

ALAMEDA COUNTY
VECTOR
CONTROL

ANNUAL REPORT 2018



Mission

The mission of the Vector Control Services District is to prevent the spread of vector-borne diseases, injury, and discomfort to the residents of the District by controlling insects, rodents, and other vectors and eliminating causal environmental conditions through education and integrated pest management practices.



District Services

Request for Service: Overview

- Conduct investigations in response to requests for service from the public for rodent, wildlife, and insect vectors of disease, assess environmental conditions for vector harborage and access, and recommend solutions to reduce vector activity and associated public health risks.
- Investigate reported public health and vermin problems related to rodents, cockroaches, flies, fleas, bed bugs, lice, stinging insects (yellow jackets and bees), ticks, mites, and spiders, and render the appropriate control services based on integrated pest management strategies.
- Provide insect, tick and spider identifications and recommend the least-toxic control strategies.
- Conduct surveys of rodents, insects and arthropods of public health importance, and maintain a reference collection.
- Survey and control cockroaches in public sewers, utility boxes, and storm drains.
- Conduct yellow jacket and bee control in public areas.



Wildlife Management and Rabies: Case Investigation

- Conduct investigations of nuisance wildlife problems relating to bats, skunks, opossums, raccoons, turkeys, feral pigs, foxes, coyotes, dogs, cats, rabbits, and birds (pigeons).
- Trap nuisance animals when preventative alternatives or exclusion practices are not possible or unlikely to be effective.
- Work in coordination with local animal control agencies and the Alameda County Public Health Department to monitor and test wildlife (bats, skunks, opossums, cats, etc.) for rabies and submit an annual report to the California Department of Public Health.



Rodent Control

- Provide recommendations for rodent proofing and population control in homes, neighborhoods, open areas, and businesses.
- Conduct rodent suppression during vector-borne disease outbreaks, public health emergencies, or when residents are experiencing a public health risk from rodents and their ectoparasites.
- Conduct surveys of rat populations to assess species abundance, distribution, and disease carrying potential.
- Conduct inspection and rodenticide baiting of sanitary sewers for rats within the City of Oakland.
- Inspect and test sewer laterals and mains to detect breaks, which may provide an egress for rats to move into adjacent neighborhoods.

Solid Waste Problems

- Investigate complaints regarding solid waste involving garbage, human or animal wastes, and odors at residential properties and businesses. These issues often attract or harbor rodent and wildlife vectors.



Vector-Borne Disease Surveillance and Control

- Investigate reports of animal or human cases of disease such as Lyme disease, Psittacosis, Plague, Hantavirus (HCPS), Malaria, Dengue fever, Chikungunya virus, Zika virus, West Nile virus, Flea-borne Typhus, Tick Relapsing Fever, Chagas disease, Reptilian salmonellosis, Ehrlichiosis, Anaplasmosis, and Rabies to determine cause, incidence, distribution, and appropriate prevention and remediation measures.
- Mosquito-borne virus surveillance for the City of Albany. This includes monitoring and controlling immature and adult mosquito populations, testing mosquitoes, sentinel chickens, and dead birds for West Nile virus activity, and reporting results to the California Department of Public Health and the residents of Albany.
- Continue an invasive mosquito surveillance program for *Aedes aegypti* and *Aedes albopictus* for the City of Albany. These invasive mosquitoes are vectors of the Zika virus, Dengue fever, and Chikungunya virus.
- Assist the public with tick identification and submissions of ticks to laboratories for Lyme disease testing.
- Collect rodent ectoparasites and determine Plague and flea-borne typhus (or other vector-borne disease transmission potentials) and implement rodent suppression and ectoparasite elimination strategies as required.



Public Education and Information

- Provide educational presentations to schools, civic groups, property managements, homeowner associations and the general public.
- Disseminate educational materials on vector-borne diseases to residents and interested groups.
- Engage with the public through interactive outreach booths at local health fairs, special events, and the Alameda County Fair.
- Post annual shellfish harvesting quarantine notices at the Alameda County bay shoreline.
- Maintain a current, informative, and interactive web site.
- Provide timely and informative media releases on vector control issues.



Legal Enforcement

- Provide assistance to local code enforcement agencies to enforce state laws, regulations, and local ordinances related to rodent, wildlife, or insect vectors that pose a threat to public health and safety.

Introduction

This Annual Report for County Service Area (CSA) VC 1984-1 for Vector Control is presented to the Alameda County Board of Supervisors (BOS) in compliance with Section 25214 and 25215.3 of the Government Code; County Service Area Law Chapter 13.20, and California Health and Safety Code Section 116110-116180.

This report gives a history on how and why the County Service Area (CSA) (known as the Alameda County Vector Control Services District) was formed, explains how the assessments are calculated, and includes assessment tables since the CSA was formed in 1984.

This report is available for public review at the Vector Control Services District, 1131 Harbor Bay Parkway, Suite 166, Alameda, CA 94502, and it is also posted on our website at www.acvcscd.org.

History

The County Service Area (CSA) 1984-1 for Vector Control was established in June 1984 to serve the public needs by providing a comprehensive vector control program. Prior to 1984, the Environmental Health Department was experiencing fiscal shortfalls, and had to reduce vector control services in Alameda County. In response, the Board of Supervisors (BOS) created the County Service Area after the passage of Measure A, which received over 70% voter's approval for the formation of the CSA. Initially, Dublin, Emeryville and Fremont were not included in the District and opted to seek alternative sources for providing vector programs.

In 1987, the City of Oakland recognized that it had a severe rat problem emanating from the sanitary sewers which exceeded the District's staff capabilities to control. Subsequently, Oakland voters approved a supplemental assessment, which was first levied in fiscal year 1988-89, and provided additional funding to control rodents in the sewers.

In 1992, at the request of the Dublin City Council, voted to join the District and subsequently Dublin was annexed by the BOS.

In 2009, both Emeryville and Fremont were annexed to the District by the BOS after a successful Proposition 218 mail-out balloting process. Currently, the CSA is a countywide District, providing the vector control services to all 14 cities in Alameda County, and the unincorporated county areas.

The City of Berkeley already had an existing vector control program when the CSA was formed in 1984. It is currently funded by a formal contract between the City of Berkeley and the CSA.

Background

The County Service Area (CSA) VC 1984-1 is solely funded through a benefit assessment (BA) charged to each property parcel. In 1997, California voters approved Proposition 218, requiring that all parcel owners receive a mailed ballot regarding any proposed change in an assessment prior to imposing an increase. Since then, the District (CSA 1984-1) has not been able to increase revenues without conducting a Proposition 218 Ballot Measure.

In 2007, the SCI Consulting Group was awarded the contract by the BOS to conduct a survey among the property owners to gauge their support for a new benefit assessment. The result was an overwhelming support for a BA of \$4.08 to boost the existing annual assessment rate to \$10 per single-family residence.



Assessment ballots were mailed to all property owners within the District boundary areas in May 2007. The ballot measure received 67.7% voter support and the BOS approved the new assessment of \$4.08 in July of that same year.



In May of 1995, the Alameda County Department of Public Health contracted with a private consultant to prepare a Strategic Marketing Plan. The recommendation for the CSA was to work with the Cities of Emeryville and Fremont toward incorporation into the CSA. The City of Emeryville contracted for services with the District in the late 1980's, but discontinued the contract for financial reasons. The City of Fremont attempted to create its own Vector Control program, but was not able to secure the necessary funding to develop an effective program. In 2006, the Alameda County Local Agency Formation Commission (LAFCO) contracted with Burr Consulting to review all of the County Service Areas for possible consolidation. Burr Consulting recommended that the Vector Control District and the Mosquito Abatement Districts conduct balloting to provide countywide services and work toward consolidation. In January of 2008, SCI Consulting surveyed a sample of residents in Emeryville and Fremont; results from both cities were favorable for creating a new benefit assessment that would permit the CSA to provide vector services.



In March, 2008, the BOS authorized the CSA to proceed with an application to the LAFCO to obtain an approval of annexation process to annex Emeryville and Fremont. The CSA submitted the application which included environmental documents (Initial Study, Negative Declaration) pursuant to the California Environmental Quality Act (CEQA). In July of 2008, the LAFCO approved the CSA application of annexation and issued a Certified LAFCO Resolution. On September 9, 2008 the LAFCO adopted a Resolution and ordered the annexation.

In compliance with Proposition 218, the CSA mailed out ballots to all parcel owners in Emeryville and Fremont regarding the proposed New Vector and Disease Control Assessment of \$10 for single-family residence. The results were favorable (Emeryville 70.23% and Fremont 66.36%) to support the new assessment in providing the vector services in both cities. In response, subsequently, the BOS approved the newly proposed Vector and Disease Control Assessment of \$10 for single-family residence. As of July 1, 2009, the CSA has extended the vector control services to Emeryville and Fremont and became a county-wide service District.



Vector Control Services in 2018

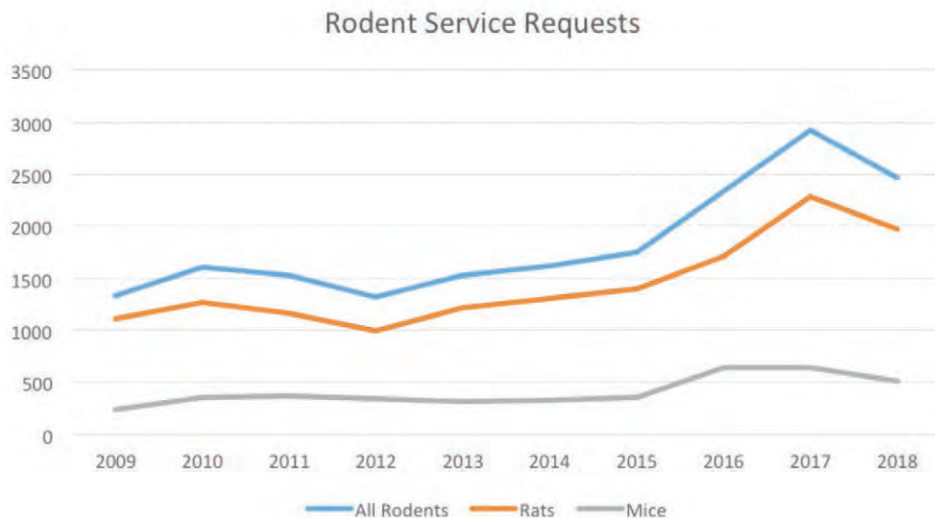
Urban Rodent Surveillance and Control Operations

The urban rodent surveillance program focuses on monitoring and controlling commensal rats (Norway and Roof rats) and mice in residential, commercial and business properties. In 2018, the District received 2,475 requests for service (1,971 rats and 504 mice) from the public for domestic rodents, representing 37.3% of all service requests. Those 2,475 rodent service requests lead to staff biologists performing 15,271 field services operations related to domestic rodents. The field service operations include smoke and dye tests of sewer lines for breaks, field and residential surveys for rodent activity, recommendations and follow-up evaluations of rodent control measures, and assistance of enforcement actions.

Staff biologists responding to a rodent service request will carry out thorough inspections of the exterior and interior premises of a property looking for rodent harborage or activity and will advise the property owner on necessary structural modifications to prevent rodent entry into their home or business. They will hand out brochures to neighbors and will inspect adjacent properties with approval

when necessary. Staff biologists also evaluate and survey neighborhoods that have significant rat activity based on clusters of complaints or where residents report seeing rats roaming on surface streets. Staff biologists will locate rodent sources (sewers, food sources, infested buildings nearby, etc.) and implement rodent suppression strategies to prevent public health issues related to rodent-borne diseases.

When evidence indicates rats are surfacing near sewer laterals, staff biologists conduct inspections to locate broken sewer lines within the system, and notify the homeowners or the Public Works Department to ensure repairs are made. In 2018, staff biologists found 19 broken sewer laterals and performed dye tests or smoke tests to verify the breaks.



As part of the City of Oakland's supplemental assessment targeting rodent populations in sanitary sewers, staff biologists conduct weekly inspections of underground sewer access structures (manholes) for signs of rodent activity (live rats or their droppings). To control rodent populations in areas with activity, rodenticide bait blocks are suspended in sewers to allow easy access for feeding. In 2018, a total of 8,260 sewer inspections were made in Oakland. Those sewers in Oakland that had active rodent activity totaled 1,887 and they were treated with a Contrac rodenticide bait.

The District also inspected underground sewers in the City of Hayward (103 sewers inspected), and the City of Alameda (123 sewers inspected). The sewers found with active sewer rats were treated with Contrac rodenticide bait. The City of Alameda (65 sewers were baited), and the City of Hayward (50 sewers were baited). The total number of sewers inspected and baited in the County for 2018 was 8,486.

Ectoparasite Surveillance on Sylvatic and Commensal Rodents and Wildlife

Sylvatic rodents such as deer mice, woodrats, ground squirrels, and meadow voles are commonly found in rural and semi-rural areas of Alameda County. Many of these animals serve as reservoir hosts of zoonotic diseases such as Plague, Hantavirus Cardiopulmonary Syndrome (HCPS), Tularemia, Lyme disease, and Babesiosis. A reservoir host is an animal that remains infected with a pathogen for an extended period and may or may not develop symptoms of the disease. They serve as a source of infection. Ectoparasites (vectors) which feed on the host will transmit the pathogen to other animals or humans. Some reservoir hosts, such as deer mice, can spread pathogens through their feces and urine without ectoparasites. Our vector ecologist and staff biologists routinely collect sylvatic and commensal rodent samples for surveillance and monitoring of ectoparasite abundance, diversity and disease testing.



2018	N	# w/ Fleas	# of Fleas	Flea Species	Flea Index	Tick Species
SYLVATIC RODENTS						
Pinon Mouse <i>Peromyscus truei</i>	42	11	23	<i>Opisodasys keeni</i> <i>Orchopeas leucopus</i> <i>Hystrihopsylla occidentalis</i>	0.5	127 larval <i>Dermacentor occidentalis</i> *
Deer Mouse <i>P. maniculatus</i>	11	0	0		0.0	<i>Dermacentor occidentalis</i> (43 larva + 16 nymph)
California Mouse <i>P. californicus</i>	4	1	1	<i>Malaraeus telchinus</i>	0.25	No ticks found
Pocket mouse <i>Chaetodipus californicus</i>	3	0	0		0.0	<i>Ixodes pacificus</i> (2 nymphs) <i>D. occidentalis</i> (10 larva + 3 nymph)
Meadow Vole <i>Microtus californicus</i>	17	13	15	<i>Malaraeus telchinus</i> <i>Orchopeas leucopus</i> <i>Hystrihopsylla occidentalis</i>	2.1	<i>Dermacentor sp.</i> (larvae and nymph)
COMMENSAL RODENTS						
Roof Rat <i>Rattus rattus</i>	20	1	1	<i>Nosopsyllus fasciatus</i>	0.05	No ticks found
Norway Rat <i>Rattus norvegicus</i>	13	2	2	<i>Nosopsylla fasciatus</i>	0.15	No ticks found
House Mouse <i>Mus musculus</i>	9	3	3	<i>Leptopsylla segnis</i>	0.3	No ticks found
WILDLIFE						
Raccoon <i>Procyon lotor</i>	14	8	70	<i>Ctenocephalides felis</i> <i>Pulex simulans</i>	5.0	<i>Ixodes augustus</i> (nymph) <i>D. variabilis</i> (2 adults)
Opossum <i>Didelphis virginiana</i>	34	32	1236	<i>C. felis</i> <i>Pulex simulans</i> <i>Nosopsyllus fasciatus</i>	36.4	<i>Dermacentor variabilis</i> (adult)
Striped skunk <i>Mephitis mephitis</i>	9	8	129	<i>C. felis</i> and <i>Pulex simulans</i> <i>Echidnophaga gallinacea</i> <i>Holopsylla anomalus</i>	14.3	<i>Dermacentor variabilis</i> (adult)
Gray fox <i>Urocyon cinereoargenteus</i>	1	1	21	<i>C. felis</i> <i>Pulex simulans</i>	21	<i>Dermacentor variabilis</i> (2 adults) <i>Ixodes pacificus</i> (adult)
Bobcat <i>Lynx rufus</i>	1	1	7	<i>C. felis</i>	7	<i>Ixodes pacificus</i> (adult)
Free tail bat	1	1	3	<i>Myodopsylla gentilis</i>		

Table 1. Ectoparasites (fleas and ticks) collected from commensal and sylvatic rodents and wildlife in urban and sylvatic areas.

* 98 ticks found on one mouse.

Hantavirus Cardiopulmonary Syndrome (HCPS) Surveillance

Hantavirus was first recognized in 1993; it is a respiratory illness spread through airborne particles of rodent urine and feces contaminated with the *Sin Nombre* virus (SNV). The Deer mouse (*Peromyscus maniculatus*) is the principal reservoir host. Occasionally, deer mice will enter buildings and potentially expose human occupants to the virus. Past surveillance conducted at various localities within the county detected 6-18% of deer mice are infected with SNV.

In collaboration with the California Department of Public Health (CDPH), the District conducts Hantavirus surveys in the East Bay Regional Parks to increase public awareness of the disease and to reduce exposure to deer mice and the structures they may inhabit.

Seven Hantavirus (SNV) surveys were conducted in 2018. Seven sites were surveyed which included three East Bay Regional Parks, three residential sites and one city park.

The 2018 sites surveyed were:

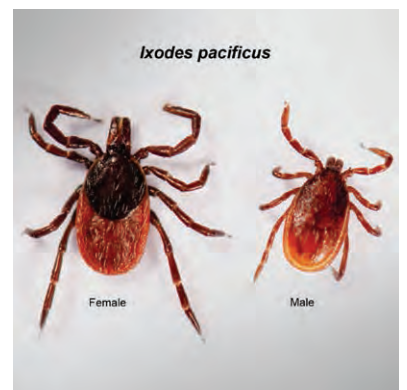
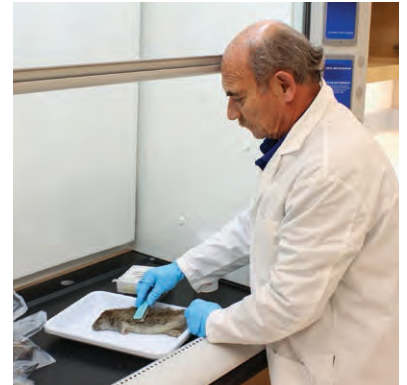
East Bay Regional Parks

1. Redwood Regional Park, Redwood Road, in Oakland: Two (2) Deer mice (*P. maniculatus*), twenty-two (22) Pinion mice (*P. truei*) and four (4) California mice (*P. californicus*) were collected and tested. All mice were negative for Hantavirus (SNV).
2. Sunol Regional Wilderness, 1895 Geary Road, Sunol: Ten (10) Pinion mice (*P. truei*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).
3. Del Valle Regional Park, 7000 Del Valle Road, Livermore: Three (3) Pinion mice (*P. truei*), and one (1) Deer mouse (*P. maniculatus*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).

Risk Assessment Hantavirus Surveys

1. Sycamore Grove Park, City of Livermore: One (1) Deer mouse (*P. maniculatus*), six (6) Pinion mice (*P. truei*) and two (2) Meadow voles (*Microtus californicus*) were trapped and tested for hantavirus (SNV). All mice were negative for Hantavirus (CNV).
2. 9600 Norris Canyon Road, Castro Valley: One (1) Deer mouse (*P. maniculatus*), and one (1) Pinion mouse (*P. truei*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).
3. 165 Mission Road, Fremont: Two (2) Meadow voles (*Microtus californicus*) were trapped and tested for Hantavirus (SNV). All voles were negative for Hantavirus (SNV).
4. Serenity Terrace, Pleasanton: One (1) Deer mouse (*P. maniculatus*) was trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).

California Department of Public Health in Richmond tested the mice for Hantavirus (SNV).



Homeless Encampment Rodents, Fleas, and *Rickettsia* sp. Surveillance and Control Operations

In 2018, the District began conducting surveillance of commensal rodent and ectoparasite populations in homeless encampments within the City of Oakland.



The most common commensal rodent associated with homeless encampments is the Norway rat, *Rattus norvegicus*, which is a host for fleas, lice and mites that can vector diseases such as plague and flea-borne typhus.

It was found that several of these encampments had active Norway rat populations as indicated by active burrows within, and adjacent to the camps. These observations coincided with reports of rat sightings by residents of the encampments, surrounding businesses, and members of the public. Staff biologists began live-trapping at a few of the larger encampments to ascertain the size of the Norway rat populations. Our Norway rat surveillance continued through all of 2018 and will continue indefinitely. Staff biologists conducted eleven (11) separate trapping events at five (5) different homeless encampments around the City of Oakland.



Staff biologists set out live-wire traps in the afternoon and the traps are collected the following morning. Trapped rats are brought back to the laboratory for analysis, where they are combed for associated ectoparasites. Ectoparasites (cat fleas, *Ctenocephalides felis* and Oriental rat fleas, *Xenopsylla cheopis*) are sorted by species and tested for pathogens, specifically *Rickettsia felis* and *Rickettsia typhi*.

Suppression was conducted during 2018 at two of the homeless encampments where Norway rat populations were determined to be extremely high. Burrows were baited with rodenticide and rat carcasses were picked up post-treatment to reduce the risk of non-target effects on other domestic animals and wildlife.

Suppressing the Norway rat populations will continue by staff biologists following the clean-up of the encampments by Public Works staff and the relocation of encampment residents and their pets into more permanent housing as they become available.

Ongoing Norway rat suppression is conducted in coordination with Public Works and other city/county agencies engaged with the encampments.

	Different Homeless Encampments Surveyed	Separate Trapping Events	Norway Rats Trapped	Fleas Collected for Disease Testing	Rodenticide Applications for Norway Rat Suppression
2017-2018	5	11	180	429	8

Table 2. Homeless encampment data.



Commensal Rodent Surveillance and Control

Species Collected	# of Specimens Collected
House Mouse (<i>Mus musculus</i>)	6
Roof rat (<i>Rattus rattus</i>)	20
Norway rat (<i>Rattus norvegicus</i>)	51
Fox squirrel (<i>Sciurus niger</i>)	4
Ground squirrel (<i>Spermophilus beecheyi</i>)	40

Table 3. Commensal rodents collected for ectoparasite surveillance.

The Alameda County Vector Control Services District conducts surveillance of commensal rodents throughout the County. Rodents are either trapped as part of on-going population monitoring and disease surveillance, or in conjunction with Requests for Service initiated by a resident or business owner. The following species were collected in 2018: House/field mouse (*Mus musculus*), Roof rat (*Rattus rattus*), Norway rat (*Rattus norvegicus*), fox squirrels (*Sciurus niger*) and ground squirrels (*Spermophilus beecheyi*). Animals were combed for ectoparasites and fleas were tested as part of the county-wide flea-borne typhus surveillance program.



Cat Fleas (*Ctenocephalides felis*) and Oriental Rat Fleas (*Xenopsylla cheopis*) Surveillance and Control

The Alameda County Vector Control Services District began a surveillance program looking at the disease prevalence found within the cat flea (*Ctenocephalides felis*) and the Oriental rat flea (*Xenopsylla cheopis*) from different host animals throughout the County in 2018.

This work is in conjunction with our flea-borne typhus disease surveillance that began in earnest in 2018 with the completion and certification of our new Vector Control Laboratory. We are focusing on two flea species, the cat flea and the Oriental rat flea. The cat flea is cosmopolitan in nature and found worldwide. It is highly associated with people and pets and is a vector of flea-borne typhus, *Rickettsia typhi*, which causes cases of human pathogenicity. It is also a competent vector of *Rickettsia felis*, a newly described *Rickettsia* species that has been linked to human illness in other parts of the world. The Oriental rat flea is the main insect vector of plague and flea-borne typhus worldwide, and we have historical populations of both fleas and associated rodent hosts in Alameda County.

Flea-borne Typhus Surveillance

Rickettsia diseases are found worldwide and are transmitted to humans via an arthropod host, specifically fleas, lice, ticks and mites. Human cases of flea-borne typhus occur worldwide, but primarily in tropical and coastal regions. In the United States most cases occur in Texas, Hawaii and California, with approximately 300 human cases per year.

Species Combed for Fleas	# of Animals Combed	# with Fleas	# of fleas
Field/House Mouse (<i>Mus musculus</i>)	9	2	2
Feral cats (<i>Felis silvestris</i>)	21	21	188
Fox squirrel (<i>Sciurus niger</i>)	4	1	3
Grey fox (<i>Urocyon cinereoargenteus</i>)	1	1	21
Ground squirrel (<i>Spermophilus beecheyi</i>)	40	34	227
Norway rat (<i>Rattus norvegicus</i>)	19	4	6
Opossum (<i>Dedelphis virginiana</i>)	34	16	416
Raccoon (<i>Procyon lotor</i>)	14	4	41
Roof rat (<i>Rattus rattus</i>)	20	1	1
Striped skunk (<i>Mephitis mephitis</i>)	9	6	78
Vole (<i>Microtus californicus</i>)	5	3	6
Total	176	93	989

Table 4. Flea surveillance data.

Rickettsia typhi, is a pathogen associated with the rat flea and *Rickettsia felis*, is a pathogen associated with the cat flea. These are responsible for most human flea-borne rickettsioses worldwide. Los Angeles and Orange counties are known endemic areas for flea-borne rickettsioses. Previous studies conducted in

Sacramento and Contra Costa counties showed the presence of *Rickettsia felis* from fleas collected from cats. We collected cat fleas (*Ctenocephalides felis*), and Oriental rat fleas (*Xenopsylla cheopis*), from Norway rats trapped from homeless camps and tested them for the presence of *Rickettsia*. Additionally, fleas collected from feral cats, raccoons and opossums were tested for the presence of *Rickettsia*.



Host Animal	Number of Animals	Total Number of Cat Flea Pools (5 fleas/pool)	Number of Positive Cat Flea Pools	Infection Prevalence (%)
Feral Cat	14	57	10	17.5
Norway Rat	41	54	10	18.5
Opossum	20	111	30	27.0
Raccoon	5	7	3	42.8

Table 5. Positive Cat Flea Pools from Feral Cats, Norway Rats, Opossums, and Raccoons for *Rickettsia felis*.

Sick, injured, or nuisance raccoons and opossums were trapped from several locations within the County and combed for ectoparasites. Feral cats obtained from animal shelters and veterinary clinics within Alameda County were combed for ectoparasites. Once the fleas are collected, they are sorted by species and then tested using standard molecular techniques for the presence of *Rickettsia*.

To date, we have found *Rickettsia felis* in fleas from animals collected from the following cities: Alameda, Oakland, Hayward, Union City, Fremont, Newark, San Leandro and Pleasanton. However, no recent reports of flea-borne rickettsioses are known from Alameda County.



Host Animal	Number of Animals	Total Number of Oriental Rat Flea Pools (5 fleas/pool)	Number of Positive Oriental Rat Flea Pools	Infection Prevalence (%)
Norway Rat	62	116	2	1.72

Table 6. Positive Oriental Rat Flea pools from Norway rats for *Rickettsia felis*.

***Ixodes pacificus* Tick Surveillance Program**

Western blacklegged tick *Ixodes pacificus* (*I.pac.*) is the primary vector of *Borrelia burgdorferi* (Lyme disease) and most likely *Borrelia miyamotoi* (*B. miyamotoi* disease). Lyme disease is the most reported vector-borne disease in the United States and a number of cases are reported in Alameda County every year. The District established the tick surveillance program to provide information about the risk of tick-borne diseases to Alameda County residents.

In 2018, 23 sites in six East Bay Regional parks and two city parks were selected as sites of interest based on previous surveillance data, habitat types and human



Park	Number of <i>I pac</i> Nymphs Collected	Number of <i>I pac</i> Adults Collected
Joaquin Miller Park, Oakland	579	31
Anthony Chabot Regional Park	155	121
Redwood Regional Park	102	534
Garin Regional Park	26	559
Pleasanton Ridge Regional Park	728	174
Augustin Bernal Park, Pleasanton	63	137
Del Valle Regional Park	33	93
Sunol Regional Parks	45	9

risk of vector exposure. These sites were monitored for abundances of nymphal and adult *I. pac.* ticks using a flagging method. In total, 1,731 *I. pac* nymphs and 1,658 *I. pac* adults were collected over the course of 93 collection events.

Tick densities varied between sites and time of year. The highest densities were found in Pleasanton Ridge Regional Park (59 nymphs per hour) and Redwood Regional Park (111 adults per hour).

The District continues surveillance of sites along trails where *Borrelia* spp. was found in ticks. 197 individual nymphs and 45 adults in nine pools were tested using real-time PCR for presence of *Borrelia sensu lato* (*Bbsl*) and *Borrelia miyamotoi* (*B.miy*). This was the first year using real-time PCR which is a rapid and high sensitive method for molecular testing. Five nymphs and one adult pool from Joaquin Miller Park were positive for *Bbsl*. In addition, one nymph from the same park was positive for *B.miy*.

Bbsl infection prevalence of 3-4% and *B.miy* infection prevalence of 1% in *I.pac.* nymphs are typical for the county and do not indicate an elevated risk.



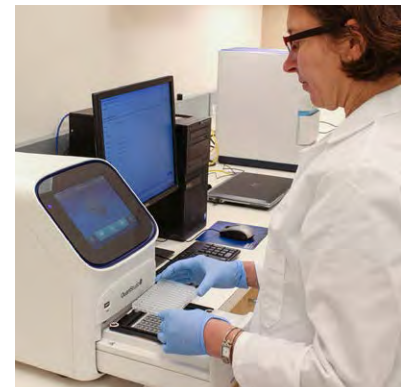
Park (number of surveillance sites)	Number of <i>I.pac.</i> Nymphs Tested	Number of <i>Bbsl</i> / Positives (infection prevalence, %)	Number of <i>B miy.</i> Positives (infection prevalence, %)
Joaquin Miller Park (4)	133	5 (3.8%)	1 (0.8%)
Redwood Regional Park (1)	20	0	0
Pleasanton Ridge Regional Park (3)	44	0	0

In 2018, the District concluded a study of adult tick movement using a “mark-release” method. 5.8% of marked female *I. pacificus*. and 18.5% of marked *Dermacentor occidentalis* ticks were recaptured 30 meters from the release site indicating ticks do move considerable distances.

Rabies Surveillance

The authority for the Rabies Program is the responsibility of the County Health Officer at the Department of Public Health, which provides laboratory support for the program, and performs human case investigations. The District manages the statistical data, and works cooperatively with the 13 local animal control agencies to administrate the rabies surveillance program in Alameda County. Moreover, the District responds to service requests and conducts surveillance on skunks, bats, and other wildlife that are susceptible to rabies. Suspected animals involved in biting or exposure incidents are euthanized, their heads removed and submitted to the Alameda County Public Health Laboratory (ACPHL) for rabies testing.

If requested, the District also investigates with Animal Control Agencies animal bite incidents and prepares an annual report for the California Department of



Type of Animal	Number Negative	Number Positive	Total Tested
Bat	32	2	34*
Cat	45	0	45
Dog	27	0	27
Fox	1	0	1
Raccoon	15	0	15
Skunk	14	0	14**
Opossum	1	0	1
Total Animals Tested	139	2	141

Public Health (CDPH). Bats and skunks are the primary rabies-infected animals in California. Rabies is almost never found in squirrels, rabbits, rats, or mice. The District submitted 141 animal heads, including bats, cats, dogs, foxes, opossums, raccoons, and skunks to the ACPHL for rabies testing in 2018. Two (2) bats collected from Piedmont and Livermore tested positive for the rabies virus. The ACPHL also reported that two skunks (**) sent in for testing had inconclusive results due to a deteriorated brain that had no tissue available for testing.



Wildlife Management Programs

In 2018, the District responded to 2,325 service requests concerning wildlife, and those service requests lead to staff performing 12,205 field service operations within or near residential areas. Most of these service calls involved raccoons, skunks, opossums, and foxes. We advise homeowners to employ harassment techniques, make exclusion repairs, reduce food or other attractants, and modify the habitat to eliminate or prevent recurrence of the wildlife problem. Our staff biologists assist property owners by coordinating with the District's USDA Wildlife Specialist (WS) who uses integrated pest management (IPM) techniques and offers a wide range of preventive (indirect control) and population reduction (direct control) methods. Below is a breakdown of the common wildlife nuisance species that account for the most service requests.



Raccoons

In 2018, the District responded to 773 service requests related to raccoon problems. Raccoons often den in backyards, beneath decks, under homes, or in attics; they feed on backyard fruits, insects, vegetables, garbage, and pet foods left outside overnight. At certain times of the year, they also dig for beetle grubs in lawns and can cause significant property damage. Raccoon "grubbing" on lawns was the leading reason for raccoon related requests for service. To prevent damage to lawns, staff biologists and the WS may suggest applying commercial grub killer products, repellents, and cutting back on watering the lawn.



Young raccoons are generally born in April/May. Female raccoons readily nest and care for the young in attics and crawlspaces. This can result in urine and feces accumulating inside homes; creating an objectionable odor and a public health risk. These situations account for the second most common service requests we receive for raccoons. Eviction and exclusion are the keys to eliminating den sites in structures. Raccoon eviction fluid and one-way doors can remove raccoons that have gained access to structures. The home then must be wildlife proofed by sealing all entry points. In situations where public safety is threatened or property damage is recurring, trapping a nuisance raccoon may be necessary.

Skunks

Skunk problems were the second most common wildlife-related service request, totaling 567 service requests. Skunks utilize residential areas because of the availability of food, water, and shelter. Skunk problems peak during their mating season (December through February), and young are born about 9 weeks later. During mating season, competing males will often spray, creating a nuisance. Females will often den in crawlspaces of homes. Additionally, skunks can be a carrier of rabies in California, creating a potential public health risk.

Skunk control methods focus on harassment, eviction and exclusion through modifying den sites and access points, using one-way doors, and other deterrents like cayenne pepper and ammonia. Trapping may be warranted if these methods are not sufficient. Exclusion after successful evictions involves denying future access through screening and the use of 1/4-inch mesh hardware cloth. Homeowners can spray lawns with an approved insecticide to control grubs and other insects, thus discouraging grubbing behavior.

Mosquito Surveillance Programs

The Alameda County Vector Control Services District conducts mosquito surveillance and suppression in the City of Albany.

In 2018, staff biologists received 17 mosquito related service requests from Albany residents. Staff biologists closely monitor the known mosquito breeding sites and suppress those mosquito larval populations before they mature into adult mosquitoes. The mosquito surveillance program also includes the trapping of adult blood-seeking female mosquitoes with Encephalitis Virus Surveillance (EVS) traps set every two weeks from spring through fall. Captured mosquitoes are identified, counted, and tested by the District biologists for West Nile virus (WNV), and reported to the State of California. In 2018, a total of 97 trap nights were performed and 449 female mosquitoes were captured.

Three new components were added to the program in 2015 and continued into 2018. The first was a WNV dead bird testing program. Residents report dead birds to the State WNV hotline and the District staff biologist collects the dead birds and delivers them back to the District laboratory for genetic testing for WNV. In 2018, no dead birds were reported to the District from the City of Albany. The second component involves using sentinel chickens at two separate locations within the City of Albany. Blood samples from the sentinel chickens are collected and delivered to the State arbovirus laboratory for testing. In 2018, all sentinel chickens in the City of Albany tested negative for WNV. The final component is directed at the invasive mosquitoes, *Aedes aegypti* and *Aedes albopictus*. These invasive mosquitoes are capable of transmitting Zika virus, Dengue virus, and Chikungunya virus. Ovipositional traps (10) were deployed to detect eggs laid by the female *Aedes* mosquitoes and no *Aedes* eggs were found in 2018.

In 2018, WNV activity in Alameda County consisted of twenty (20) positive dead birds and fifteen (15) positive mosquito pools. There were no human cases. None of these WNV positive birds or mosquitoes occurred in the City of Albany.



Venomous Arthropods Programs

Venomous arthropods include mites, ticks, spiders, wasps (and other insects) that can sting, bite, secrete venoms, and cause allergic reactions in humans and domestic pets. The District received 591 service requests for venomous arthropods. County residents can request the identification of various stinging insects and arachnids that they find in and around their homes. A staff biologist will collect and identify the insect and advise residents on how best to control the insect while minimizing the risks of bites and stings.

Staff biologists treat yellowjacket and wasps nests located near residential and public areas because of the public health risk these insects may pose. Staff biologists may contact bee keepers to safely remove bee swarms and hives when possible. They also work quickly to treat wasp and yellowjacket nests. In addition, the District has an agreement with the East Bay Regional Park District (EBRPD) to control ground nesting yellowjackets within county parks. In 2018, the District responded to 329 venomous wasps and 128 honeybee complaints.



Miscellaneous Arthropod Programs

In 2018, the District responded to service requests on a variety of nuisance pests such as ants (10), cockroaches (248), flies (68) and fleas (76) infesting homes, yards, and commercial facilities. Our vector ecologist frequently identifies insect and other arthropod species collected by concerned residents. Staff biologists will conduct inspections to locate insect breeding locations and recommend control options. Additionally, residents frequently request treatment of residential or commercial areas where they see cockroaches openly roaming sidewalks and

streets. With their ongoing research programs, staff biologists are developing new operational strategies for controlling cockroaches in sewers, water meter boxes and storm drains. The Turkestan cockroach, introduced into California in 1978, was first recorded in Alameda County in 2013 and continues to be monitored by our staff.



Bed bugs continue to be a difficult nuisance pest problem in Alameda County. The District responded to 210 bed bug service requests in 2018. New community-based programs are being developed to educate and control the spread of bed bugs throughout low-income housing, multi-family units, rapid transit systems, recreational facilities, hotels and motels, and residential properties.

Swimmer's Itch Program

Swimmer's itch, also called cercarial dermatitis, appears as a skin rash caused by an allergic reaction to certain parasites found in specific birds and mammals. When these microscopic parasites are released from infected snails, they can burrow into the nearby swimmer's skin, causing an allergic reaction and rash.



In 2018, between May and June, two cases of alleged swimmer's itch were reported at Robert W. Crown Memorial State Beach in Alameda. Cases at Crown Memorial Beach in Alameda typically occur during low or extremely low tides. This year there were twenty-eight (28) cases of swimmer's itch reported at Shadow's Cliff in Pleasanton from the end of July to mid-August. The facility is posted for swimmer's itch. None of these cases were diagnosed, they were all alleged. This is not a reportable disease by the county's Public Health Communicable Disease program, and the District will not be notified unless an outbreak of human cases has occurred.

Inventoried Animal Holding Facilities Programs

The District maintains an inventory of stables and kennels and inspects them occasionally to prevent nuisance problems such as odors, insects, or rodents. Upon request by the Alameda County Animal Control, animal hobbyist facilities are inspected during annual permit renewal. Currently, there is no statutory requirement or authority to inspect pet shops, animal grooming salons or livestock holding facilities; however, when there are nuisance complaints, we will conduct inspections.



Nuisance Abatement Programs

Garbage, rubbish, abandoned vehicles, furniture/appliances, and animal manure stockpiles can become public nuisances when left unattended prior to disposal. In addition, these nuisances provide harborage and food sources for rodents, flies, and other pests that might result in disease transmission to humans. In 2018, staff biologists responded to 149 nuisance service requests of furniture, garbage, abandoned vehicles, overgrown vegetation, or rubbish. This resulted in 551 field services that included investigations, progress assessments, correspondence, and compliance inspections. When necessary, staff biologists work with local code enforcement agencies to seek compliance to mediate problems.

Public Information and Educational Activities

We attract a large audience through our web site, social media such as Facebook, media contacts, group presentations, and event participations. Our District continues to expand its outreach program to the public and our ethnically diverse communities. In addition to issuing press releases, we respond to media requests for information and interviews.

Our website provides valuable information to visitors and is a conduit for the public to request our services. The District completed the development of a new and improved website in December 2016, which it continued to enhance and

update during 2018. The public can access information on current vector and public health issues such as Zika virus, and the user-friendly on-line form simplifies service requests.

The District provides an on-going educational program aimed at “rental property management professionals” regarding bed bugs. Our goal is to be an educational resource to help the rental property owners, managers, tenants and the Alameda County public to effectively respond to the bed bug infestations in housing. Staff also provided a Bed Bug Occupational-Safety Workshop to Homeless Services providers and professionals, whom in their daily duties visiting clients, may encounter bed bugs or other ectoparasites.

The District provided twenty-three (23) vector management educational training sessions to other statewide and local organizations. Of these, district staff spoke about District research and projects at the Mosquito and Vector Control Association of California’s (MVCAC) 2018 Annual Conference to five hundred attendees and gave three presentations at the California Environmental Health Association’s (CEHA) Annual Conference. Our staff also provided six presentations at the 28th Vertebrate Pest Conference, and one presentation at the 48th Annual Society of Vector Ecologists (SOVE) Annual Conference.

Mussel Quarantine (due to dangerous levels of paralytic shellfish poisoning (PSP) toxins) and “Bay Caught Fish” advisory signs were posted along the Alameda County shoreline to inform the public about the risks of consuming local shellfish and fish. Our Community Relations Coordinator designed a multi-language mussel quarantine sign for permanent posting from May 1st thru October 31st.

Community Events Programs

Staff biologists attended over forty-four (44) days of community events including city fairs, health events, schools, and organizations throughout the county. Among them were the Fremont Earth Day, Oakland and Eden Area Ag Day, San Leandro Cherry Festival, Peralta College Eco Fest, Alameda County sponsored Emergency Preparedness Information Fair in Castro Valley, Chinatown Lions Club Emergency Preparedness Fair, Fremont Festival of the Arts, Fremont India Festival, Hayward Zucchini Festival, Oakland Chinatown Street-Fest, Albany Solano Stroll, Dublin’s St. Patrick’s Day, Newark Days, Hayward Science in the Park, and many other local venues. The staff biologists also provided educational support at the District’s booth during the twenty (20) day Alameda County Fair. The events in which we participated attracted almost 1.5 million visitors.

City of Berkeley Vector Program

The City of Berkeley is one of four cities in California with its own environmental health jurisdiction. In 1976, the City adopted several environmental health ordinances that provide a mechanism to protect public health from vectors. The voters of Berkeley approved Measure A in 1984 and became part of the CSA. Since the Berkeley Division of Environmental Health already had a vector control program that has enforceable regulations for controlling rodents and other vectors, the CSA authorizes a contract each fiscal year to fund the City’s vector program through the benefit assessment. In the years since 1984, the Berkeley vector program has been limited in their ability to perform all the duties expected of the CSA, and District staff continue to provide field services within Berkeley to enhance their program.

In 2018, the City of Berkeley responded to and investigated a total of 576 service requests and complaints in the following categories: rodents (255), vegetation overgrowth (4), field services for sewer inspections and baiting (340), wildlife (30), venomous and miscellaneous arthropods (179), nuisance abatement (37), sewage (0) and general surveys (57). The City participated in no community



events. The District staff assisted in monitoring, surveillance and clean-up of three homeless encampments within the city that included the South Aquatic Park, Adeline and Fairview, and Shattuck Avenue Businesses.

Integrated Pest Management

The District participates in a countywide Integrated Pest Management policy set in place by the Board of Supervisors. Most of the pesticide applications are used to suppress Norway rats in sanitary sewers or to destroy ground nesting yellow jacket nests. The total pesticide usage is listed below and is reviewed by the Alameda County Agricultural Commissioner, the Department of Pesticide Regulation and the California Department of Public Health.

Pesticide Use Summary for ACVCSD, 2018

Pesticide	Manufacturer	Formulation	Target Pest	Amount Used	Applications
Contrac Super Blox	Bell Labs	8 oz Block	Domestic Rodents	987 lbs	146*
Contrac Pellets	Bell Labs	Pellet	Domestic Rodents	99.56 lbs	6
Delta Dust	Bayer Environmental Science	Insecticidal Dust	Fleas/ Yellowjackets/ Wasps	3.02 lbs	26
Ditrac Tracking Powder	Bell Labs	Insecticidal Dust	Domestic Rodents	2 lbs	1
Drione Dust	Bayer Environmental Science	Insecticidal Dust	Yellowjackets/ Wasps	19.33 lbs	134
Zoecon Altosid XR-G	Wellmark International	Granule	Mosquito Larvae	6.1 oz	2
LaForce Roach Gel Bait	Bayer Environmental Science	Gel	Cockroaches	10.44 lbs	58
Prescription Treatment Brand P. I.	Whitmire	Aerosol Spray	Yellowjackets/ Wasps	11.5 lbs	7
EcoEXEMPT Wasp & Hornet Killer	Prentiss	Aerosol Spray	Yellowjackets/ Wasps	4.19 lbs	4
Victor Poison-free Wasp & Hornet Killer	Woodstream	Aerosol Spray	Yellowjackets/ Wasps	2.56 lbs	5
Wasp Freeze	Whitmire	Aerosol Spray	Yellowjackets/ Wasps	1.33 lbs	5
Wasp-X	Wellmark International	Aerosol Spray	Yellowjackets/ Wasps	1.94 lbs	6
ProVerde Wasp & Hornet Killer	Envance Technologies	Aerosol Spray	Yellowjackets/ Wasps	4 oz	3
Altosid XR Briquets	Wellmark International	Briquet	Mosquito Larvae	2 oz	2
PT Wasp Freeze II	BASF	Aerosol Spray	Yellowjackets/ Wasps	6.69 lbs	18
Fastrack Pellets	Bell Labs	Pellet	Domestic Rodents	14 oz	2

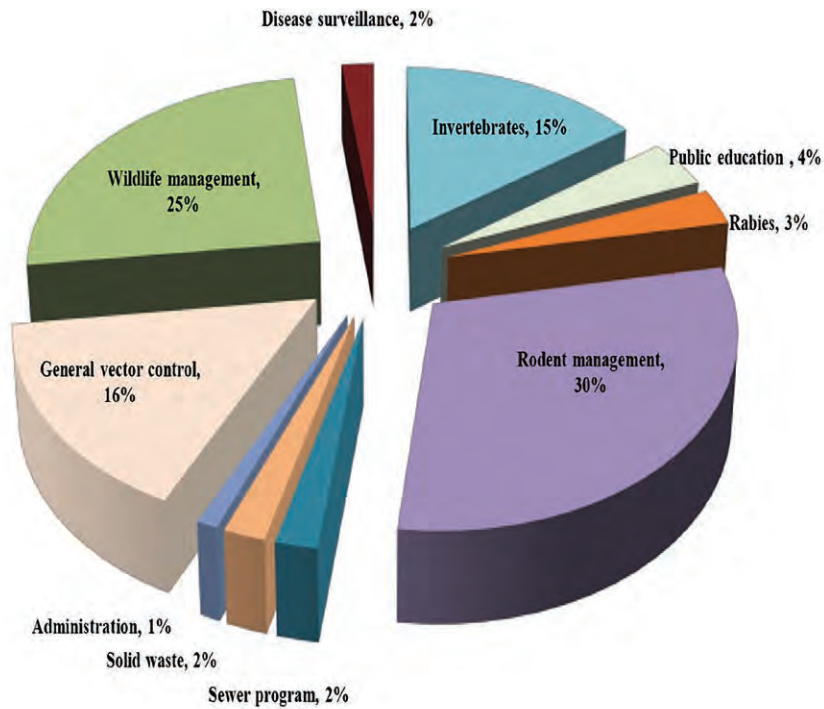
* One rodent application is one day of rodent sewer inspecting and baiting. The total number of sewers inspected in 2018 were 8,486.

Pesticide Use for Berkeley, 2018

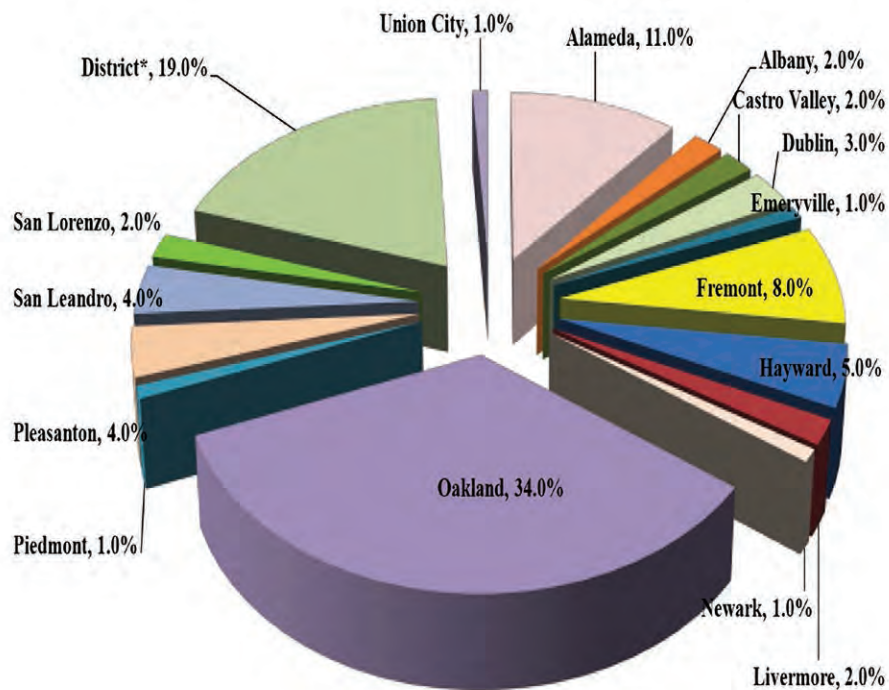
Pesticide	Manufacturer	Formulation	Target Pest	Amount Used	Applications
Talon	Syngenta	5 oz wax block	Norway rats	106 lbs	14 ¹
Drione Dust	Bayer	Insecticide Dust	Yellowjackets/ Wasps	2 oz	38

1. Total number of sewers inspected and baited were 340.

Services by Program, 2018

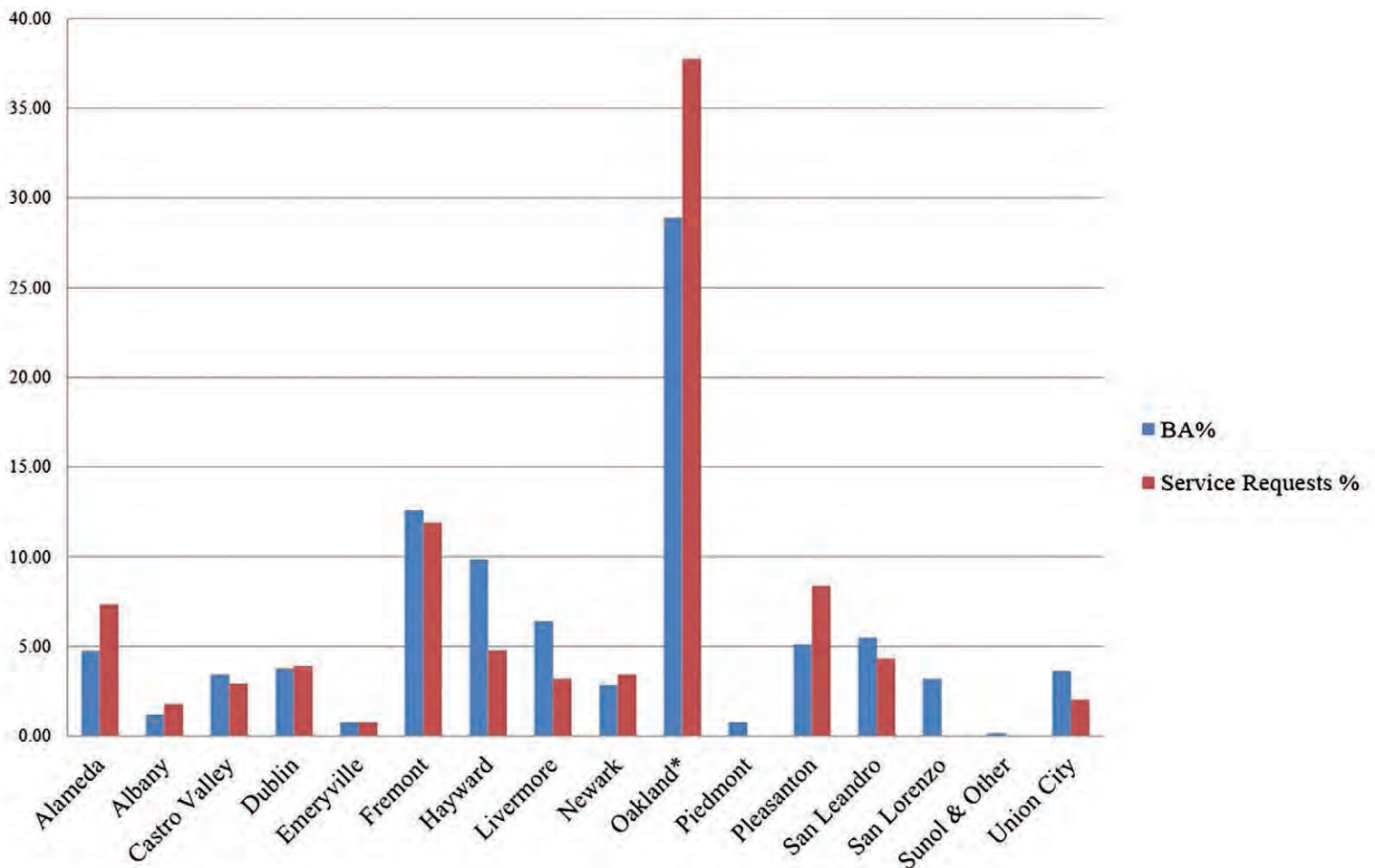


Total Services Provided to Cities, 2018



*District initiated includes disease surveillances and services to Sunol and Berkeley.

Percentage of Services Requests and Benefit Assessment by City, 2018



* District Staff working extra hours in Oakland on vector issues including sewer rats and bed bugs within the homeless encampments.

CSA Vector Control Benefit Assessment

The Board of Supervisors reviews annually the proposed rate of assessment, holds public hearings, and then establishes the assessment for the fiscal year. Assessments are levied and collected at the same time and in the same manner as the general county property taxes. The assessments are subject to the same fines, penalties, and forfeiture as property taxes.

From 1984 to 2007, the CSA Vector Control Benefit Assessment (Initial Benefit Assessment) was based on land/property use as classified by the Assessor's Office. A basic assessment rate was established as a single benefit unit (BU), which was applied to the schedule for assessments according to land/property use.

In the Post Proposition 218 (Secondary Benefit Assessment) formulas (approved by voters in 1997), the BU rate was established based on the number of people who potentially live on or work at the various types of property. The methodology determined by the ratio of population density factors in relation to the usage density for different types of property. In general, larger properties such as parking lots, self-storage, industrial properties and golf courses will be assessed

in a lower BU under the Post Proposition 218 rate. The table below depicts some of the differences between the two rate calculation methods.

Land/Property Use Categories

Property Use Categories	CSA Vector Control Benefit Units/Per Property Type (Initial Benefit Assessment)	CSA Vector Control Benefit Units/Per Property Type (Secondary Benefit Assessment)
Single Family Residence/Condominium	1 BU	1 BU/0.61 BUs
Vacant Land Parcel	1 BU	0.25 BUs
Multiple Residential Small (2-4 units)	2 BUs	0.46 BUs
Commercial, Industrial	2 BUs	0.5 BUs
Large Rural Property (10+ acres)	2 BUs	0.08 BUs (per 10 acres)
Multiple Residential (5+ units)	5 BUs	0.32s BUs
Large Commercial (Hotels, Mobile Home Parks)	5 BUs	0.5s BUs (per 1/4-acre increments)

Benefit Assessments, FY 2017-2018

Use/Size	CSA Vector Control Initial Benefit Assessment	Oakland (Residence Only) + Supplement Assessment (\$1.28)	CSA Vector Control Secondary Benefit Assessment
Single Family Residence/Condominiums	\$5.92	\$7.20	\$4.08/2.49
Vacant Land Parcel	5.92	7.20	1.02
Multiple Residential Small (2-4 units)	11.84	14.40	1.88 ¹
Commercial, Industrial	11.84	14.40	2.04 ⁴
Large Rural Property (10+ acres)	11.84	14.40	0.34 ³
Multiple Residential (5+ units)	29.60	36.00	1.30 ²
Large Commercial (Hotels, Mobile Home Parks)	29.60	36.00	2.04 ⁴

1. This rate is per unit. There would be a minimum of 2 units for this category.
2. This rate is per unit. There would be a minimum of 5 units for this category.
3. A property would be charged this minimum. It would be \$.34 for 10 acres.
4. These estimates are based on per 1/4-acre increments.

Assessment for One Benefit Unit (BU)
(Single-Family Residence – CSA Basic Rate and Oakland)
1984-2018

Fiscal Year	CSA Basic Rate	Oakland Supplement Rate*	Oakland Total Rate
1984-85	\$3.15		\$3.15
1985-86	2.66		2.66
1986-87	2.66		2.66
1987-88	3.24		3.24
1988-89*	3.30	0.70	4.00
1989-90	3.58	0.66	3.84
1990-91	3.80	0.70	4.50
1991-92	3.96	0.70	4.66
1992-93	3.96	0.70	4.66
1993-94	4.72	1.04	5.76
1994-95	4.82	1.06	5.88
1995-96	5.82	1.26	7.08
1996-97	5.92	1.28	7.20
1997-98	5.92	1.28	7.20
1998-99	5.92	1.28	7.20
1999-2000	5.92	1.28	7.20
2000-01	5.92	1.28	7.20
2001-02	5.92	1.28	7.20
2002-03	5.92	1.28	7.20
2003-04	5.92	1.28	7.20
2004-05	5.92	1.28	7.20
2005-06	5.92	1.28	7.20
2006-07	5.92	1.28	7.20
2007-08**	10.00	1.28	11.28
2008-09	10.00	1.28	11.28
2009-10***	10.00	1.28	11.28
2010-11	10.00	1.28	11.28
2011-12	10.00	1.28	11.28
2012-13	10.00	1.28	11.28
2013-14	10.00	1.28	11.28
2014-15	10.00	1.28	11.28
2015-16	10.00	1.28	11.28
2016-17	10.00	1.28	11.28
2017-18	10.00	1.28	11.28

**Includes Oakland Supplemental (initiated 1988-89)*

***Includes Initial and Secondary Benefit Assessments*

****Includes Emeryville and Fremont (annexed 2009-10)*



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