

# Annual Report 2019



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Dear Residents,

I'm excited to share with you our 2019 annual report. This report contains updates on some key issues affecting the District and our work in San Mateo County.

In 2019, the District's Comprehensive Annual Financial Report (CAFR) was awarded the Certificate of Achievement for Excellence in Financial Reporting by the Government Finance Officers Association. The Certificate of Achievement is the highest form of recognition in governmental accounting and financial reporting, and its attainment represents a significant accomplishment. There are more than 37,000 special districts in the United States, but only 108 have been awarded the Certificate of Achievement. In California, only 49 special districts have achieved this honor. San Mateo County Mosquito and Vector Control District is the second vector control district in the US to be awarded the Certificate of Achievement.

At the end of 2019, the District closed out one of its lowest seasons for West Nile virus activity since the virus first appeared in San Mateo County in 2004. No virus was detected in the county during 2019, despite its detection in several other Bay Area counties during the summer. However, there is no way to predict whether West Nile virus will return to San Mateo County in the future.

Unfortunately, summer didn't bring only good news; in August, invasive *Aedes aegypti* mosquitoes were detected in Placer, Sacramento, San Joaquin, and Stanislaus Counties for the first time. While this mosquito hasn't been seen in San Mateo County since 2015, it's likely it will be re-introduced to our county in the near future, bringing with it the threat of serious mosquito-borne illnesses like Zika, dengue, and chikungunya viruses.

This year's many 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

# ANNUAL REPORT 2019

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### Residents say:

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**“I received faster and better service than expected. It is nice to have expectations exceeded.”**

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# ABOUT THE DISTRICT

## Our Vision

***“We are an agency that protects public health through a science-based program of integrated vector management, which is responsive to the community, and prepared to adapt to new challenges.”***

## Our Mission

***“To safeguard the health and comfort of the citizens of San Mateo County through a science-based program of integrated vector management.”***

## Our Goals

1. Reduce or eliminate host-seeking vector populations and maintain consistency in control operations by evaluating vector populations before and after they are carried out.
2. Use scientific methods to evaluate the distribution of vectors and vector-borne diseases in nature and work toward preventing the occurrence of human cases among District residents.
3. Engage in research and development to optimize the District's ability to carry out its mission with available resources.
4. Maintain a highly motivated, productive staff that is aware of, and has access to, the latest materials, technologies, and techniques in vector control.
5. Ensure residents are aware of the District's Integrated Vector Management Program and cooperate with recommendations to reduce populations of vectors and minimize the risk to human health posed by vectors.
6. Ensure that residents are aware of District services, utilize them as needed, and are satisfied with the service they receive.
7. Cultivate strong, mutually beneficial relationships with local, state, county, and federal agencies.
8. Conduct all aspects of District business in a transparent and accountable manner.
9. Adequately maintain the District's physical assets and keep them up to date with the best technology available.
10. Anticipate and be prepared to respond to future scientific, operational, and financial challenges.
11. Ensure that the Board of Trustees operates in an ethical manner, makes sound decisions based on current and complete information, and has the capacity to lead the agency effectively.
12. Ensure that District finances are adequately managed to provide for long term financial stability and sustainability.

## The Board of Trustees

As an independent special district, the 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, and one resident appointed by the San Mateo County Board of Supervisors 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.

<b>CITY</b>	<b>REPRESENTED BY</b>
Atherton .....	Mason Brutschy
Belmont .....	Wade Leschyn
Brisbane .....	Carolyn Parker
Burlingame .....	Joe Galligan
Colma.....	Joe Silva
Daly City .....	Glenn R. Sylvester
East Palo Alto .....	Donna Rutherford
Foster City.....	Rick Wykoff
Half Moon Bay .....	Kati Martin
Hillsborough .....	Dr. D. Scott Smith
Menlo Park .....	Justin Evans
Millbrae .....	Dr. Muhammad Baluom
Pacifica .....	Peter DeJarnatt
Portola Valley .....	Raymond Williams
Redwood City .....	Kathryn Wuelfing Lion
San Bruno .....	Robert Riechel
San Carlos .....	Ross Graves
San Mateo .....	Ed Degliantoni
San Mateo County, at Large .....	Claudia Mazzetti
South San Francisco.....	Chris Levin-Young
Woodside .....	Paul Fregulia

### BOARD OFFICERS

#### Jan 2018–Dec 2019

Board President  
Joe Galligan

Board Vice President  
Wade Leschyn

Board Secretary  
Kati Martin

Board Assistant Secretary  
Kathryn Wuelfing Lion

## District Staff

### ADMINISTRATION

Chindi Peavey, Ph.D., *District Manager*  
 Brian Weber, *Assistant Manager*  
 Richard Arrow, CPA, *Finance Director*  
 David Kwan, *Information Technology Director*  
 Megan Sebay, MPH, *Public Health Education & Outreach Officer*  
 Mary Leong, *Accountant*  
 Devina Walker, *Office Administrator*  
 Paul Weber, *Facility Maintenance Technician*

### LABORATORY

Angie Nakano, MS, *Laboratory Director*  
 Tara Roth, Ph.D., *Vector Ecologist*  
 Cheryl Tina Sebay, *Vector Ecologist*  
 Theresa Shelton, M.Sc., *Laboratory Technician*

### OPERATIONS

Casey Stevenson, *Field Operations Supervisor*  
 David Allen, *Vector Control Technician*  
 Walter Bruj, *Vector Control Technician*  
 Stephanie Busam, *Vector Control Technician*  
 Eric Eckstein, *Vector Control Technician*  
 Sean Jones, *Vector Control Technician-Mechanic*  
 Kim Keyser, *Vector Control Technician*  
 Devon MacDonald, *Vector Control Technician*  
 Evan Ostermann, *Vector Control Technician*  
 Ryan Thorndike, *Vector Control Technician*

# SERVICE REQUESTS

## Resident Services

In addition to ongoing work to prevent the emergence of adult mosquitoes, 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 on rodents and nuisance wildlife, pick-up of dead bird specimens for disease testing, identification of insects or other arthropods, presentations, and public outreach events.

District staff responded to a total of 3,698 requests for service during 2019 (Fig. 1). This was the largest number of service requests the District has ever received in a single year, and a 41% increase over the average of the previous five years (2014-2018). Part of this increase was accounted for by the large number of requests for yellowjacket and wasp control, which may be related to warmer-than-average temperatures. It is likely that the total number of service requests will continue to increase over the coming years, especially given the effects of climate change in our county.

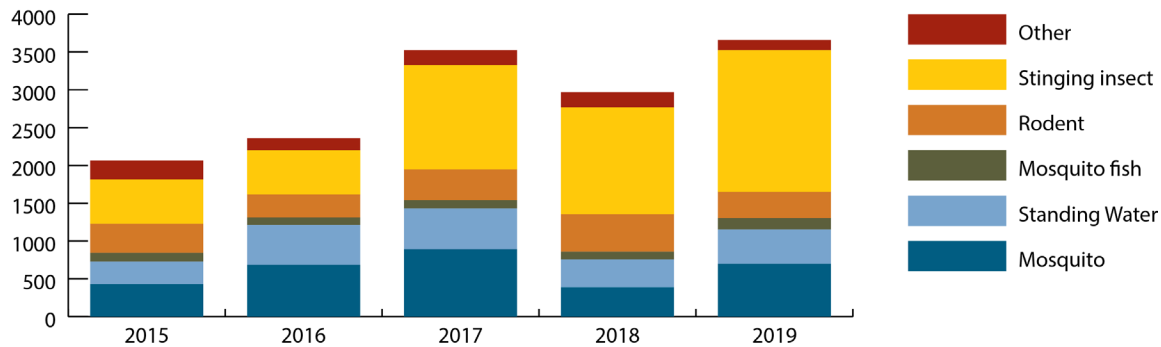


Figure 1: Service Requests by category, 2015-2019.

As in previous years, the majority of service requests were received over the summer (Fig. 2), with a seasonal peak occurring during late summer as the area's warmest temperatures boost mosquito populations. Likewise, warm weather allows yellowjacket and wasp populations to rise, resulting in dozens of resident service requests during the warmest months of the year. As temperatures cool in fall, mosquito populations decrease, despite the increased abundance of standing water left by seasonal rainstorms.

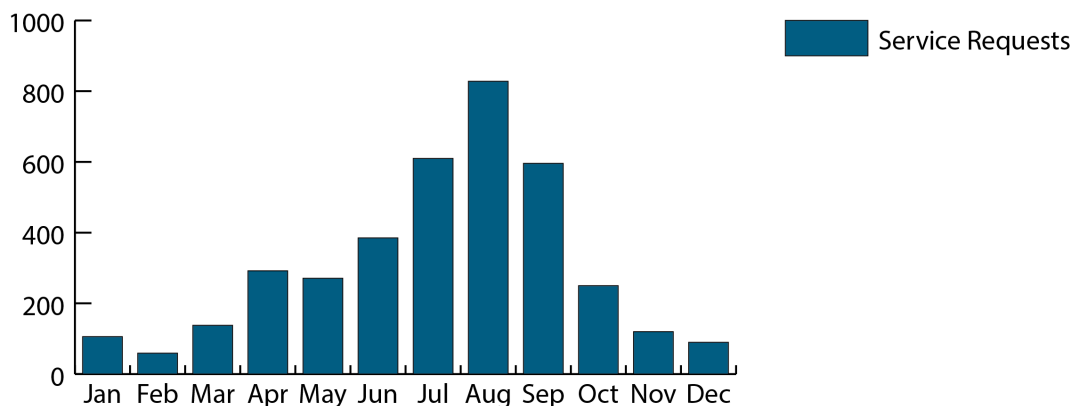


Figure 2: Total number of service requests by month in 2019.

# MOSQUITO PROGRAMS

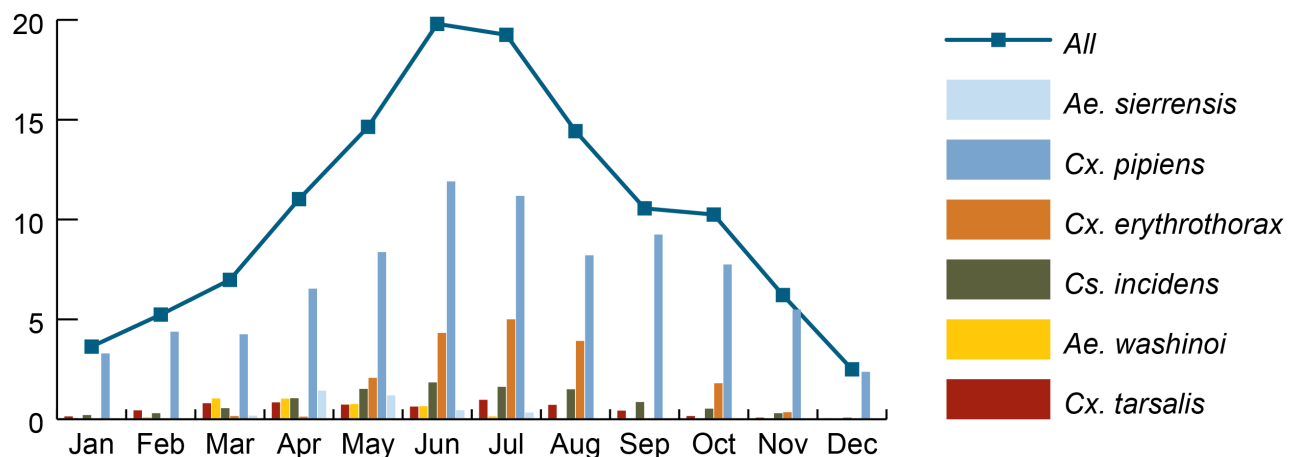
## Mosquito Population Surveillance

The District laboratory uses traps to conduct surveillance year-round for both native and invasive mosquito species. The results of these trap collections are used to estimate population levels of various mosquito species in San Mateo County and to provide comparative data on changing mosquito populations from year to year. Mosquito population data is compared over time, and seasonally, at specific locations. This data is used to optimize mosquito control and disease surveillance efforts in response to seasonal challenges throughout the year.

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 the spring, while *Culex erythrothorax*, the tule mosquito, begins emerging in early summer and requires a large larviciding effort to prevent its natural peak in the fall. However, *Culex pipiens*, the mosquito most commonly detected carrying West Nile virus in San Mateo County, makes up a large portion of local mosquito populations year-round, and is the biggest cause of mosquito-related complaints.



The total abundance of adult mosquitoes was above average during the 2019 calendar year, especially during spring and summer months. An especially wet winter, with rains continuing into the early spring, provided numerous breeding sites that persisted into the summer. This accumulation of water caused an above average spike in the numbers of *Aedes washinoi*, the fresh water mosquito, in the month of May. This mosquito breeds in freshwater ponds, impounds and marshes. The highest adult mosquito collection numbers were in July, and mostly *Culex pipiens* and *Culex erythrothorax*. The northern house mosquito, *Cx. pipiens*, develops urban areas along the bay, including sewer plants, fresh water pools that continuously hold water throughout the summer, and water under buildings. The tule mosquito, *Cx. erythrothorax*, is a seasonal mosquito that emerges from tule marshes in summer. The tules can make it difficult for larvicide materials to penetrate into mosquito larval sites, and sometimes these mosquitoes will emerge in high numbers, despite the efforts of the District. Both species declined in abundance during autumn.



**Figure 3: Average number of common adult mosquito species collected in carbon-dioxide baited traps during 2019 compared to the combined total of these common species.**



## West Nile Virus Surveillance

The District's year-round surveillance program for West Nile virus is part of CalSurv, the surveillance program for mosquito-borne encephalitis coordinated by the California Department of Public Health. This program includes surveillance for western equine encephalitis, St. Louis encephalitis, and other mosquito-borne viruses. These viruses are maintained through mosquito/bird transmission cycles. Surveillance for these viruses is carried out by multiple methods. The District tests carcasses of dead birds and live adult mosquitoes collected from CO<sub>2</sub>-baited traps. The viruses are detected using real-time PCR and other molecular techniques. In addition, the District maintains two flocks of sentinel chickens, located in San Mateo and East Palo Alto, as a method for monitoring the transmission of virus by local mosquitoes.

During the 2019 season, the overall risk of West Nile virus infection in San Mateo County remained low (Table 1). West Nile virus was not detected in any bird or mosquito samples collected in San Mateo County, and no human cases were reported.

**Table 1: West Nile virus detections in San Mateo County 2015-2019.**

DETECTION TYPE	2015	2016	2017	2018	2019
Human Case	0	0	0	0	0
Sentinel Chicken Seroconversion	0	0	0	0	0
Mosquito	5	5	0	2	0
Bird	23	15	1	5	0
Squirrel	0	0	0	0	0



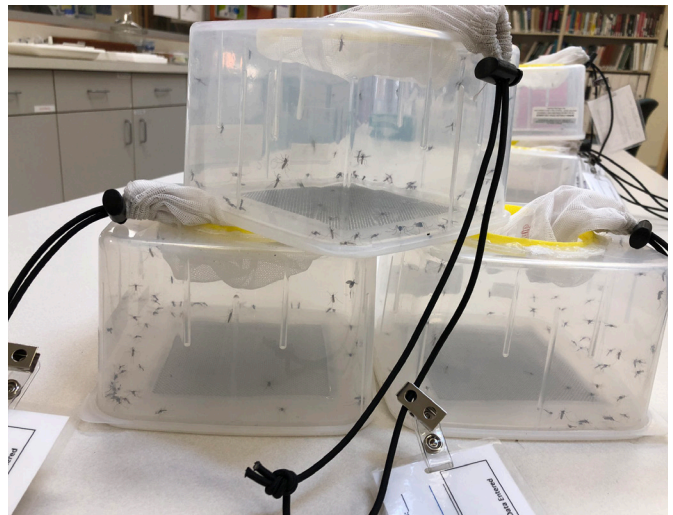
## Mosquito Trapping and Testing

Mosquito trapping for detection of West Nile virus is typically conducted when there is reason to believe the virus is present in adult mosquitoes in a particular geographical area, such as when bird carcasses test positive for West Nile virus or when a human case of West Nile virus is reported. *Culex* mosquitoes (the genus that transmits West Nile virus) are separated by species and pooled from each trap for testing. The results of mosquito testing for West Nile virus are used to plan mosquito control treatments.

**Table 2: West Nile Virus surveillance of mosquito samples, 2015-2019.**

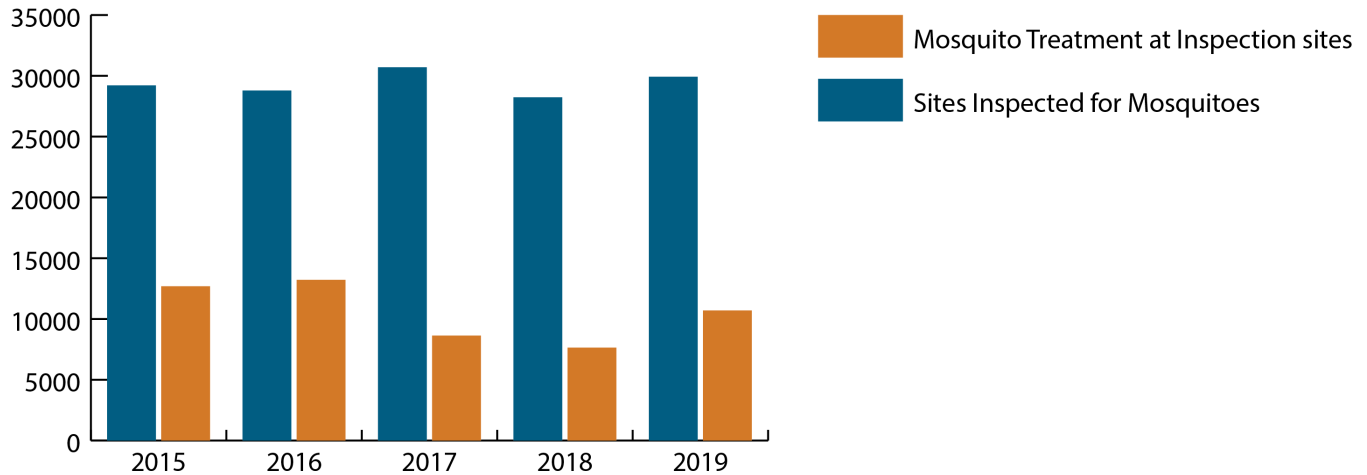
SAN MATEO COUNTY	2015	2016	2017	2018	2019
Mosquito Pools Tested	205	291	4	131	118
Positive Mosquito Pools	5	5	0	2	0
Percent Positive Mosquito Pools	2.4%	1.7%	0%	1.5%	0%

In 2019, laboratory staff conducted a field study evaluating different bait solutions for gravid mosquito traps. A gravid trap (shown below) is baited with a solution made from water and other ingredients such as alfalfa or hay to create attractive water conditions for gravid mosquitoes (female mosquitoes ready to lay eggs). Gravid mosquitoes are useful for disease surveillance because they are more likely than unfed mosquitoes to be infected with West Nile virus, but they are sometimes difficult to trap in large numbers. The study suggested that the location and the time of year in which the traps were set were more important factors in collecting gravid mosquitoes than which bait solution was used in the trap.



## Control of Mosquito Larvae

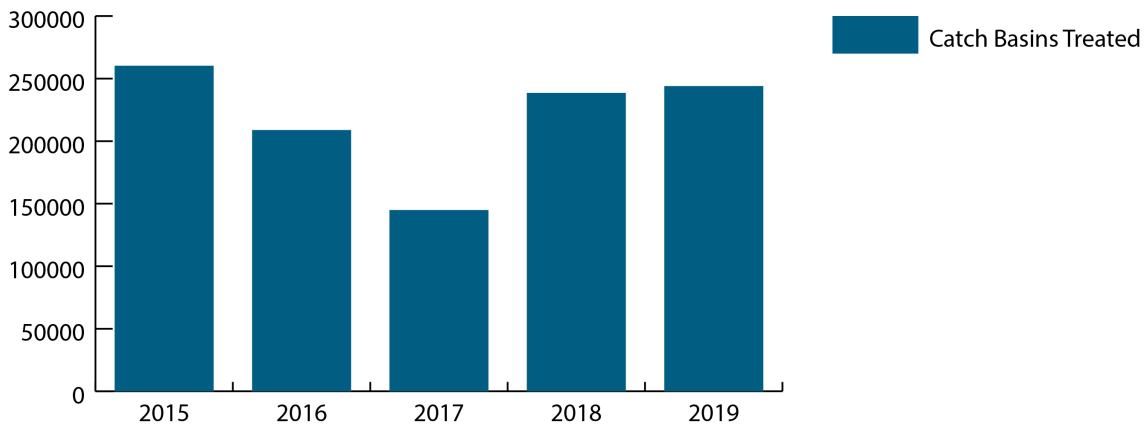
The vast majority of the District's mosquito control program consists of controlling mosquitoes in the larval stage (larviciding). Mosquito larviciding is both efficient and cost-effective. This tactic eliminates mosquito larvae before they develop into adult mosquitoes capable of transmitting diseases to humans. Products used for control of mosquito larvae are specific to mosquitoes and have minimal to no effects on non-target animals. These products include bacterial larvicides, insect growth regulators, and mosquito fish.



**Figure 4: Inspections and treatments for mosquito larvae, 2015-2019.**

The type of water source treated varies seasonally, with natural water sources – creeks, ponds, marshes, and impounds – treated frequently in response to winter and spring rain. In summer and fall, backyard water sources and municipal sources – including water treatment plants, storm drains, and ditches – make up the majority of the District's mosquito larvicide treatments. Salt marshes require treatment after king tides, when areas usually out of reach of tidal flushing are inundated by higher-than-usual water levels, leaving water standing and allowing large numbers of saltmarsh mosquito larvae to develop.

The county's storm water system also requires extensive treatment during the dry season (April through October). The District hires seasonal staff to complete the more than 200,000 treatments needed annually to keep these stormwater catch basins mosquito-free.



**Figure 5: Stormwater catch basin treatments, 2015-2019.**

In 2019, the District participated in a multi-agency study to evaluate a new formulation of methoprene, a biorational mosquito larvicide, in catch basins. While District mosquito control operations has used methoprene products for many years as part of its Integrated Pest Management program (IPM), this collaborative effort introduced our staff to new sampling and testing methods specific to catch basin/storm drain applications. Data from District sampling will be combined with results from other districts across the state to provide a balanced assessment of this control method.



## 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, including when they are found to be infected with West Nile virus. When this happens, information collected through mosquito surveillance is used to make the decision on whether to reduce adult mosquito populations by conducting an adult mosquito control treatment. Adult mosquito control, or adulticiding, is used to quickly reduce the number of adult mosquitoes and interrupt the disease transmission cycle in an area with elevated West Nile virus activity. Adulticiding is always conducted in conjunction with intensified efforts to locate and reduce mosquito larvae in standing water, so that additional adult mosquitoes cannot emerge.

During the 2019 West Nile virus season, there was no detection of West Nile virus in San Mateo County. This was consistent with an overall low level of West Nile virus statewide, particularly in the San Francisco Bay coastal region. The low prevalence of virus was despite higher than average mosquito abundance after a rainy season, which is consistent with data from past years that suggests West Nile virus activity increases in drought years. Fewer dead birds were reported by the public than usual (233 in 2019 compared to 409 in 2018 and 404 in 2017), which reduced surveillance as well. Since West Nile virus was detected in California in 2003, the level of activity has fluctuated, with repeated cycles of virus activity rising and falling every few years.

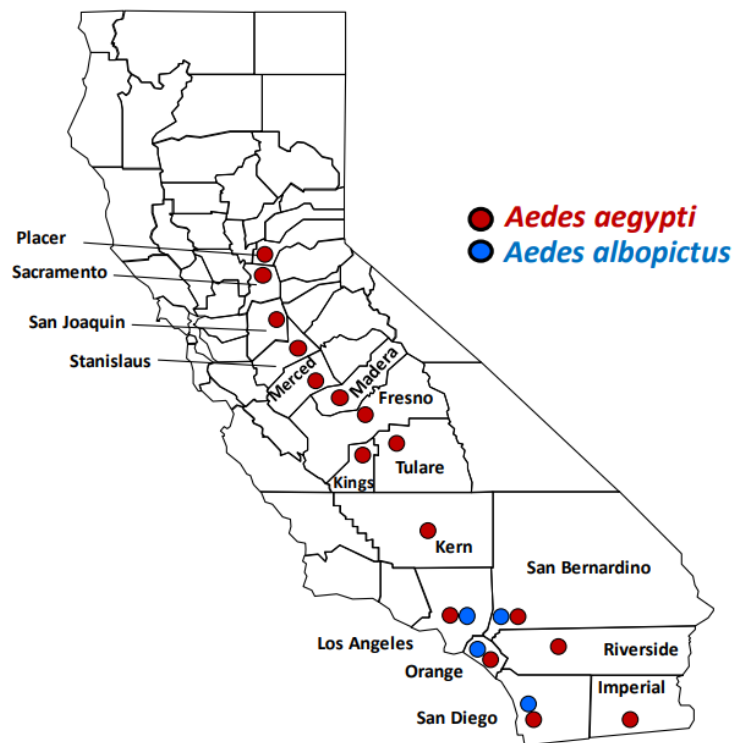
## Surveillance for Invasive Aedes Mosquitoes

Three species of non-native *Aedes* genus mosquitoes – *Aedes aegypti*, *Aedes albopictus*, and *Aedes notoscriptus* – have been identified in California to date (Figure 6). These species are concerning for vector control agencies across the state because they are highly invasive, difficult to control, and are vectors for a variety of diseases affecting humans, including Zika virus, chikungunya, dengue, and yellow fever. Allowing large populations of these invasive *Aedes* mosquito species to become established creates the risk that travel-acquired human cases of these diseases may lead to local outbreaks in California. Both *Aedes aegypti* and *Aedes albopictus* have been detected in San Mateo County in the past. Most recently, *Aedes aegypti* was found inhabiting a one square mile area in the city of Menlo Park in 2013. Following two years of intensive control efforts, there have been no detections of invasive *Aedes* mosquitoes in San Mateo County since May of 2015.

During the summer of 2019, invasive *Aedes aegypti* mosquitoes were detected for the first time in Placer, Sacramento, San Joaquin, and Stanislaus Counties. As invasive *Aedes* move closer to the Bay Area, San Mateo County mosquito and Vector Control District is taking steps to prepare for its almost inevitable arrival in the near future. The District has created an invasive *Aedes* response plan and has entered into a mutual aid agreement with Alameda County Mosquito Abatement District and Marin-Sonoma Mosquito and Vector Control District to provide assistance in the event of a future invasive *Aedes* mosquito emergency.

In addition to collaborating with neighboring districts, the District conducts active surveillance for invasive *Aedes* mosquitoes. A variety of mosquito traps are used which are specific to invasive *Aedes*. These include ovicups, and Biogents BG-Sentinel traps and BG-GAT (Gravid Aedes Trap) traps. Additional surveillance is conducted in areas where there have been human cases of illnesses that can be transmitted by invasive *Aedes*, including chikungunya, dengue, Zika, and yellow fever. The District is alerted to these cases by the San Mateo County Health System. This ensures that there is no risk that the infection will be transmitted by mosquitoes locally. In 2019, all human cases of these diseases were acquired outside California by people traveling to other countries.

Invasive *Aedes* mosquitoes were not detected in any area of San Mateo County during 2019. However, the risk of introduction of invasive *Aedes* mosquito species from other parts of California remains high.



**Figure 6: California counties and cities where invasive *Aedes* mosquitoes are currently found as of Feb 7, 2020. *Aedes notoscriptus* not included. (Map from California Department of Public Health)**

In 2019, laboratory staff tested and optimized a PCR-based assay technique used to identify suspicious mosquito eggs (shown right) or damaged mosquito specimens. The traditional method of identifying mosquito eggs is to hatch and identify them as later-stage larvae. This method is often hampered when eggs don't hatch. The PCR-based assay confirms identification in significantly less time. The ability to rapidly respond to detections of any invasive mosquito species is critical for success in eradication and containment efforts.



**Figure 7: Invasive *Aedes* mosquito surveillance locations, 2019.**

### *Residents say:*

**“As a homeowner, I felt so confident knowing this resource was available. The representative was knowledgeable, professional, patient with my questions and very helpful”**

## RODENT PROGRAMS

### Rodent Service Requests

The District's vector control technicians responded to an average of 348 service requests related to rodents per year over the last 5 years. During 2019, the District responded to 344 rodent-related service requests (Fig. 2 on page 4). These requests came from urban and suburban areas throughout the District's service area and were not concentrated in any particular city.

### Rodent Control in Sewers and Creeks

In 2010, San Mateo County turned over a large portion of residential rodent control responsibilities to the District. The District oversees contracts between private pest control operators and several local 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 also contract directly with the District for rat control services along above-ground public storm control waterways and urban creekways. Between July and October of 2019, the District conducted 452 rodent inspections and deployed 113 bait stations in San Carlos. In San Mateo, the District conducted 1336 inspections and deployed 334 bait stations. This work totaled 295 technician-hours for 2019.



## Surveillance for Rodent-Borne Disease

In 2019, the District conducted surveillance for pathogens in wild rodents that may cause disease in humans, including hantavirus, tularemia 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 the urine or feces of infected animals. There are several different strains of hantavirus; each is carried by a different species of wild mice. Only the Sin Nombre strain of hantavirus, which occurs in the deer mouse (*Peromyscus maniculatus*), has been associated with human disease cases. Tularemia (*Francisella tularensis*) and plague (*Yersinia pestis*) have similar symptoms of fever, malaise, aches and pains, vomiting, diarrhea, and enlarged lymph nodes and can be very serious if left untreated.

The District laboratory conducted humane live trapping in April of 2019 at a northern section of Año Nuevo State Park and nearby Costanoa Resort in order to collect biological samples for testing. Evidence of hantavirus infection was detected in three out of 14 deer mice trapped at Año Nuevo, and one out of five trapped at Costanoa. While these results indicate that hantavirus is present at these locations, not enough mice were collected during surveillance to confidently estimate the true prevalence and relative risk of exposure. Blood samples from 14 deer mice, two California mice (*Peromyscus californicus*), and two Merriam's chipmunks (*Tamias merriami*) were suitable for testing for tularemia. All tested negative. Samples from the three chipmunks were also tested for plague and were all negative. All tests were conducted by the California Department of Public Health laboratory.

These results were sent to the Costanoa Resort and the California State Parks. A follow-up facility inspection for evidence of rodent activity was conducted at Costanoa by District and CDPH staff. While some evidence of rodent activity was detected, it concluded there was not an elevated risk of exposure to guests staying at the facility. The District provided a complete facility evaluation report to the resort, and conducted safety training for resort staff.

**Table 3: Summary of animals captured and test results from hantavirus surveys in 2019.**

SITE	TRAIL/LOCATION	SPECIES	ANIMALS TRAPPED	HANTAVIRUS +
Año Nuevo SP	Franklin Point Trail	<i>P. californicus</i>	2	0
Año Nuevo SP	Franklin Point Trail	<i>P. maniculatus</i>	4	1
Año Nuevo SP	Whitehouse Creek Trail(s)	<i>P. californicus</i>	1	0
Año Nuevo SP	Whitehouse Creek Trail(s)	<i>P. maniculatus</i>	7	2
Costanoa	Whitehouse Creek Trail	<i>P. maniculatus</i>	1	0
Costanoa	N. end Outer Pine Village	<i>P. californicus</i>	1	0
Costanoa	N. end Outer Pine Village	<i>P. maniculatus</i>	2	0
Costanoa	Comfort station near Eucalyptus Camp #4	<i>P. maniculatus</i>	1	1

# TICK PROGRAMS

## Surveillance for Ticks and Tick-Borne Disease

San Mateo County Mosquito and Vector Control District conducts yearly tick collection and molecular testing via real-time PCR analysis for the three most common tick borne diseases in the state of California that are carried by the western black-legged tick (*Ixodes pacificus*). These diseases are Lyme disease (specifically the *Borrelia burgdorferi sensu lato* complex which includes *B. burgdorferi sensu stricto*, the agent of Lyme disease), hard-tick relapsing fever (caused by the pathogen *Borrelia miyamotoi*), and human granulocytic anaplasmosis (HGA) (caused by the pathogen *Anaplasma phagocytophilum*). All three diseases may be vectored by both nymphal and adult ticks. Larval western black-legged ticks rarely bite humans, and are only capable of transmitting hard-tick relapsing fever at an extremely low level and thus were not tested for any diseases in 2019.

Lyme disease is a bacterial infection that involves flu-like symptoms, a characteristic bulls-eye rash, and can lead to severe joint pain and neurological problems. Although it is found throughout the United States, the infection prevalence on the West Coast is significantly lower than in the Midwest or East Coast, due to differences in tick hosts and ecology. Hard tick relapsing fever is a bacterial disease that was first discovered in 2001 in Connecticut and was identified as a human pathogen in 2011. It has similar symptoms to Lyme disease but without the characteristic rash and the fever may reoccur multiple times before the infection clears. HGA is a bacterial infection that presents with fever, abdominal pain, aching joints, fatigue and other flu-like symptoms. The bouts of fever may reoccur multiple times. All three of these diseases, if identified early, can be treated with antibiotics.

Adult ticks are tested in groups, or “pools,” of a maximum of five individuals. Nymphal ticks are tested in pools of a maximum of two individuals. The results are reported as a minimum infection prevalence, or MIP. This is the standard way of expressing the proportion of vectors tested that are infected with a particular pathogen and assumes that only one tick in a given pool is infected. As prevalence values are highly dependent on the number of ticks collected, we sample 150 or more adult ticks per park which increases the chance that our sample will be similar to the true prevalence. Collection values under 150 are unlikely to be an accurate representation of the true prevalence.

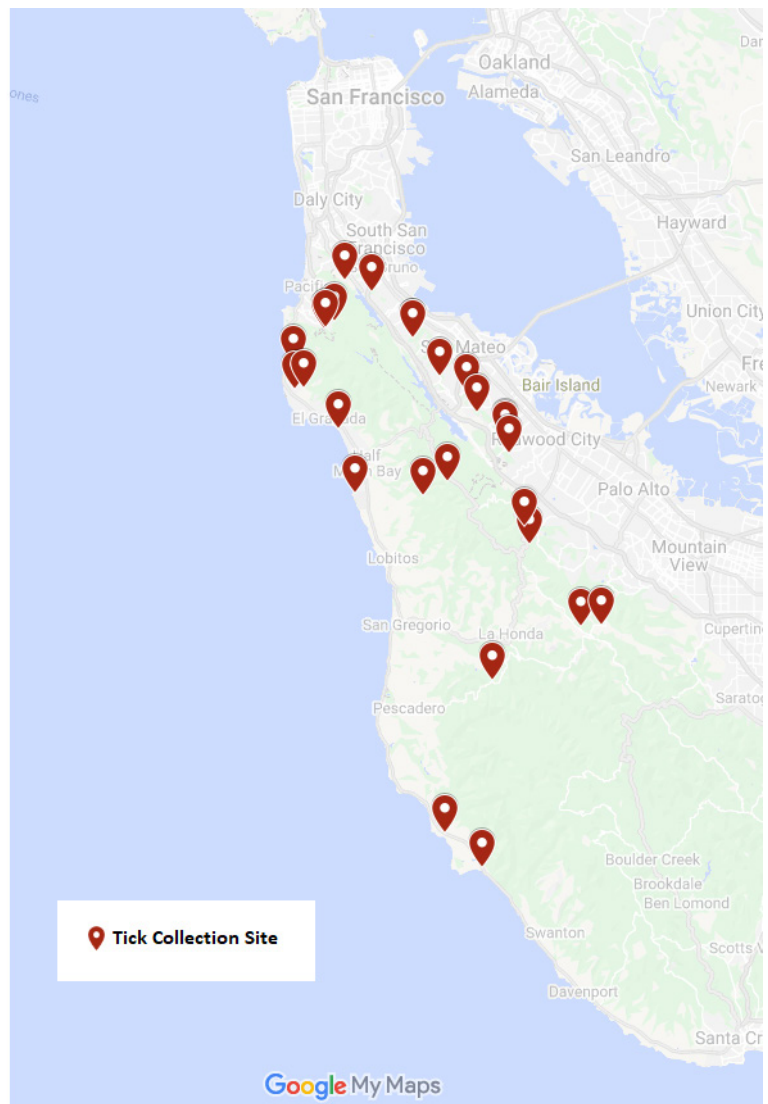


Figure 8: Tick collection sites, water year 2018/2019.



**Table 4: Results from surveillance for tick-borne disease in *Ixodes pacificus* ticks collected from October 2018 through September 2019 from local parks.**

Park Name	Stage	Total Collected	MIP <i>Borrelia burgdorferi</i> s.l.	MIP <i>Borrelia miyamotoi</i>	MIP <i>Anaplasma phagocytophilum</i>
Año Nuevo State Park	Adult	292	0.00%	0.34%	0.00%
	Nymph	3*	0.00%	0.00%	0.00%
Big Canyon Park	Nymph	7*	0.00%	0.00%	0.00%
Coal Creek OSP	Adult	363	0.83%	1.38%	0.00%
Costanoa Recreational Area	Adult	186	0.54%	0.54%	55.00%
	Nymph	8*	0.00%	0.00%	0.00%
Eaton Park	Nymph	58	1.72%	0.00%	0.00%
Edgewood County Park	Nymph	102	0.98%	0.98%	0.00%
Frontierland Park	Adult	6*	0.00%	16.67%	0.00%
Half Moon Bay Coastal Trail	Adult	1*	0.00%	0.00%	0.00%
Hillsborough (South)	Adult	159	1.26%	1.26%	0.00%
Hillsborough (North)	Adult	85*	1.18%	0.00%	1.18%
Junipero Serra Park	Adult	46*	0.00%	0.00%	0.00%
Laurelwood Park	Nymph	91	1.10%	0.00%	0.00%
Los Trancos OSP	Adult	196	1.02%	2.55%	1.02%
Memorial Park	Adult	44*	2.27%	0.00%	0.00%
Montara Mountain	Adult	216	0.00%	0.46%	0.46%
Purisima Creek OSP	Adult	243	0.00%	0.41%	0.82%
Rancho Corral de Tierra (GGNRA)	Adult	43*	0.00%	0.00%	0.00%
San Pedro Valley Park	Adult	449	0.22%	1.11%	0.67%
Sweeney Ridge (GGNRA)	Adult	15*	0.00%	0.00%	0.00%
Thornewood OSP	Nymph	71	1.41%	2.82%	0.00%
Water Dog Lake Park	Nymph	36*	5.56%	0.00%	0.00%
Wavecrest OSP	Adult	9*	0.00%	0.00%	0.00%
Wunderlich OSP	Nymph	80	0.00%	0.00%	0.00%

MIP - Minimum Infection Prevalence. A measure of pathogen prevalence equal to the number of positive testing pools divided by the total number of ticks tested, expressed as a percentage.

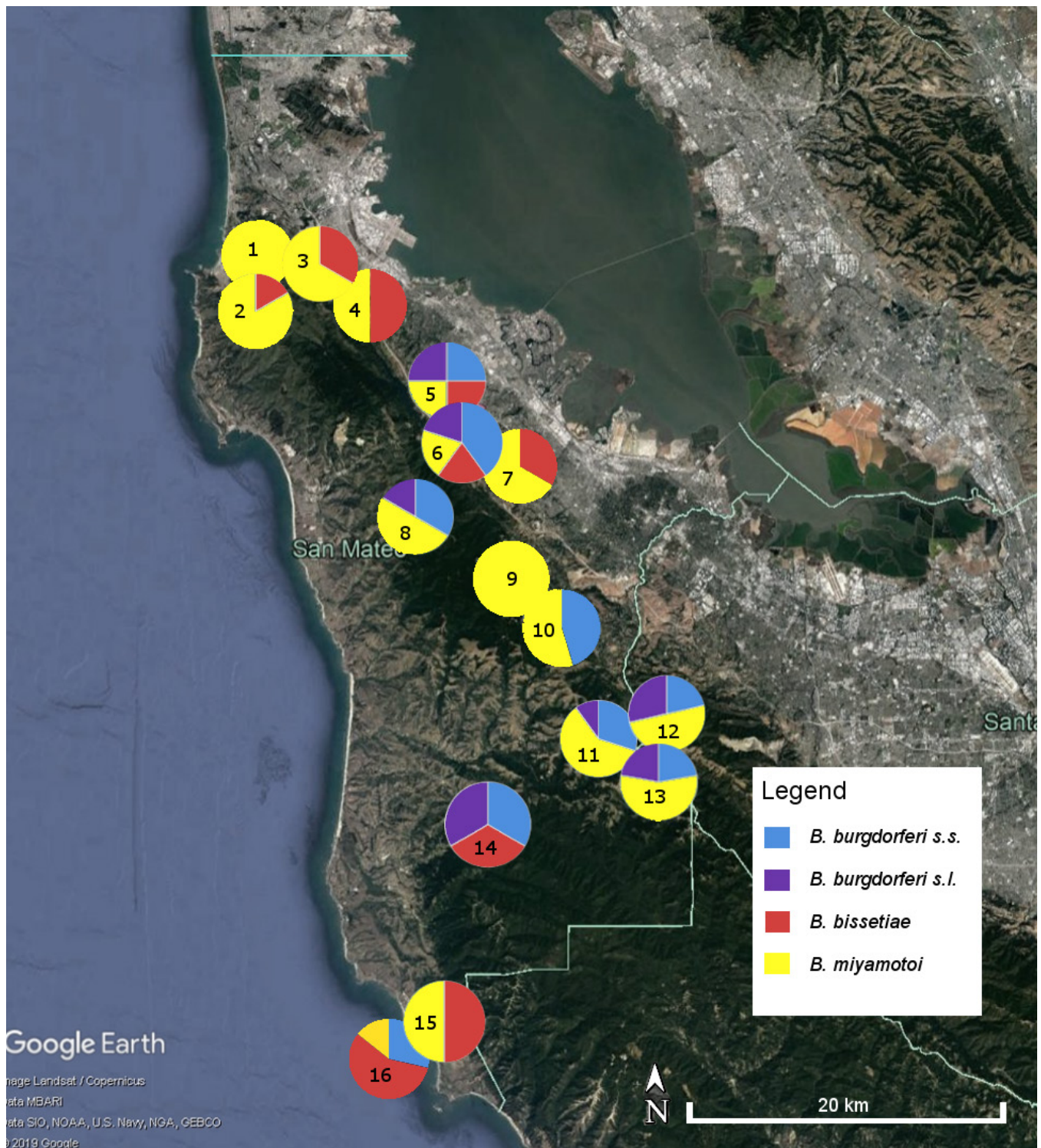
\* Indicates the number of ticks collected is insufficient to provide an accurate representation of the true prevalence of the diseases tested for.

Abbreviations: OSP - Open Space Preserve, SP - State Park, RT - Regional Trail, Bbsl – *Borrelia burgdorferi sensu lato*, Bm – *Borrelia miyamotoi*, Ap – *Anaplasma phagocytophilum*

In the 2018/2019 collection period, rain restricted the number of days available for tick collection. A total of 2,350 adult *I. pacificus* ticks were collected from 16 parks and 458 nymphal *I. pacificus* ticks were collected from nine parks. County-wide, *B. burgdorferi*, *B. miyamotoi* and *A. phagocytophilum* were detected at 0.48%, 0.89% and 0.44% MIP in adult *Ix. pacificus* ticks respectively. In nymphal *Ix. pacificus* ticks, *Borrelia burgdorferi* and *B. miyamotoi* were detected at a MIP of 1.04% and 0.76% respectively (see Table 4 on the preceding page). These overall values only include parks where 150 or more adult or 50 or more nymphal ticks were collected. An MIP of up to 3.0% in adult ticks, and up to 5.0% in nymphal ticks for any of the three tick-borne diseases we test for is typical for San Mateo County.

The bacteria that causes Lyme disease is actually part of a complex of many different bacteria strains – of which only one, *B. burgdorferi sensu stricto*, can cause Lyme disease. In 2019 laboratory staff and National Science Foundation grant awardee and summer intern Arielle Crews further tested *B. burgdorferi sensu lato* positive tick pools in order to determine the proportion of isolates that were *B. burgdorferi sensu stricto* (Fig. 9). Of the 53 positive pools detected in 2018 and 2019, only 24 (45.28% of all pools) were confirmed to be *B. burgdorferi sensu stricto*. This means the overall MIP of *B. burgdorferi sensu stricto* in San Mateo County is approximately 0.35%.





Google Earth  
 Image Landsat / Copernicus  
 Data MBARI  
 Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
 © 2019 Google

**Map Reference: Park Names**

1. Frontierland	5. Laurelwood Park	9. Wunderlich OSP	13. Skyline Ridge OSP
2. San Pedro Valley OSP	6. Water Dog Lake Park	10. Thornewood OSP	14. Memorial Park
3. Crystal Springs Reservoir	7. Eaton Park	11. Coal creek OSP	15. Costanoa Recreational Area
4. Hillsborough OS	8. Purisima Creek OSP	12. Los Trancos OSP	16. Ano Nuevo State Park

**Figure 9: Diversity of *Borreliae* in San Mateo County**

## Surveillance for Tularemia

In 2019, the District laboratory staff continued surveillance for the tick-borne disease tularemia (caused by the bacterial pathogen *Francisella tularensis*) at Costanoa/northern Año Nuevo State Park. This location has a history of human cases of tularemia from 2004 and 2006. Tularemia is a febrile illness that causes fever, malaise, aches and pains, vomiting, diarrhea, and enlarged lymph nodes and can be very serious if left untreated. Tularemia is transmitted in California by the Pacific Coast tick (*Dermacentor occidentalis*) and the American dog tick (*D. variabilis*) which may be found year-round but are most abundant during the summer. From March 2019 till June 2019, the District collected a total of 2228 *Dermacentor* ticks from Costanoa/northern Año Nuevo State Park. Ticks were pooled in groups of 5 for disease testing. Eighteen pools were positive for *F. tularensis* for an MIP of 0.81%. This MIP does not vary significantly from previous years. These positive pools were confirmed by multiplex real-time PCR analysis by the CDPH Vector Borne Disease Laboratory (VBDL) in Richmond, CA.

**Table 5: Dermacentor tick collection results and prevalence of *Francisella tularensis* collected March through June 2019 from Año Nuevo State Park and Costanoa Recreational Area.**

Trail	Date	# DOC Collected	DOC MIP	# DVAR Collected	DVAR MIP	All MIP
North Whitehouse Creek Trail	3/14/2019	38	5.26%	3	0.00%	4.88%
South Whitehouse Creek Trail	3/1/2019	69	5.80%	11	0.00%	5.00%
Rossi Rd and partial bridge loop	3/14/2019	23	0.00%	4	0.00%	0.00%
North Whitehouse Creek Trail	4/23/2019	178	1.69%	23	0.00%	1.49%
South Whitehouse Creek Trail	4/23/2019	49	2.04%	5	0.00%	1.85%
Rossi Rd and partial bridge loop	4/23/2019	205	0.00%	24	0.00%	0.00%
North Whitehouse Creek Trail	5/24/2019	74	0.00%	60	0.00%	0.00%
South Whitehouse Creek Trail	5/24/2019	251	2.39%	28	0.00%	2.15%
Rossi Rd and partial bridge loop	5/24/2019	207	0.00%	54	0.00%	0.00%
North Whitehouse Creek Trail	6/14/2019	111	0.00%	128	0.00%	0.00%
South Whitehouse Creek Trail	6/14/2019	98	1.02%	16	0.00%	0.88%
Rossi Rd and partial bridge loop	6/14/2019	434	0.23%	135	0.00%	0.18%

MIP - Minimum Infection Prevalence. A measure of pathogen prevalence equal to the number of positive testing pools divided by the total number of ticks tested, expressed as a percentage.

Abbreviations: DOC – *Dermacentor occidentalis*, DVAR – *Dermacentor variabilis*

### Residents say:

**“The service was super fast, easy, and thorough. I couldn’t even pay someone to take care of it as fast as you guys did. Thanks a ton.”**

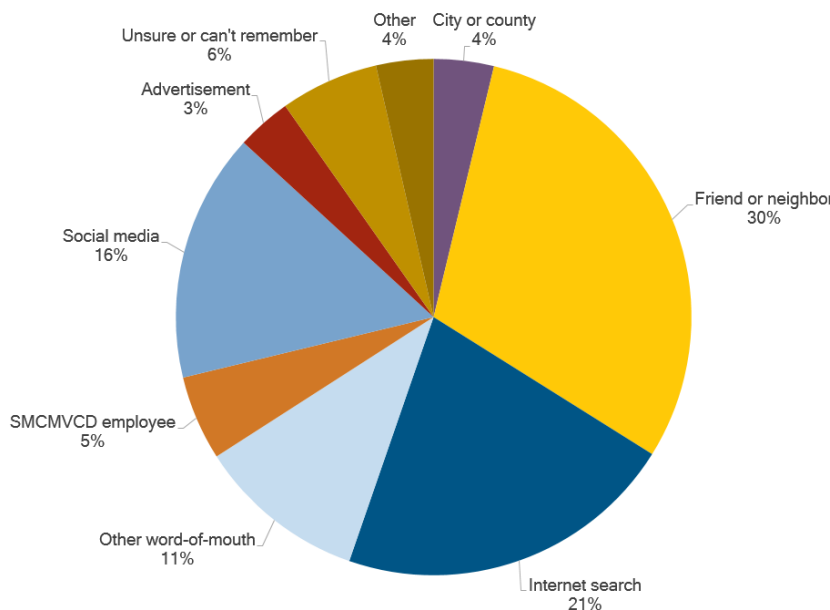
# PUBLIC HEALTH EDUCATION AND OUTREACH

The District's integrated vector management program includes extensive public outreach aimed at improving public awareness of and participation in vector-borne disease prevention, including vector attractant/source reduction and behaviors to reduce the risk of vector-borne disease transmission.

A post-service online survey is used to collect information on where residents first heard about the District, how often and what kind of services were requested, and whether they were satisfied with those services. An invitation to complete the survey is sent to every resident who provides an email address when requesting service. Nearly 600 residents responded during 2019, rating their satisfaction with the District's services at 4.9 out of 5.

In 2019, the most important sources of referrals to the District were internet sources (internet search results, internet advertising, social media posts, and email subscriptions) and word-of-mouth (friends, neighbors, city and county staff, pest control professionals, and others). Other significant sources of resident referrals included transit and television advertising, as well as outreach events.

The District website received more than 50,000 visits during 2019, an increase of 30% compared to the previous year. Eighty percent of these visitors accessed the site from within the United States; 40% of all visitors accessed the site from within California. The average user visited the site 1.1 times, viewed 2.1 pages per session and spent just 1.15 minutes on the site per visit. As in previous years, site visits are higher during summer.



### Residents say:

**“We have always been very happy with your wonderful service. Thank you so much for providing it!”**

Figure 10: Resident-reported source of referrals to the District during 2019.

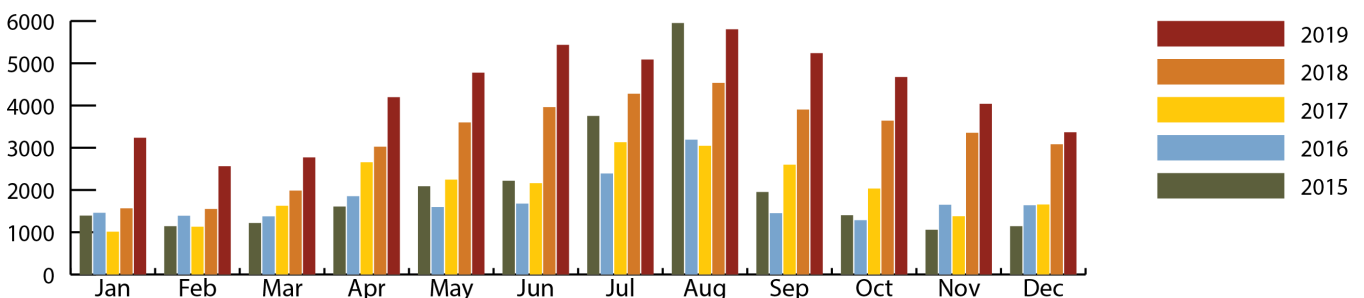


Figure 11: User visits to the District website by month 2015 to 2019.

## 2019 EVENTS AND PRESENTATIONS

- City of Millbrae Disaster Preparedness Day
- San Mateo County Disaster Service Workers' Day
- Ortega School Safety Day
- San Mateo Senior Center Health & Wellness Fair
- California Association of Pest Control Advisors
- San Mateo County Public Works Safety Day
- Peninsula Infectious Disease Conference
- La Honda Neighborhood Association
- San Mateo Bayfront Cleanup Day
- San Mateo County Safety Committee
- PacBay Christian School
- San Mateo County Parks Department
- Belmont SOAR Camp
- Redwood City Kiwanis Farmers Market
- Pacifica Farmers Market
- Bug Day at the San Francisco Zoo
- Brisbane Farmers Market
- San Mateo County Fair
- San Carlos Farmers Market
- South San Francisco Farmers Market
- Daly City Farmers Market
- Coyote Point Kite Festival
- Half Moon Bay Farmers Market
- San Mateo County City Managers Association
- Foster City Farmers Market
- East Palo Alto Farmers Market
- SMCMVCD Mosquito Awareness Week Open House
- San Bruno Girl Scout Troop #62550
- East Palo Alto City Council
- San Carlos City Council
- San Mateo Highlands Association
- Harbor Industrial Association
- San Mateo County Department of Agriculture Growers' Workshop
- Burlingame Mills Intermediate Girl Scouts
- Fernando Rivera Middle School Career Day
- Millbrae City Council
- Fernando Rivera Middle School Career Day

## PUBLICATIONS AND PRESENTATIONS

### ANGIE NAKANO

More than just tucking pants into socks: approaches to tick control

2019 Mosquito and Vector Control Association of California Annual Conference

### TARA ROTH

Using mammal tracking techniques to improve placement and targeting of bait stations in rodent control programs

2019 Mosquito and Vector Control Association of California Annual Conference

### MEGAN SEBAY

Is It Broke? Should We Fix It? Evaluating Programs and Projects

2019 Mosquito and Vector Control Association of California Annual Conference





## FINANCIAL REPORTS

In 2019, in addition to its Annual Financial Audit, the District published a Comprehensive Annual Financial Report (CAFR), which gives a deeper look into the District finances for Fiscal year 2018-19. The CAFR for FY 2018-19 can be found on the District website at [www.SMCMVCD.org/CAFR](http://www.SMCMVCD.org/CAFR).

### Financial Highlights for Fiscal Year 2018/2019

- In Fiscal Year 2018-19, the District's Fund Balance increased 22% or \$1,291,676 from the prior year. Actual revenues were higher than expected and expenditures were lower than budgeted, primarily due to vacant positions which the District expects to fill in FY 2018-19.
- Total revenues from all sources increased by 6.5%, or \$353,373 from the prior year, primarily due to an increase of \$312,197 in tax revenues.
- Actual revenues exceeded the amount budgeted by \$183,307, primarily due to the amount received for ERAF rebate and Redevelopment Pass-Through, and Investment revenue being higher than expected. These amounts can vary from year to year.
- Total expenditures for the District's operations in FY 2018-19 slightly decreased \$15,202 over the previous year.
- The District had no outstanding debt, other than capital leases for District vehicles.
- The District liabilities for Other Post Employee Benefits (OPEB) are fully funded and paid for by a trust established for this purpose in 2015.

**Residents say:**

**“I was really impressed! I made a request online in the afternoon, and the next morning someone came to take care of the yellowjacket nest.”**

**Balance Sheet**

The Balance Sheet shows the composition of District assets, liabilities, and fund balances as of June 30, 2019. Cash and investments make up the majority of the District's assets.

**Table 6: Balance Sheet for Fiscal Year ending June 30th, 2019.**

	GENERAL FUND	CAPITAL PROJECT FUND	TOTAL
<b>ASSETS</b>			
Cash and investments	5,722,336	745,567	6,467,903
Restricted cash and investments	105,707		105,707
Accrued interest receivable	39,604		39,604
Accounts receivable	46,168		46,168
Accounts receivable other	22,588		22,588
Materials and supplies inventory	158,293		158,293
Deposits with Vector Control Joint Powers Agency (VCJPA)	485,069		485,069
Prepaid items	20,780		20,780
<b>Total assets</b>	<b>\$6,600,545</b>	<b>\$745,567</b>	<b>\$7,346,112</b>
<b>LIABILITIES</b>			
Accounts payable and accrued expenditures	\$139,533		\$139,533
Accrued salaries and benefits	50,473		50,473
<b>Total liabilities</b>	<b>\$190,006</b>		<b>\$190,006</b>
<b>FUND BALANCES</b>			
Nonspendable	179,073		179,073
Restricted	105,707		105,707
Committed	800,000		800,000
Assigned	2,000,000	\$745,567	2,745,567
Unassigned	3,332,759		3,332,759
<b>Total fund balances</b>	<b>\$6,410,539</b>	<b>\$745,567</b>	<b>\$7,156,106</b>
<b>Total liabilities and fund balances</b>	<b>\$6,600,545</b>	<b>\$745,567</b>	<b>\$7,346,112</b>



## Statement of Revenues, Expenditures and Changes in Fund Balance

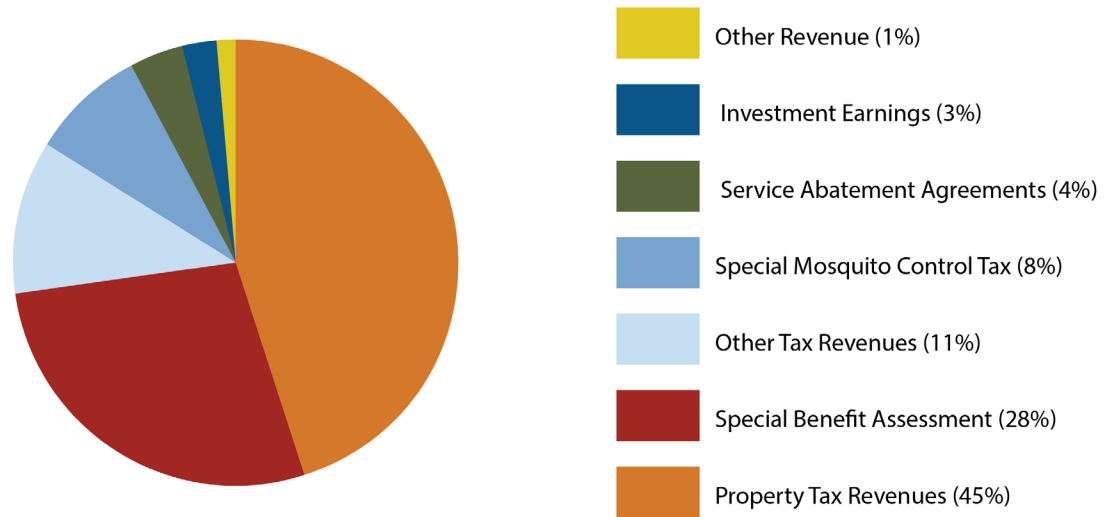
This statement shows the District's revenues and expenditures in FY 2018-19. From this statement and the explanation on the following page, the reader can see how the District's operations are funded and what the funds are used for.

**Table 7: Statement of Revenues, Expenditures and Changes in Fund Balances for Fiscal Year ending June 30th, 2019.**

	GENERAL FUND	CAPITAL PROJECT FUND	TOTAL
<b>REVENUES</b>			
Service abatement revenue	233,273		233,273
Special benefit assessment	1,624,577		1,624,577
Special mosquito control tax	485,759		485,759
Property taxes	2,629,658		2,629,658
Other tax revenues	633,838		633,838
Investment earnings	150,110		150,110
Other revenues	66,629		66,629
<b>Total Revenues</b>	<b>\$5,823,844</b>		<b>\$5,823,844</b>
<b>EXPENDITURES</b>			
<b>Mosquito and Vector Control</b>			
Salaries and wages	\$2,258,887		\$2,258,887
Employee benefits	945,440		945,440
Materials and services	1,165,632		1,165,632
<b>Capital outlay</b>	7,776	120,149	127,925
<b>Debt Service</b>			
Principal		25,965	25,965
Interest and fiscal charges		8,319	8,319
<b>Total Expenditures</b>	<b>\$4,377,735</b>	<b>\$154,433</b>	<b>\$4,532,168</b>
<b>REVENUES OVER (UNDER) EXPENDITURES</b>	<b>1,446,109</b>	<b>-154,433</b>	<b>1,291,676</b>
<b>OTHER FINANCING SOURCES</b>			
Transfer in		900,000	900,000
Transfers out	-900,000		-900,000
<b>Total other financing sources</b>	<b>-900,000</b>	<b>900,000</b>	
<b>Net change in fund balances</b>	<b>546,109</b>	<b>745,567</b>	<b>1,291,676</b>
<b>FUND BALANCES</b>			
Beginning of year	5,864,430		5,864,430
End of year	\$6,410,539	\$745,567	\$7,156,106

## Who Pays for Services

In Fiscal Year 2018-19, the District received \$5.8 million of revenue. County property owners, who pay property taxes and assessments are the source of almost all District revenue. The District's top three revenue sources – ad valorem property taxes, a special mosquito tax and a benefit assessment – provide 85% of revenue. Property owners in the Southeast portion of the county pay for services through a small portion of the ad valorem property taxes (0.000018505 cents per \$1.00 of property taxes) and a Special Mosquito Control tax of \$3.74 per parcel. Property owners in the northern part of the county, on the coast, and in the mountainous areas pay a benefit assessment of approximately \$18.15 per Single Family Equivalent (SFE).

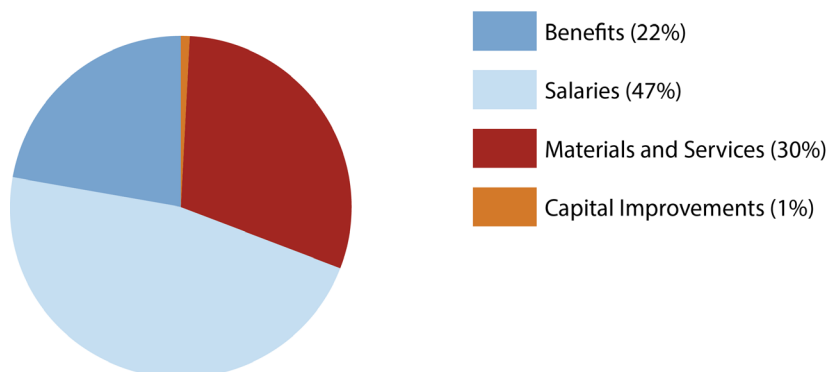


**Figure 12: Sources of Revenue for Fiscal Year Ending: June 30, 2019.**

In fiscal year 2018-19, total revenues from all sources increased by 6.5%, or \$353,373 from the prior year. The District's revenue from ad valorem property tax increased by 7.3% or \$179,108, while revenue received from the benefit assessment increased by 2.9% or \$45,141.

## How Revenue is Used

Total annual operating expenditures in Fiscal Year 2018/2019 were \$4.4 million. As is typical for local government agencies, most District expenditures were for employee salaries and benefits. The District's Integrated Vector Management (IVM) program reduces pesticide use but is labor-intensive and requires highly trained staff. Field staff conduct inspections and choose from a variety of control strategies and tools depending on the conditions present at a given site. Field and Laboratory staff monitor vector populations by trapping vectors and identifying the species present.



**Figure 13: Expenditures for Fiscal Year Ending: June 30, 2019.**

## Financial Reserves

As of June 30, 2019, the District reported a total fund balance of \$7,156,106 at the end of the fiscal year. The District allocated unassigned fund balance equal to 60% of budgeted operating expenditures to provide working capital requirements from the beginning of the fiscal year on July 1, until the receipt of property tax revenue in November of each year.

**Table 8: Fund Balances and Reserve Allocations.**

<b>FUND BALANCE and RESERVE ALLOCATION</b>	<b>Amount</b>	<b>% of Fund Balance</b>
Real Property Reserve	1,350,000	19%
PUBLIC HEALTH EMERGENCY RESERVE	800,000	11%
NATURAL DISASTER EMERGENCY RESERVE	650,000	9%
PENSION RATE STABILIZATION RESERVE	105,707	1%
CAPITAL PROJECTS RESERVE	745,567	10%
UNASSIGNED FUND BALANCE (WORKING CAPITAL)	3,162,920	44%
UNASSIGNED FUND BALANCE	162,839	2%
NON-SPENDABLE (Inventory & prepaid items)	179,073	3%
<b>TOTAL FUND BALANCE</b>	<b>\$7,156,106</b>	<b>100%</b>



# 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**

**FREE Mosquitofish**

**Tick Identification  
& Education**

**Rodent & Wildlife  
Inspections**

**Disease  
Surveillance**

**Public Education  
& Treatment Notifications**