBac 12AS	Bacillus thuringiensis, subsp. israelensis, (11.61)	0.25 – 2 pts/acre	1.48	2.15
VectoBac GR	Bacillus thuringiensis, subsp. israelensis (2.8)	2.5 – 20 lbs./acre	4.98	2.58
VectoLex WDG	Bacillus sphaericus 2362, serotype H5a5b (51.2)	0.5 – 1.5 lbs./acre	4.45	5.72
VectoLex FG	Bacillus sphaericus 2362, serotype H5a5b (7.5)	5 – 20 lbs./acre	12.51	10.67
VectoLex WSP	Bacillus sphaericus 2362, serotype H5a5b (7.5)	1 lbs./ ft3	4.24	2.04
VectoMax FG	-BTI serotype H-14 (4.5) -BS 2362, serotype H5a5b (2.7)	5 – 20 lbs./acre	2.3	0.68
Teknar SC	BTI (6.5)	0.25 – 2 pts/acre	1.17	1.97
Fourstar SBG	Bacillus thuringiensis subsp. israelensis (2.15)	10 – 20 lbs./acre	1.88	
Natular G30	Spinosad (2.5)	5 – 20 lbs./acre	1.11	3.67

Table 1: Susceptibility of various formulations of microbial larvicides against *Culex pipiens* 4th instar larvae from laboratory and field populations

The results of the District laboratory's microbial larvicide resistance testing "Monitoring the susceptibility of mosquitoes to microbial and IGR larvicides in San Mateo County Mosquito and Vector Control" will be submitted for publication to the Journal of Medical Entomology.

Control of Adult Mosquitoes

San Mateo County Mosquito and Vector Control District takes a preventative approach to mosquito control. Whenever possible, mosquitoes are controlled in their immature stages, before they emerge as biting adults, capable of transmitting disease to humans. Sometimes, however, adult mosquito populations become a threat to human health if they are infected with encephalitis virus such as West Nile virus. When this happens, information collected through mosquito surveillance is used to make the decision to reduce adult mosquito populations. Adult mosquito control is always done in conjunction with intensified efforts to locate and reduce mosquito larvae in standing water so that more adult mosquitoes cannot emerge.

In June 2014, the District conducted its first adult mosquito control treatment in response to the human health risk posed by West Nile virus. By the end of September 2014, the District had conducted a total of 10 adult mosquito control treatments in six cities. In 2015, only three adult mosquito control treatments were needed.

The success of adult mosquito control treatments is evaluated by trapping adult mosquitoes before and after treatment. These results are reported as an overall reduction in adult mosquitoes in the treatment area. During fiscal years 2013/2014 and 2014/2015, the District's adult mosquito control treatments achieved an average of 88% reduction in adult mosquitoes in treated areas.

TREATMENT YEAR	TREATMENT DATE	TREATMENT LOCATION	PERCENT REDUCTION IN ADULT MOSQUITO POPULATIONS
2014	June 19	San Mateo	77%
2014	July 21	San Mateo	99%
2014	July 21	Ladera/Portola Valley	99%
2014	July 28	San Mateo	79%
2014	July 30	San Mateo	100%
2014	August 11	Menlo Park	86%
2014	August 19	South San Francisco	78%
2014	August 24	Menlo Park	98%
2014	September 02	Redwood City/Menlo Park	89%
2014	September 18	San Mateo/Foster City/ Belmont/Redwood Shores	91%
2015	August 2nd	Menlo Park	93%
2015	August 5th	Redwood City	75%
2015	September 2nd	Menlo Park	81%

Invasive *Aedes*

SURVEILLANCE FOR INVASIVE *AEDES*

Three species of non-native *Aedes* genus mosquitoes have been identified in California to date. These species are concerning for vector control agencies across the state because they are highly invasive, difficult to control, and are the primary vectors for a variety of diseases affecting humans, including Zika virus, chikungunya, dengue, and yellow fever. Allowing large populations of these invasive *Aedes* species to become established creates the risk that travel-acquired cases of these diseases can be locally transmitted by mosquitoes.

In order to reduce the risk of invasive *Aedes* mosquitoes becoming established in San Mateo County, the District conducts year-round county-wide surveillance for invasive *Aedes* species using a variety of traps specific to invasive *Aedes*, including ovicups, Autocidal Gravid Ovitraps (AGOs), BG-Sentinel traps, and carbon dioxide traps (locations shown below).

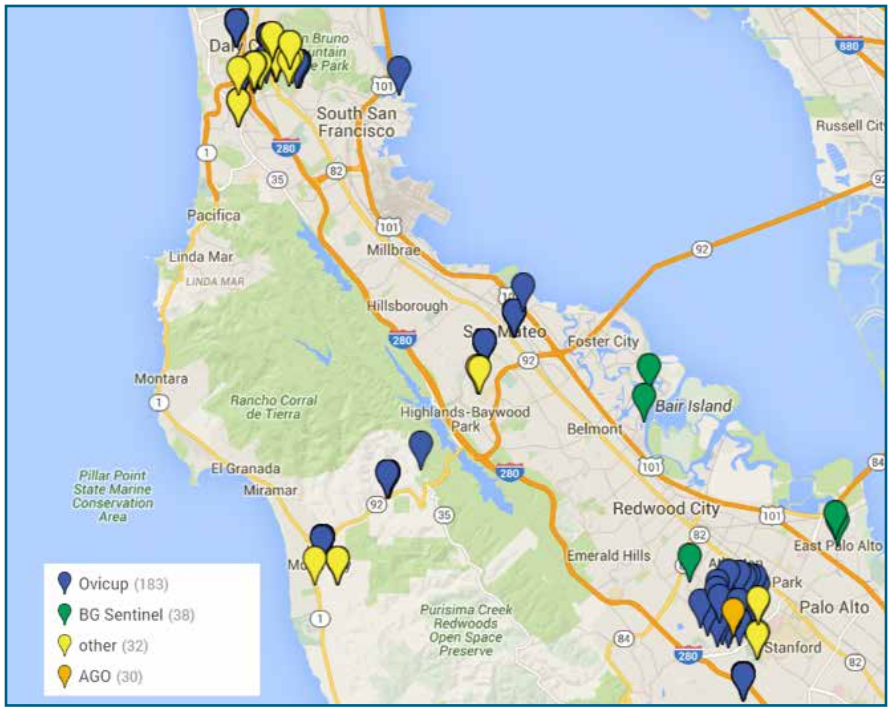


Figure 4: 2013 - 2015 invasive Aedes surveillance sites

Additional surveillance is conducted in areas where travel-acquired *Aedes*-vectored illnesses – including chikungunya, dengue, Zika, and yellow fever – are reported to the San Mateo County Health System to ensure that there is no risk that the infection can be transmitted locally.

AEDES AEGYPTI ERADICATION EFFORTS

Invasive *Aedes aegypti* mosquitoes were detected in San Mateo County in 2013 in Menlo Park during the course of routine surveillance for invasive *Aedes*. The District subsequently determined that these mosquitoes were limited to a 1.7 square mile area of Menlo Park and Atherton, and were not found in any other area of San Mateo County.

Due to the risk of dispersal of this invasive species, the District immediately began an aggressive eradication program consisting of individually inspecting the front and back yard of every property located within 150 meters of each site where invasive *Aedes* had been detected. Larval samples were taken at each property where mosquito breeding was identified, and a new detection added each time invasive *Aedes* were found. All mosquito breeding sources were treated in the course of inspection.

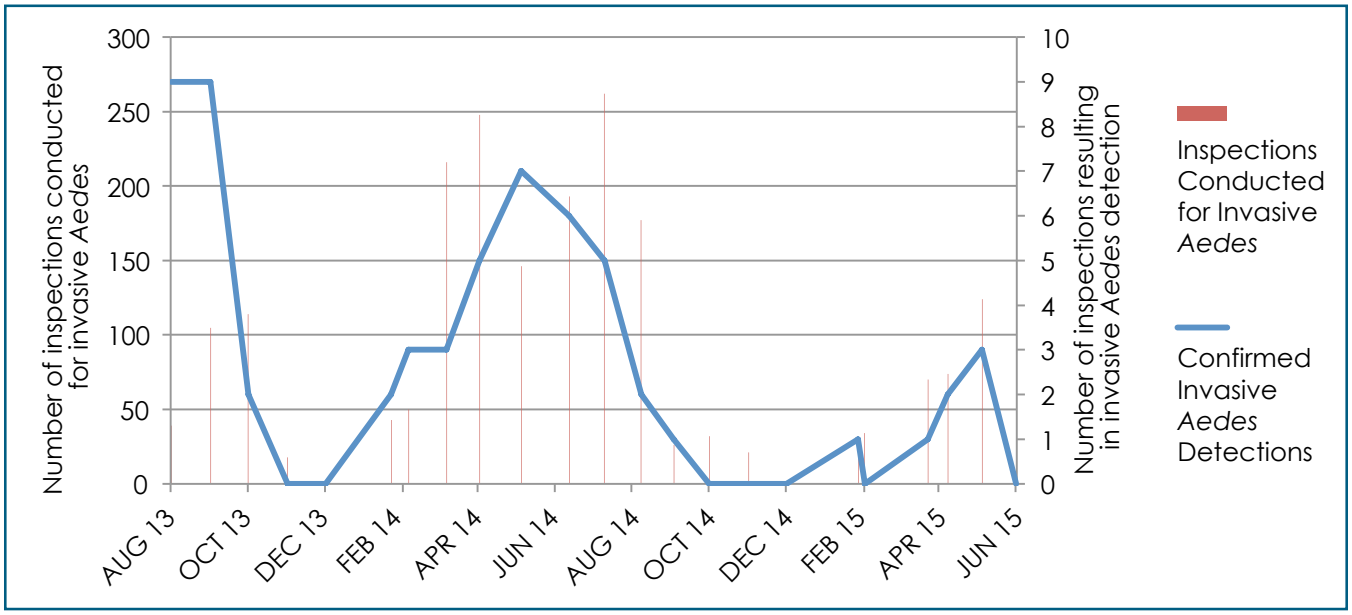


Figure 5: Invasive *Aedes* inspections relative to detections, 2013-2015

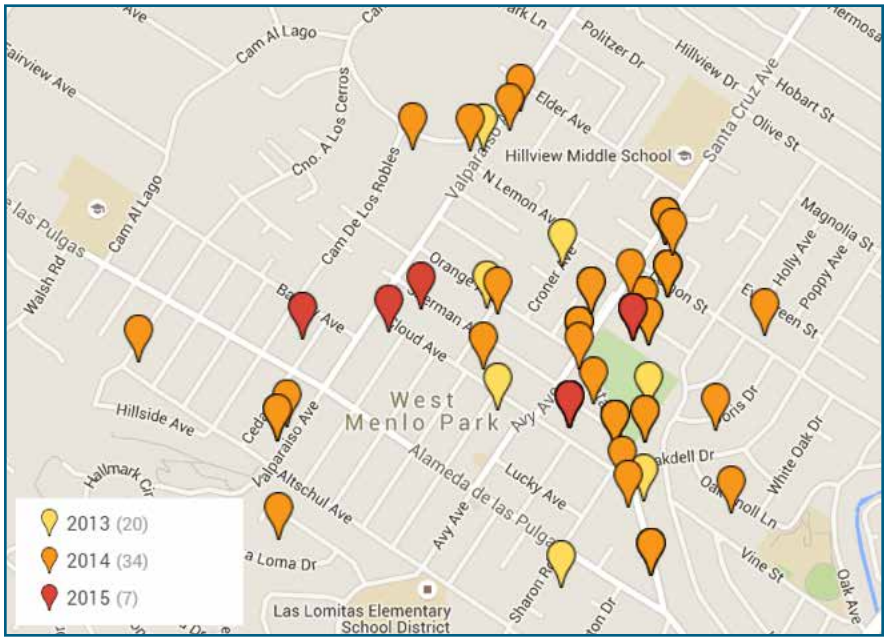


Figure 6: Invasive *Aedes* mosquito detections by location, 2013-2015

The invasive *Aedes* eradication program continued successfully throughout 2014 and 2015, with the last *Aedes aegypti* detection in Menlo Park in May of 2015.

RODENT PROGRAMS

Rodent Service Requests

In 2013-2015, District vector control technicians responded to an average of 175 service requests per year related to rodents. When responding to these calls, technicians provide a thorough inspection, written inspection report, and recommendations for conducting rodent exclusion, sanitation, and trapping.

The majority of rodent requests (87%) in San Mateo County, are for roof rats, *Rattus rattus.* The extensive suburban neighborhoods are well suited for this species of rat, which likes to nest in trees and will run from one property to the next along fences. They often gain entry into houses through openings near the roof, but will use any hole larger than the size of a quarter at any location. Abundant gardens, fruit trees, vegetation, and older construction throughout San Mateo County all enable these rats to thrive locally.

Norway rats, *Rattus norvegicus*, are far less commonly the cause of an infestation during service requests (4%). This species prefers to burrow, and is also found living in sewers in metropolitan areas and utilizing riprap along waterways. The sewer baiting program likely contributed to a decline in Norway rats locally. They do not travel as far as roof rats, and their populations might be restricted to a few areas, such as marinas. Also, Norway rat infestations could be more abundant near downtown area restaurants and businesses that do not utilize District services.

Rodent Control in Sewers and Creeks

In 2004 San Mateo County turned over a large portion of residential rodent control to the District. The District oversees contracts between Dewey Pest Control and several cities and sanitary districts to provide rodent control in sewers and creeks. These control programs use tamper-resistant bait stations and a reduced-risk rodenticide to control commensal rats. The cities of San Mateo and San Carlos contract directly with the District for rat control services in certain areas.

Rodent-Borne Disease Surveillance

The District conducts annual surveillance for pathogens in wild rodents that may cause rodent-borne disease in humans, including hantavirus and plague. Hantavirus causes fatal respiratory disease in humans. The virus is carried by wild mice and can be acquired by inhalation or ingestion of virus particles from urine or feces of infected animals. There are several different strains of Hantavirus, each is carried by a different species of mice and only 1 (Sin Nombre) which occurs in deer mice has been associated with human disease. Plague is an infectious disease caused by the bacterium *Yersenia pestis*. It is most commonly transmitted through the bites of fleas that have previously fed on infected rodents.

Rodent-borne disease surveillance sites are selected based on historical patterns of disease detection. District laboratory staff conducts humane live trapping at these sites in order to collect biological samples for testing. During fiscal years 2013/2014 and 2014/2015, the District laboratory tested samples for hantavirus and plague at San Bruno Mountain and San Pedro Valley County Park, where these diseases had previously been detected. No samples tested positive for these rodent-borne diseases. However, hantavirus and plague are known to be present at low levels in San Mateo County, and will likely be detected again in the future.

OTHER PROGRAMS

Surveillance for ticks and Tick-Borne Disease

The District conducts annual surveillance for tick-borne pathogens that may cause disease in humans, including Lyme disease. Tick-borne disease surveillance is conducted on trails at 15 city and county parks each year. Surveillance is also conducted when human cases of tick-borne disease are reported that may have been acquired locally.

Ticks are tested in groups of 5 and results are reported as a minimum infection rate, or MIR. This is the standard way of expressing the proportion of vectors tested that are infected with a particular pathogen and assumes that 1 of the ticks in a given pool were infected. A MIR of 2-3% is considered normal for our county, and does not indicate an elevated level of risk.

YEAR	PARK	TICKS COLLECTED	TOTAL BORRELIA MIR (MINIMUM INFECTION RATE)
2013/2014	Los Trancos Open Space Preserve	238	2.52
2013/2014	Thornewood Open Space Preserve	169	2.37
2013/2014	Waterdog Lake Park	495	1.82
2013/2014	Wunderlich County Park	476	1.68
2013/2014	Mills Canyon Wildlife Refuge	65	1.54
2013/2014	Windy Hill Open Space Preserve	296	1.35
2013/2014	Laurelwood Park	154	1.30
2013/2014	Big Canyon Park	184	0.54
2013/2014	Pulgas Ridge Open Space Preserve	220	0.46
2013/2014	Año Nuevo State Park	151	0.00
2014/2015	Thornewood Open Space Preserve	359	0.03
2014/2015	Los Trancos Open Space Preserve	193	0.03
2014/2015	Pulgas Ridge Open Space Preserve	337	0.02
2014/2015	Huddart Park	243	0.02
2014/2015	Laurelwood Park	279	0.01
2014/2015	Año Nuevo State Park	215	0.01
2014/2015	Wunderlich County Park	227	0.01
2014/2015	Sweeny Ridge	153	0.01
2014/2015	Edgewood Park	174	0.01
2014/2015	Big Canyon Park	188	0.01
2014/2015	San Pedro Valley County Park	173	0.01
2014/2015	Crystal Springs Regional Trail	180	0.01
2014/2015	Windy Hill Open Space Preserve	184	0.01
2014/2015	Waterdog Lake Park	229	0.00

Table 2: Tick-borne disease surveillance results by park for 2013-2015

Invasive Cordgrass

Spartina alterniflora, a non-native cordgrass species, was introduced to San Francisco Estuary in the 1970s. This species of cordgrass has since hybridized with native *Spartina foliosa,* producing offspring that invaded tidal marsh and mudflats throughout the Estuary. In addition to impacts to tidal marsh restoration efforts, the hybrid *Spartina* also degrades endangered species habitat, clogs flood control channels, and creates mosquito breeding areas.

As part of an effort to reverse the loss of marsh ecosystems in the San Francisco Estuary, the California State Coastal Conservancy, in partnership with the United States Fish and Wildlife Service (USFWS), established the San Francisco Estuary Invasive Spartina Project (ISP) in 2000. Core ISP partners include USFWS, California Department of Fish & Wildlife, East Bay Regional Park District, California Wildlife Foundation, California State Parks, San Mateo County Mosquito and Vector Control District, City of Alameda, City of Palo Alto, Santa Clara Valley Water District, and Friends of Corte Madera Creek Watershed.

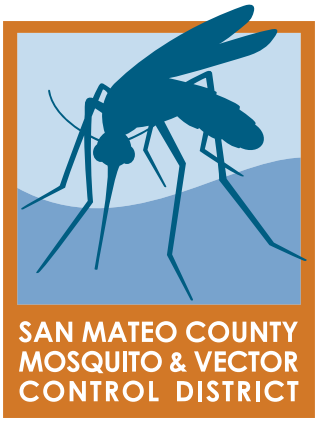
Since 2005, San Mateo County Mosquito and Vector Control District has conducted targeted vegetation management of invasive *Spartina* under the guidance of the California State Coastal Conservancy. By 2015, through the use of integrated landscape-scale monitoring and treatment, the San Francisco Estuary Invasive *Spartina* Project has recorded a greater than 97% estuary-wide reduction in hybrid *Spartina*, and a corresponding reduction in the acreage treated by San Mateo County

PUBLIC EDUCATION AND OUTREACH

The District's integrated pest management program includes extensive public outreach aimed at improving public knowledge of the risks of vector-borne disease, vector attractant and source reduction, and behaviors to reduce the risk of vector-borne disease transmission. In 2014 the District hired a Public Health Education and Outreach Officer to manager the outreach program, prompting several major additions to the outreach strategy.

Rebranding

In 2014, the District underwent a complete rebranding based on a new logo and brand colors. The District's new logo was developed by graphic designer Guy Rogers of Spark Creative Design, with guidance from Public Health Education and Outreach Officer Megan Caldwell. The new logo design depicts a mosquito poised to bite over an abstract background representing the interface of air and water – the moment at which an emerging adult mosquito becomes capable of transmitting disease to humans. The logo colors – blue and orange – were chosen to match the District office's existing color scheme.



The new logo and brand style were implemented across a wide range of materials, including promotional items, employee and trustee apparel, brochures, social media, website, and building signage. Materials displaying previous logos were phased out during 2014 and early 2015, with most materials displaying the new branding by the beginning of FY 2015/2016.

Resident Survey

Starting in late 2014, residents who supplied an email address when requesting service were sent a brief follow-up survey. The results reflect an extremely high rate of satisfaction with services received, with more than 90% of respondents answering that they were 'very satisfied'. Despite high levels of satisfaction with services, the District scored low on measures of opinion, perhaps due to the fact that less than a third of respondents correctly identified the District's primary role as protecting residents' health from pests and vectors. These results indicate that while the District provides excellent service to the residents of San Mateo County, additional work is needed to improve public perception and understanding of the District's role in the community.

Website Relaunch

In early 2015, the District launched a new website. The new website was built by Digital Deployment, a Sacramento-based web design firm. Improvements over the previous website include integration with social media and email subscription services, a user-friendly editing interface, and an attractive, professional design.

Since the launch of the new District website, user traffic has nearly tripled. Average session duration and number of pages per session – both considered good indicators of user engagement – have increased.

Social Media

In 2015 the District launched a social media presence on Facebook, Twitter, YouTube, Google+, and Nextdoor.com. Together, these social networks account for approximately 5% of referral traffic to the District webpage.

FINANCIAL REPORTS

The District is committed to providing open, transparent and understandable financial reporting. Under District finance committee leadership, comprehensive internal controls were developed in fiscal year (FY) 2012-13. An external auditor conducted a review of those controls in FY 2013 and found them to be adequate. In addition, annual external audits found District financial statements in FY 2013-14 and FY 2014-15 to be represented fairly and internal controls adequate.

The District was able to operate without raising tax rates and assessment amounts in 2013, 2014 and 2015. The District's three main sources of revenue are ad valorem property taxes and a Special Mosquito Control Tax in the original thirteen cities that made up the South and East portions District from 1916 to 2004, and a benefit assessment in the North and West portions of the County. These areas were added to the District in 2004. Each year, these taxes are placed on property tax bills by the San Mateo County Assessor's Office.

In fiscal year 2014-2015, District revenues totaled $4.77 million, while expenses totaled $4.35 million. Expenses were lower than expected because, the District had several unstaffed positions which have subsequently been filled.

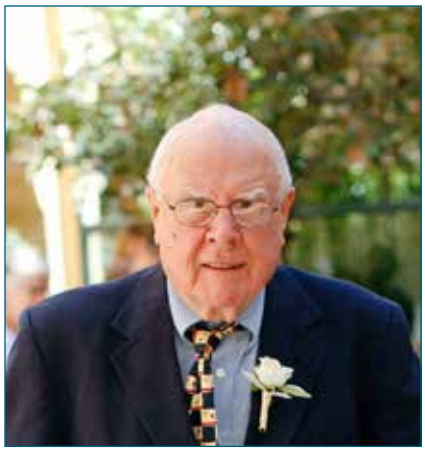
The District's total net position was $9.64 million as of June 30, 2015, of which $5.26 million was unrestricted and available to fund services for County residents, debt and employee retirement obligations. Because the District relies on property taxes to fund its operations and those funds are not collected until six months after the start of each fiscal year, it must maintain an operating reserve of 60 percent (six months) of its annual budgeted expenses. This amount was $2.26 million and $2.55 million in FY 2013-14 and FY 2014-15, respectively.

The District's total net position (worth) increased 8.9 percent or $793,075, from $8.85 million on June 30, 2013 to $9.64 million on June 30, 2015. In FY 2015-16, some of this is being used to pay down unfunded liabilities in the retirement system and to fund the required trust for future retiree health costs.

Statement of Revenues, Expenditures, and Changes in Fund Balance Governmental Funds

FOR THE YEAR ENDED JUNE 30, 2015

		General Fund
REVENUES:		
Service abatement revenue	$	237,847
Special benefit assessment		1,427,237
Special mosquito control assessment		461,080
Property taxes		1,912,947
Other tax revenues		396,172
Interest earnings		47,466
Other revenues		**282,243**
Total revenues		4,764,992
EXPENDITURES:		
Current:		
Salaries and wages		1,868,139
Employee benefits		945,652
Materials and services		1,143,437
Capital outlay		316,009
Debt service:		
Principal		80,735
Interest		451
Total expenditures		**4,354,423**
REVENUES OVER (UNDER) EXPENDITURES		**410,569**
OTHER FINANCING SOURCES (USES):		
Capital lease issuance proceeds		108,100
Total other financing sources (uses)		108,100
NET CHANGES IN FUND BALANCE		**518,669**
FUND BALANCE:		
Beginning of year		6,983,607
End of year	$	7,502,276



IN MEMORY OF JAMES RIDGEWAY

This Annual Report is dedicated to the memory of James Ridgeway, who served on the San Mateo County Mosquito and Vector Control District Board of Trustees from 2007 to 2015.

Dr. Ridgeway passed away in 2015. James Ridgeway served as Chair of the Board's Strategic Planning Committee from 2013 to 2015 and as a member of the Financial, Environmental, and Legislative Committees during his tenure on the Board. Dr. Ridgeway gave generously of his time and energy, and his wisdom and kindness were an asset to the District and the board during his tenure with us.

San Mateo County Mosquito & Vector Control District

Protecting Public Health since 1916

The mosquito control program in San Mateo County is one of the oldest in the United States. Control work was initiated in 1904, when the Burlingame Improvement Club asked entomologists from the University of California to assist them in developing a plan to fight the city's mosquito infestations. A control plan was developed which included ditching, repair of existing dikes and tide gates, and filling of low areas. These physical control measures were to be supplemented with oiling of the remaining standing water.

On April 8th, 2008, San Mateo County Board of Supervisors passed a resolution to transfer specific vector control operations and responsibilities to San Mateo County Mosquito Abatement District. Our Board of Trustees reviewed and approved the transfer of services resolution during the board meeting on April 9th, 2008. San Mateo County Mosquito Abatement District Board of Trustees also approved a name change to San Mateo County Mosquito and Vector Control District.

OUR SERVICES
for San Mateo County Residents

- **Mosquito Control**
- **Tick Identification & Education**
- **FREE Mosquitofish**
- **Public Education & Treatment Notifications**

SAN MATEO COUNTY MOSQUITO & VECTOR CONTROL DISTRICT

(650) 344 - 8592
1351 Rollins Road
Burlingame, CA 94010

Monday-Friday
7a.m. to 4:30p.m.
www.smcmvcd.org