ALAMEDA COUNTY

# VECTOR CONTROL

## ANNUAL REPORT 2020


# 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 (yellowjackets and bees), ticks, mites, and spiders, and render or recommend 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 yellowjacket 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 preventive 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 inspections 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 (Hantavirus Cardio Pulmonary Syndrome), 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.
- Assist the public with tick identification and submissions of ticks to laboratories for Lyme disease testing.
- Collect rodent ectoparasites and determine Plague potential (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.acvcsd.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, Dublin 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 vector control services to all 14 cities in Alameda County, including 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 two benefit assessments (BA) charged to parcels benefitting from District services. In 1997, California voters approved Proposition 218, requiring that all parcel owners subject to the assessment receive a mailed ballot regarding any proposed change in an assessment prior to imposing an increase. Since then, the District (CSA 1984-1) is not able to increase revenues without conducting a new revenue measure.

In 2007, the SCI Consulting Group was awarded a contract by the BOS to conduct a survey among the property owners to gauge their support for a new vector control benefit assessment. The survey showed that there was overwhelming support for an additional benefit assessment at the rate of $4.08 which when

added to the existing levy of $5.92, would result in a total rate of $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.

Previously, 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 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.

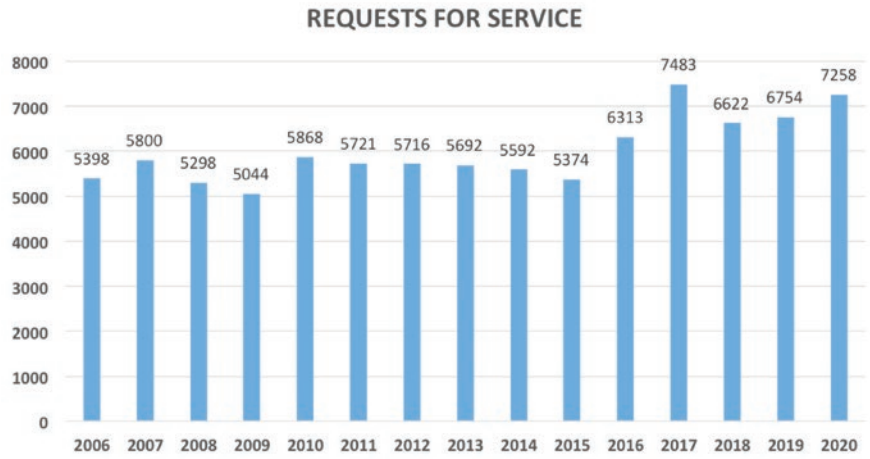
In January of 2008, SCI Consulting surveyed a sample of residents in Emeryville and Fremont; results from both cities were favorable for creating a new benefit assessment that would permit the CSA to provide vector services. In March, 2008, the BOS authorized the CSA to proceed with an application to 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 subject to the assessment 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 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 Field Services – Operations

## Requests for Service During COVID Pandemic at High Level

In March 2020, the impact of the COVID pandemic was beginning to be understood. At the time, the County was seeing less than a handful of confirmed cases per day, but by December 2020, over 1,000 cases per day were common. Because of uncertainty and fear among County residents, requests for vector control services were initially extremely low. As the weeks passed, the risks to individuals were better recognized, and the County implemented important policies that reduced the probability of employees acquiring infection. Practices such as working from home, wearing masks while indoors, social distancing, daily temperature checks/symptoms tracker, reducing riding along with others and minimizing interior residential inspections all were adapted as standard operating procedures. While the County and State enacted "shelter-in-place" orders and

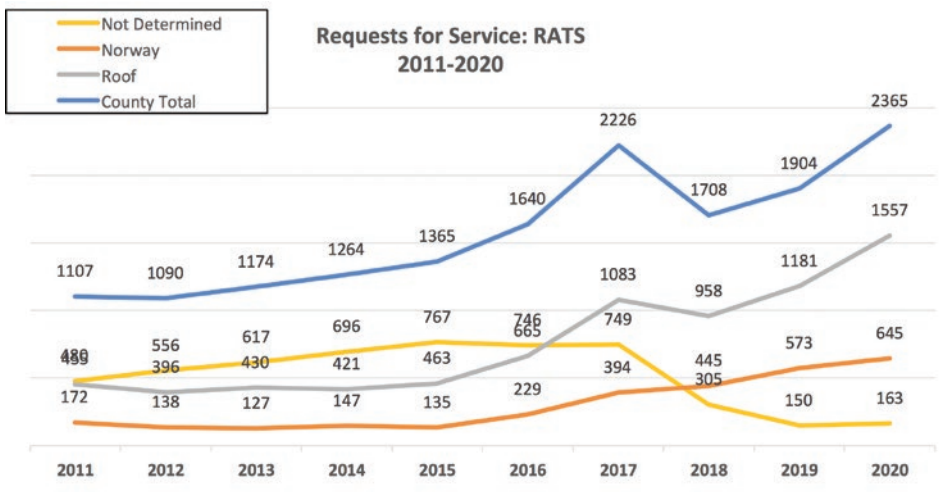
many schools closed, residents were forced to spend most of their time at home. This had the interesting effect of increasing their contact with vector-related issues and subsequent calls to the District. In 2020, 7,258 requests for service were performed, the second highest annual number within the past 14 years.




## Urban Rodent Surveillance and Control

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 2020, the District received 2,788 requests for service (2,397 rats and 391 mice) from the public for domestic rodents, representing 38.4% of all service requests. This is the highest number of annual domestic rat requests for service ever received in the District's history. Those 2,788 rodent service requests led to staff biologists performing 17,639 field services operations related to domestic rodents. The field service operations included 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 carry out thorough inspections of the exterior and interior premises of a property looking for rodent harborage or activity and advise the property owner on necessary structural modifications to prevent rodent entry into their home or business. They hand out brochures to neighbors and 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 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 2020, staff biologists found 12 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 2020, a total of 8,109 sewer inspections were made in Oakland. Those sewers in Oakland that had active rodent activity totaled 2,172 and they were treated with a Contrac rodenticide bait block. In some cases, where signs of heavy rat activity were observed, sewers were double baited (216) or triple baited (3).

## Wildlife Management Programs

In 2020, the District responded to 2,341 service requests concerning wildlife, and those service requests led to staff performing 16,061 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 wildlife nuisance species (raccoons and skunks) that account for the most wildlife service requests.

## Raccoons

In 2020, the District responded to 638 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, one-way doors, and harassment strategies 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 in 2020, totaling 591 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.

## Increase in Wild Turkey Requests

Over the last few years, calls from the public regarding wild turkey issues have increased. In 2020, a new "reason code" was created in the District's database to closely monitor these calls. For the year 2020, 13 requests for service were documented. Turkeys can cause property damage such as cracking roof tiles, scratching cars, or disturbing landscaping. In addition, they may defecate in areas frequented by the public. Male turkeys (toms) can act aggressively towards people. Nuisance birds cannot be removed (euthanized) unless the reporting party obtains a depredation permit from California Fish and Wildlife.

A dramatic and well-publicized event occurred in 2020, when an aggressive tom (nicknamed "Gerald") charged and pecked visitors to Oakland's Morcom Rose Garden. Multiple complaints were received, and it was determined that the problem likely began when someone started feeding the bird. Our District, the City of Oakland's Animal Control, and the California Department of Fish and Wildlife all were involved in attempting to trap the belligerent animal. After a public petition was garnered to spare Gerald from euthanasia, plans were set for trapping and relocating him to a remote location in the East Bay hills. Unfortunately trapping failed, and the attacks continued. Finally, after 7 months, Gerald was skillfully grabbed by a Monterey-based wildlife expert, and visitors could return to the garden without fear of attack.

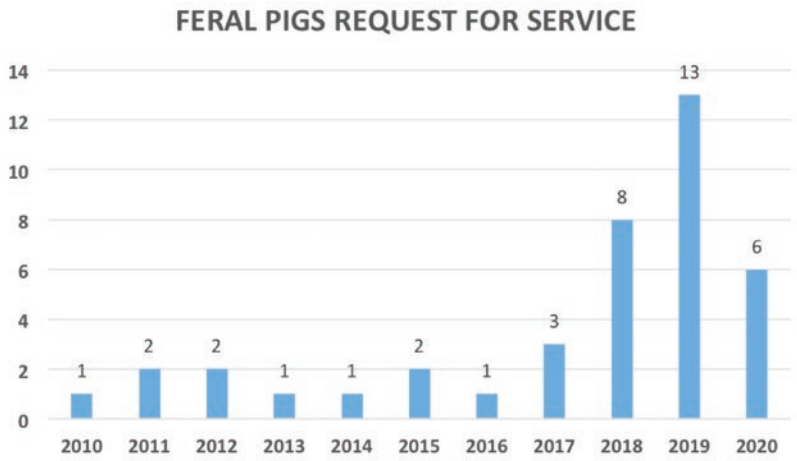
## Increase in Coyote Service Requests

Over the last three years the Alameda County Vector Control Services District has seen a significant increase in the number of requests for service for coyotes, with 2019 being a peak year. Most of these calls are simply reporting sightings, but in some cases, pets have been taken. The District's primary response is to investigate the request and provide education to the residents. Advice is given on eliminating artificial food, water, and harborage areas, and residents are encouraged to call 911 if they feel unsafe. Harassment of the animals with loud noises or motion activated sprinklers may be effective under certain conditions. Coyotes are not easily trapped, so it's also recommended that residents contact the California Department of Fish and Wildlife and report their incident with coyotes, as the State has the management authority over these animals.

Human-coyote interaction reached a peak when on April 1, 2020, a five-year-old girl was attacked and bitten by a coyote at Dublin Hills Regional Park, a part of the East Bay Regional Park. She was bitten in the neck, ears, and back, and fortunately her injuries were not life-threatening. Park officials coordinated with the California Department of Fish and Wildlife, local law enforcement agencies, and the USDA's Wildlife Services (including a member from ACVCSD staff) to organize a response to what was described as "an extremely rare event". Later in the week a coyote was successfully tracked and euthanized, and lab tests confirmed that there was a DNA match to the animal that attacked the girl.

## Increase in Feral Pig Service Requests

In addition to increases in coyote calls over the last several years, the District has also seen a significant increase in the number of requests for service for feral pigs. The number of these calls peaked in 2019, when 13 separate requests for




service were received. These pigs move into residential areas usually in the fall, where they do significant damage to lawns and landscaped areas, seeking out beetle grubs and earthworms. The harm done can be considerable, and their presence can be intimidating to the public trying to use recreational areas. Ideally feral pigs may be excluded from an area by strong fencing, or by removing water intensive plantings and replacing them with native or drought tolerant landscaping. These calls are referred to the District's USDA Wildlife Specialist, who works closely with the impacted community to remove these destructive animals.

## Mosquito Surveillance Program

Up until 2020, the Alameda County Vector Control Services District conducted mosquito surveillance and suppression in the City of Albany.

In 2020, staff biologists received 3 mosquito related service requests from Albany residents, and another 24 county-wide. 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 staff biologists for West Nile virus (WNV), and reported to the State of California. In 2020, 11 mosquito sites from Albany, Livermore, and Oakland were sampled. A total of 13 trap nights were performed, 185 female mosquitoes were captured, and 127 were tested for WNV. In 2020, there were no positive mosquito pools from the 11 sampled sites.

Two new components were added to the program in 2015 and continued into 2020. 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 WNV genetic testing. In 2020, no dead birds were reported to the District from the City of Albany. The second component involves using sentinel chickens at two separate locations, one within the City of Albany, and the other in the City of Livermore. Blood samples from the sentinel chickens are collected and delivered to the State arbovirus laboratory for testing. In 2020, all sentinel chickens from Albany and Livermore tested negative for WNV.

## Venomous Arthropod 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. In 2020, the District received 840 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.

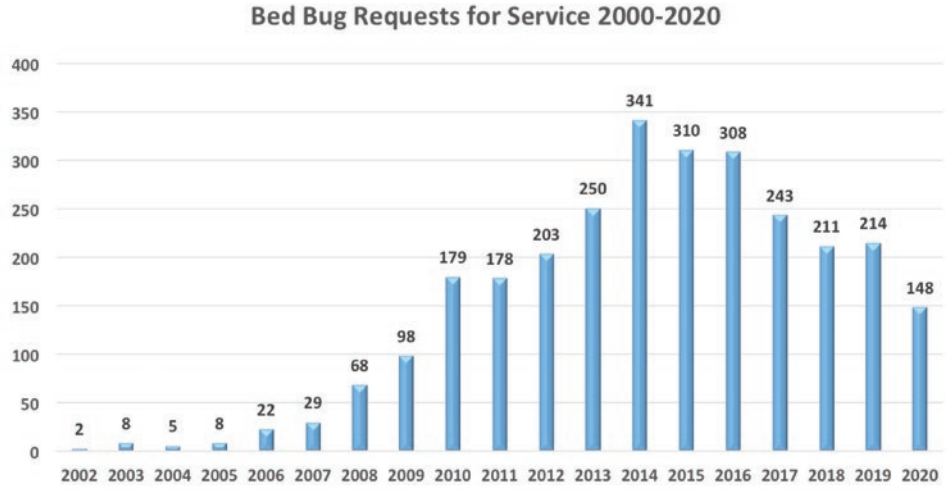
Staff biologists treat yellowjacket and wasp nests located near residential and public areas because of the public health risk these insects may pose. Staff biologists may contact honeybee keepers to safely remove swarms and hives when possible. They also work quickly to treat wasp and yellowjacket nests. In addition, the District has an agreement with the East Bay Regional Park District (EBRPD) to control ground nesting yellowjackets within county parks. In 2020, the District responded to 569 venomous wasps (a 10% increase from 2019) and 119 honeybee complaints.

## Miscellaneous Arthropod Programs

In 2020, the District responded to service requests on a variety of nuisance pests such as ants (30), cockroaches (271), flies (69), and fleas (83) infesting homes, yards, and commercial facilities. Our staff biologists frequently identify insect and other arthropod species collected by concerned residents. Staff biologists will conduct inspections to locate insect breeding sites 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 Request for Service Trend Downward

Although bed bugs continue to be a difficult nuisance pest problem in Alameda County, a downward trend has been observed over the past several years. The District responded to 148 bed bug service requests in 2020, a 56% decline from the peak year, 2014. Several factors may be responsible for this decline. New community-based programs have been 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. In addition, the passage of California State Assembly Bill 551 places a greater responsibility on landlords to address bed bug infestations before they reach critically high levels. Finally, improvements in pest control practices and techniques have likely played an important role in suppressing outbreaks.



## 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 2020, between June 4th and July 10th, 16 cases 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 no cases of swimmer's itch reported at Shadow's Cliff in Pleasanton, likely due to park closures from the COVID pandemic.

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 Program

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 Program

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 2020, staff biologists responded to 165 nuisance service requests of furniture, garbage, abandoned vehicles, overgrown vegetation, or rubbish. This resulted in 340 field services that included investigations, progress assessments, correspondence, and compliance inspections. When necessary, staff biologists work with local code enforcement agencies and public works to seek compliance to mediate problems.

# Vector Control Laboratory Surveillance Operations

## Ectoparasite Surveillance on Sylvatic Rodents, 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. Commensal rodents refer to those rodents that live in close proximity to humans and are typically nonnative species. Wildlife species include the more common opossum, raccoon, and skunk, but also include the less common fox, coyote, feral pig, bats, squirrels, and jackrabbits.

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. The District vector ecologist and staff biologists routinely collect sylvatic and commensal rodent samples for surveillance and monitoring of ectoparasite abundance, diversity and disease testing.

| Animal Species 2020 | # of Animals | # of Animals w/Fleas | # of Fleas | Flea Species and # of Fleas | Flea Index* | Tick Species |
|---|---|---|---|---|---|---|
| SYLVATIC RODENTS | | | | | | |
| Pinon Mouse *Peromyscus truei* | 29 | 5 | 8 | *Opisodasys keeni (6)* *Orchopeas leucopus (2)* | 0.28 | *Dermacentor* sp. larvae |
| Deer Mice *Peromyscus maniculatus* | 14 | 5 | 5 | *O. keeni (4)* *O. leucopus (1)* | 0.35 | *Ixodes pacificus* (4) larvae |
| Harvest Mouse *R. megolotis* | 4 | 0 | 0 | | | |
| COMMENSAL RODENTS | | | | | | |
| Roof Rat *Rattus rattus* | 30 | 5 | 7 | *Nosopsylla fasciatus (3)* *Hoplopsylla anomolus (2)* *O. sexdentatus (2)* | 0.2 | |
| Norway Rat *Rattus norvegicus* | 356 | 172 | 582 | *N. fasciatus (267)* *H. anomolus (30)* *Leptopsylla segnis (11)* *Xenopsylla cheopis (189)* *Ctenocephalides felis (85)* | 1.6 | |
| House Mouse *Mus musculus* | 15 | 1 | 1 | *Monopsylla sp.* | .06 | |
| WILDLIFE | | | | | | |
| Skunk | 2 | 2 | 28 | *Pulex irritans (27)* *C. felis (1)* | 14.0 | |
| Opossum | 12 | 11 | 309 | *C. felis (299)* *P. irritans (10)* | 25.7 | |
| Red Fox | 3 | 3 | 61 | *P. irritans (60)* *C. felis (1)* | 20.3 | |
| Fox Tree Squirrel | 17 | 10 | 159 | *O. howardii (158)* *Echidonophaga gallinacea (1)* | 9.3 | |
| Black-tailed Deer[1] | 3 | 2 | 71 | *Pulex irritans (71)* | 23.7 | *I. pacificus* (38) *Dermacentor occidentalis* (41) |
| Bobcat[1] | 2 | 2 | 4 | *Pulex irritans (2) E. gallinacea (1) Catallagia sp.(1)* | 2.0 | *I. pacificus* (1) |
| Coyote[1] | 6 | 6 | 183 | *Pulex irritans (182) C. felis (1)* | 30.5 | *I. pacificus* (107) *D. variabilis* (17) |
| American Badger[1] | 1 | 0 | 0 | | | *D. variabilis* |
| 1. Specimens analyzed at animal control/shelter. | | | | | | |

***Table 1. Ectoparasites (fleas and ticks) collected from commensal and sylvatic rodents and wildlife from urban and sylvatic areas (including rodents from homeless encampments).***

****Total number of fleas divided by total number of animals trapped.***

## Hantavirus Cardiopulmonary Syndrome (HCPS)

Hantavirus Cardiopulmonary Syndrome (HCPS) 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 CSA 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.

Nine Hantavirus surveys were conducted in 2020. The sites surveyed included four East Bay Regional Parks, one school, one city park and three public open spaces. Of all the rodents tested, none were positive for SNV by serology or PCR.

The 2020 sites surveyed were:

**East Bay Regional Parks**

***Garin Regional Park in Hayward:*** Two Deer mice (*Peromyscus maniculatus*), one Pinyon mouse (*Peromyscus truei*), and three Harvest mice (*Reithrodontomys megalotis*) were collected and tested. All mice were negative for Hantavirus (SNV).

***Redwood Regional Park maintenance yard and office in Oakland:*** Twenty Pinyon mice (*P. truei*) and eight Deer mice (*Peromyscus maniculatus*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).

***Redwood Regional Park near Piedmont stables in Oakland:*** Two Pinyon mice (*P. truei*) and one Deer mouse (*Peromyscus maniculatus*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).

***Leona Heights Regional Park in Oakland:*** Three Pinon mice (*P. truei*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).

**Risk Assessment Surveys**

***Craigmont High School, City of Berkeley:*** Five House mice (*Mus musculus*), two Norway rats (*Rattus noviegicus*) were trapped. Little to no risk of Hantavirus.

***Morgen Territory at county line:*** Two Deer mice (*Peromyscus maniculatus*) were trapped and tested for hantavirus (SNV). All mice were negative for Hantavirus (SNV).

***Dagnini Road in Pleasanton:*** One Meadow Vole (*Microtus californicus*) trapped. Not tested for SNV.

***Andrade Road in Sunol:*** One Pinon mice and one Deer mouse (*Peromyscus maniculatus*) were trapped and tested for hantavirus (SNV). All mice were negative for Hantavirus (SNV).

***Note: Testing was conducted by California Department of Public Health, Richmond, CA by serology and PCR.***

## Seoul Virus Surveillance

Seoul virus belongs to the hantavirus family of rodent borne viruses. This family also includes Sin Nombre virus, which is the most common hantavirus causing disease in the United States. Seoul virus is transmitted from rats to humans after exposure to aerosolized urine, droppings, or saliva of infected rodents, or after exposure to dust from their nests or bedding. This virus has been found in both pet rat and wild rat populations around the world. The natural hosts for Seoul virus are the Norway rat (*Rattus norvegicus*) and roof rat (*Rattus rattus*). In 2017, there was an outbreak of Seoul virus and 11 states confirmed Seoul virus positive results in humans and rats. Symptoms in humans range from mild to severe, with most cases going unnoticed. In 2019, District staff began collecting Norway rat blood samples to test for this uncommon rodent-borne virus. Through 2020, 440 Norway rat blood samples have been submitted to an independent (CDC recommended) lab for the detection of Seoul virus. By serology approximately a dozen samples had shown some initial reactivity, but subsequent tests did not confirm a positive result.

## Homeless Encampment Rodent, Flea, and *Rickettsia spp.* 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, flea-borne typhus, and salmonellosis.

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 performed live-trapping at some of the larger encampments to ascertain the size of the Norway rat populations. In 2020, staff biologists conducted 37 separate trapping events at 16 different homeless encampments around the City of Oakland and Berkeley. Six-hundred twenty-six Norway rats were trapped, and from those, 696 fleas were collected for disease testing.

Abatement efforts were conducted during 2020 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.

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

| Different Homeless Encampments Surveyed | Separate Trapping Events | Norway Rats Trapped | Fleas Collected for Disease Testing | Rodenticide Applications for Norway Rat Suppression |
|---|---|---|---|---|
| 16 | 37 | 626 | 696 | 2 |

*Table 2. Homeless encampment data 2020.*

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

In 2020, the Alameda County Vector Control Services District continued 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.

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 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 Rickettsial 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 these fleas and their associated rodent hosts in Alameda County.

## Flea-borne Typhus Surveillance

*Rickettsia typhi* is a pathogen associated with the Oriental 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. In 2020, our District tested 1,049 total fleas as 374 "pools" (groups up to five). Six different species of fleas were collected and tested: *Ctenocephalides felis*, *Pulex simulans*, *Nosopsyllus fasciatus*, *Xenopsylla cheopis*, *Leptopsylla segnis*, and *Orchopeas howardi* (Table 3).

| Host | # of Fleas Tested | Flea Pools Tested | *C. felis* Positive Pools (Fleas Tested) | *Pulex* Positive Pools (Fleas Tested) | *N. fasc* Positive Pools (Fleas Tested) | *X. cheopis* Positive Pools (Fleas Tested) | *L. segnis* Positive Pools (Fleas Tested) | *O. howardi* Positive Pools (Fleas Tested) | Total Positive Pools (Fleas Tested) |
|---|---|---|---|---|---|---|---|---|---|
| Norway rat | 610 | 278 | 16 (85) | | 6 (223) | 1 (291) | 1 (11) | | 24 |
| Opossum | 254 | 59 | 37 (247) | 0 (6) | 0 (1) | | | | 37 |
| Roof rat | 2 | 1 | | | 0 (2) | | | | 0 |
| Skunk | 25 | 1 | 0 (1) | 2 (24) | | | | | 2 |
| Coyote | 78 | 16 | 0 (1) | 0 (71) | | | | | 0 |
| Raccoon | 5 | 1 | 1 (5) | | | | | | 1 |
| Red fox | 30 | 6 | 0 (1) | 1 (29) | | | | | 1 |
| Ground squirrel | 1 | 1 | 0 (1) | | | | | | 0 |
| Fox squirrel | 11 | 3 | 0 (1) | | | | | 0 (10) | 0 |
| Deer | 32 | 7 | | 4 (32) | | | | | 4 |
| Bobcat | 1 | 1 | | 1 (1) | | | | | 1 |
| Total | 1,049 | 374 | 54 (342) | 8 (169) | 6 (226) | 1 (291) | 1 (11) | 0 (10) | 70 (1,049) |

***Table 3. Fleas collected from animals in Alameda County in 2020.***

Fleas were collected from bobcats, raccoons, opossums, skunks, red foxes, ground squirrels, tree squirrels, coyotes, roof rats, and Norway rats. Sick, injured, or nuisance raccoons, opossums, and skunks were trapped from several locations within the County and combed for ectoparasites, especially fleas and ticks. Coyotes and deer were road kill specimens that came from local animal control agencies. Rats were trapped as a part of the sylvatic and commensal rodent surveillance program.

Norway rats showed the highest flea diversity, with four different flea species collected; the Oriental rat flea, *X. cheopis*, was the most abundant. The cat flea, *C. felis*, was found on the largest number of hosts (9) and was most abundant on opossums (Table 3). The greatest number of fleas tested were from Norway rats, followed by opossums, with opossums producing the greatest number of positive pools (Table 4).

| Host | # of Fleas Tested | Flea Pools Tested | *C. felis* Positive Pools (Fleas Tested) | *Pulex* Positive Pools (Fleas Tested) | *N. fasc* Positive Pools (Fleas Tested) | *X. cheopis* Positive Pools (Fleas Tested) | *L. segnis* Positive Pools (Fleas Tested) | *O. howardi* Positive Pools (Fleas Tested) | Total Positive Pools |
|---|---|---|---|---|---|---|---|---|---|
| Norway rat | 610 | 278 | 16 (85) | | 6 (223) | 1 (291) | 1 (11) | | 24 |
| Opossum | 254 | 59 | 37 (247) | 0 (6) | 0 (1) | | | | 37 |
| Roof rat | 2 | 1 | | | 0 (2) | | | | 0 |
| Skunk | 25 | 1 | 0 (1) | 2 (24) | | | | | 2 |
| Coyote | 78 | 16 | 0 (1) | 0 (71) | | | | | 0 |
| Raccoon | 5 | 1 | 1 (5) | | | | | | 1 |
| Red fox | 30 | 6 | 0 (1) | 1 (29) | | | | | 1 |
| Ground squirrel | 1 | 1 | 0 (1) | | | | | | 0 |
| Fox squirrel | 11 | 3 | 0 (1) | | | | | 0 (10) | 0 |
| Deer | 32 | 7 | | 4 (32) | | | | | 4 |
| Bobcat | 1 | 1 | | 1 (1) | | | | | 1 |
| Total | 1,049 | 374 | 54 (342) | 8 (169) | 6 (226) | 1 (291) | 1 (11) | 0 (10) | 70 (1,049) |

***Table 4. Rickettsia spp. in fleas by host animal and by flea species.***

Of the six species of fleas tested, cat fleas collected from opossums had the highest number of *Rickettsia*-positive pools, followed by cat fleas collected from Norway rats. *O. howardi* was the only flea species that did not test positive (Table 4). Animals with the highest number of fleas per individual (flea infestation index) included skunk, opossum, and deer. Significantly, three out of four opossums and one out of ten Norway rat individuals had fleas that tested positive for *Rickettsia* (Table 5).

| Host | # of Animals | Fleas, Total | Flea Infestation Index | Animals with Positive Fleas | Percent of Animals with Fleas, % |
|---|---|---|---|---|---|
| Norway rat | 172 | 610 | 3.5 | 17 | 9.9 |
| Opossum | 11 | 254 | 23.1 | 8 | 72.7 |
| Roof rat | 1 | 2 | 2.0 | 0 | 0 |
| Skunk | 1 | 25 | 25.0 | 1 | 100 |
| Coyote | 5 | 78 | 15.6 | 0 | 0 |
| Raccoon | 1 | 5 | 5.0 | 1 | 100 |
| Red fox | 2 | 30 | 15.0 | 1 | 50.0 |
| Ground squirrel | 1 | 1 | 1.0 | 0 | 0 |
| Fox squirrel | 2 | 11 | 5.5 | 0 | 0 |
| Deer | 2 | 32 | 16.0 | 1 | 50.0 |
| Bobcat | 1 | 1 | 1.0 | 1 | 100 |
| Total | 199 | 1,049 | | 30 | |

***Table 5. Infestation with Rickettsia positive fleas.***

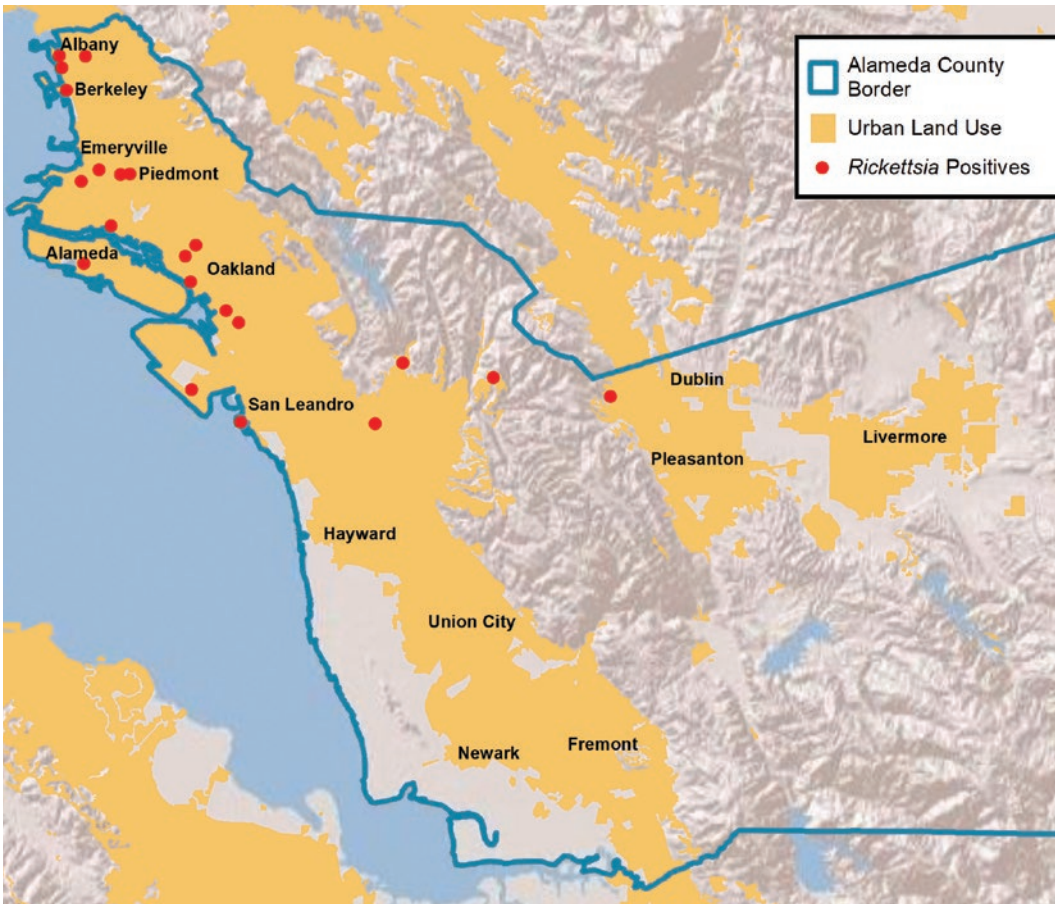
These animals have peridomestic habits (that is, they tend to live in close association with humans) which increases the risk of disease transmission to people. Opossums were mainly infested with the cat flea, whereas Norway rats were mainly infested with Oriental rat fleas. Cat fleas from opossums showed a higher percentage of *Rickettsia*-positive infections than cat fleas from Norway rats, but the fleas from Norway rats showed a higher minimum infection prevalence (MIP, the total number of positive pools divided by the total number of host individuals, tables 6 and 7).

| Flea spp. | # of Fleas Tested | Pools Tested | Positive Pools | Percent of Positive Pools, % | Minimum Infection Prevalence, % |
|---|---|---|---|---|---|
| *C. felis* | 247 | 54 | 37 | 68.5 | 15.0 |
| *Pulex* | 6 | 4 | 0 | 0 | 0 |
| *N. fasc.* | 1 | 1 | 0 | 0 | 0 |
| Total | 254 | 59 | 37 | 62.7 | 14.6 |

*Table 6. Rickettsia felis and Rickettsia felis-like infections in fleas from Opossums.*

| Flea spp. | # of Fleas Tested | Pools Tested | Positive Pools | Percent of Positive Pools, % | Minimum Infection Prevalence, % |
|---|---|---|---|---|---|
| *C. felis* | 85 | 39 | 16 | 41.0 | 18.9 |
| *N. fasc* | 223 | 128 | 5 | 3.9 | 2.2 |
| *X. cheopis* | 291 | 101 | 1 | 1.0 | 0.3 |
| *L. segnis* | 11 | 10 | 0 | 0 | 0 |
| Total | 610 | 278 | 22 | 8.6 | 3.9 |

*Table 7. Rickettsia felis and Rickettsia felis-like Infections in fleas from Norway Rats.*




*Distribution of Rickettsia Positive Fleas in Alameda County 2020.*

In 2020, we found *Rickettsia felis* in fleas from animals collected from the following cities: Alameda, Albany, Oakland, Castro Valley, Dublin, and San Leandro. Most of these locations are considered urban or suburban, with high population densities. However, no recent reports of human flea-borne rickettsioses are known from Alameda County.

## Tick Surveillance Program

Tick-borne diseases threaten the health of people. For over 20 years, Alameda County Vector Control District has conducted a tick surveillance program concurrently with the surveillance for pathogens in ticks that may cause disease in humans. Using a standard flagging method, ticks were collected in regional parks, city parks, and public open spaces. In addition, ticks recovered from road-killed animals or animals in the other county surveillance programs were included in testing for pathogens. In total, 3,115 *Ixodes pacificus* ticks, 504 *Dermacentor occidentalis* ticks, 27 *Dermacentor variabilis* ticks, 11 *Ixodes spinipalpis* ticks, 2 *Ixodes auritulus*, and 6 *Haemaphysalis leporispalustris* were collected. The largest number of ticks (1,001) was collected in Pleasanton Ridge Regional park. Joaquin Miller park demonstrated the highest tick species diversity (6 species).

| Location | *Ixodes pacificus* | *Dermacentor occidentalis* | *Dermacentor variabilis* | *Ixodes spinipalpus* | *Ixodes auritulus* | *Haemaphysalis leporispalustris* | Total |
|---|---|---|---|---|---|---|---|
| Anthony Chabot Regional Park | 435 | 144 | 1 | 2 | | 2 | 584 |
| Del Valle Regional Park | 315 | 3 | 1 | | | | 319 |
| Garin Regional Park | 110 | 34 | | 2 | | | 146 |
| Leona Heights Regional Park | 123 | 22 | | 1 | | | 146 |
| Mission Peak Regional Preserve | 100 | 10 | | | | | 110 |
| Pleasanton Ridge Regional Park | 936 | 63 | 2 | | | | 1,001 |
| Redwood Regional Park | 180 | 137 | | | | 2 | 319 |
| Sunol Regional Park | 53 | 8 | | | | | 61 |
| Joaquin Miller Park, Oakland | 601 | 14 | 1 | 6 | 2 | 2 | 626 |
| Augustin Bernal Park | 80 | 35 | | | | | 115 |
| Alamo Creek Park | 85 | 23 | 3 | | | | 111 |
| Palomares Hills Park | 10 | 5 | 1 | | | | 16 |
| Coyote HIlls Regional Park | | | 2 | | | | 2 |
| Vargas Plateau Regional Park | | | 1 | | | | 1 |
| Open Spaces, Berkeley | 87 | 6 | | | | | 93 |
| Open Spaces, Dublin | | | 12 | | | | 12 |
| Open Spaces, Castro Valley | | | 3 | | | | 3 |
| Total Per Tick Species | 3,115 | 504 | 27 | 11 | 2 | 6 | 3,662 |

*Table 8. Tick Collection Summary Locations and Species.*

## *Ixodes pacificus* Tick Surveillance

*Ixodes pacificus* (*I. pacificus*) or the Western blacklegged tick is the primary vector of Lyme disease which is caused by the bacterium *Borrelia burgdorferi,* and the vector of tick-borne relapsing fever (TBRF), which is caused by the bacterium *Borrelia miyamotoi*. Both pathogens are primarily transmitted to humans through the bite of an infected Western blacklegged tick.

Based on the previous tick surveillance data and an estimated human risk of being bitten by a tick, *I. pacificus* from selected locations were tested in groups, or "pools", of a maximum of five adults or two nymphs for presence of *Borrelia sensu lato* (*Bbsl*) and *Borrelia miyamotoi* (*B.miya.*). In total, 1,952 ticks (1,069 adults, 753 nymphs, and 130 larvae) were evaluated using real-time PCR. The results are reported as a minimum infection prevalence (MIP). This is the standard way of expressing the proportion of vectors tested that are infected with a specific pathogen and assumes that only one tick in a given pool is infected.

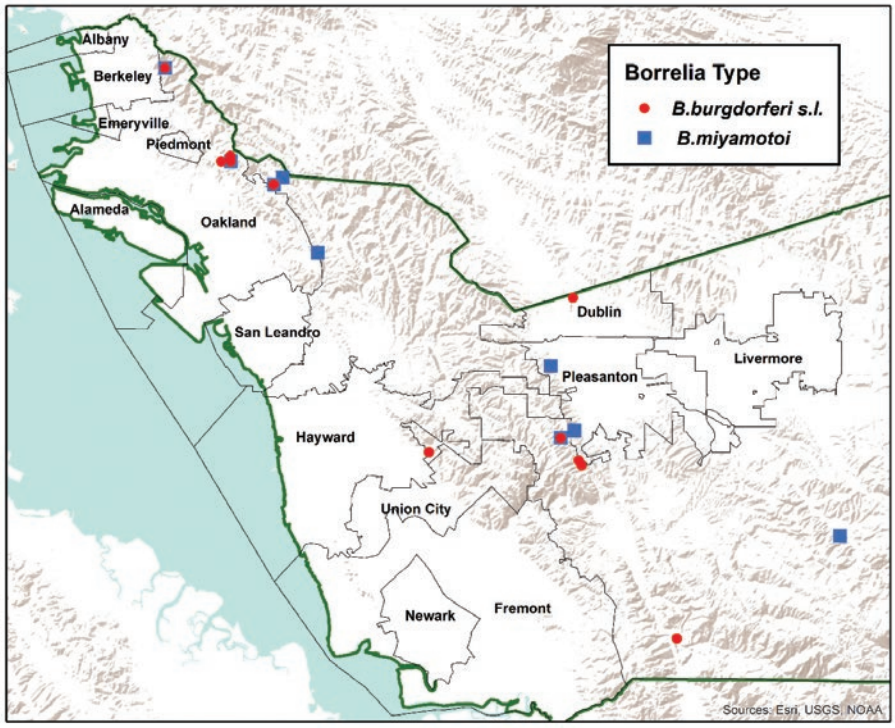
| Location | Female | Male | Nymph | Larvae | Total |
|---|---|---|---|---|---|
| Anthony Chabot Regional Park | 227 | 179 | 29 | | 435 |
| Del Valle Regional Park | 144 | 161 | 10 | | 315 |
| Garin Regional Park | 35 | 31 | 26 | 18 | 110 |
| Leona Heights Regional Park | 67 | 56 | | | 123 |
| Mission Peak Regional Preserve | 56 | 44 | | | 100 |
| Pleasanton Ridge Regional Park | 237 | 250 | 330 | 119 | 936 |
| Redwood Regional Park | 60 | 50 | 70 | | 180 |
| Sunol Regional Park | 5 | 9 | 39 | | 53 |
| Joaquin Miller Park | 156 | 173 | 267 | 5 | 601 |
| Augustin Bernal Park | 30 | 50 | | | 80 |
| Alamo Creek Park | 46 | 39 | | | 85 |
| Palomares Hills Park | | | 10 | | 10 |
| Open Spaces, Berkeley | 15 | 10 | 58 | 4 | 87 |
| Total Per Tick Species | 1,078 | 1,052 | 839 | 146 | 3,115 |

***Table 9. Ixodes pacificus ticks collected in 2020 by location and life stages.***

| *I. pacificus* Life Stage | # of Ticks | Pooled Samples | *Bbsl* Positive Pools | *B.miya* Positive Pools | *Bbsl* MIP, % | *B.miya* MIP, % |
|---|---|---|---|---|---|---|
| Adult | 1,069 | 223 | 20 | 10 | 1.9 | 0.9 |
| Nymph | 753 | 380 | 34 | 6 | 4.5 | 1.6 |
| Larvae | 130 | 2 | 0 | 0 | 0 | 0 |
| Totals | 1,952 | 605 | 54 | 16 | | |

***Table 10. Borrerai sensu lato and B. miyamotoi infection rates in Ixodes pacificus ticks.***

County-wide, *Borrelia sensu lato* and *B. miyamotoi* were detected at 1.9% and 0.9% MIP in adult *I. pacificus* ticks respectively. In nymphal *I. pacificus* ticks, *Borrelia sensu lato* and *B. miyamotoi* were detected at a MIP of 4.5% and 1.6% respectively. The MIP values recorded in 2020 are typical for Alameda County and do not indicate an elevated level of risk.




*Distribution of Borrelia Positive Ticks in Alameda County 2020.*

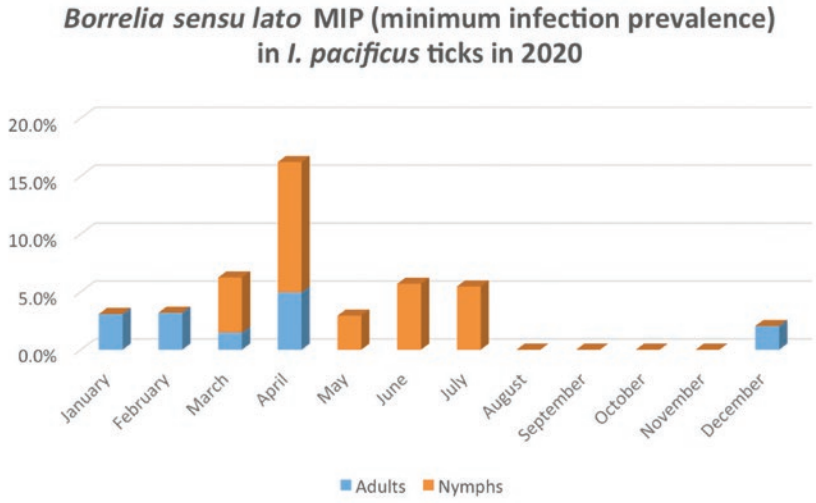
In 2020, *Borrelia burgdorferi s.l.* positive *Ixodes* ticks were collected in the cities of Berkeley, Oakland, Hayward, Pleasanton, Dublin, and Sunol. *Borrelia miyamotoi* positive *Ixodes* ticks were collected in the cities of Berkeley, Oakland, Pleasanton, and Livermore.

A temporal analysis of *Borrelia sensu lato* MIP showed that MIP varied during the year in adult ticks between 0 and 5.0% and in nymphs between 0 and 11.3%.

Those variations reflect seasonality in *I. pacificus* activities and demonstrate that *Bbsl*-infected adults and nymphs can be found in Alameda County in March and April. April was the month with the highest Bbsl MIP in adults (5.0%) and nymphs (11.3%) which is two to three times more than countywide averages.

| Month | *I. pacificus,* Adults | | *I. pacificus,* Nymphs | |
|---|---|---|---|---|
| | # of Ticks | *Bbsl* MIP, % | # of Ticks | *Bbsl* MIP, % |
| January | 195 | 3.1 | 1 | 0 |
| February | 344 | 3.2 | 3 | 0 |
| March | 204 | 1.5 | 42 | 4.8 |
| April | 121 | 5.0 | 80 | 11.3 |
| May | 0 | 0 | 238 | 2.9 |
| June | 9 | 0 | 334 | 5.7 |
| July | 1 | 0 | 55 | 5.5 |
| August | 0 | 0 | 0 | 0 |
| September | 0 | 0 | 0 | 0 |
| October | 0 | 0 | 0 | 0 |
| November | 0 | 0 | 0 | 0 |
| December | 195 | 2.1 | 0 | 0 |

*Table 11. Borrelia Infection rates in I. pacificus across time.*




## *Dermacentor* Tick Surveillance

In 2020, the District continued surveillance for the tick-borne diseases in *Dermacentor occidentalis* and *Dermacentor variabilis* ticks which started in 2019. According to California Department of Public Health records, *D. occidentalis* is second only to *Ixodes pacificus* in total numbers of tick attachments to humans. The Pacific Coast tick (*D. occidentalis*) and the American dog tick (*D. variabilis*) may be found year-round in Alameda County but are most abundant late spring through early summer. In total, 504 *D. occidentalis* and 27 *D. variabilis* adult ticks were collected in regional and city parks, and open spaces. The abundance of *D. occidentalis* was highest in Anthony Chabot and Redwood Regional Parks.

| Location | *Dermacentor occidentalis* | *Dermacentor variabilis* |
|---|---|---|
| Anthony Chabot Regional Park | 144 | 1 |
| Del Valle Regional Park | 3 | 1 |
| Garin Regional Park | 34 | |
| Leona Heights Regional Park | 22 | |
| Mission Peak Regional Preserve | 10 | |
| Pleasanton Ridge Regional Park | 63 | 2 |
| Redwood Regional Park | 137 | |
| Sunol Regional Park | 8 | |
| Joaquin Miller Park | 14 | 1 |
| Augustin Bernal Park | 35 | |
| Alamo Creek Park | 23 | 3 |
| Palomares Hills Park | 5 | 1 |
| Coyote HIlls Regional Park | | 2 |
| Vargas Plateau Regional Park | | 1 |
| Open Spaces, Berkeley | 6 | |
| Open Spaces, Dublin | | 12 |
| Open Spaces, Castro Valley | | 3 |
| Total | 504 | 27 |

***Table 12. Dermacentor Collection Summary.***

For 2020, 401 *D. occidentalis* and 23 *D. variabilis* were tested in pools for the presence of *Rickettsia* spp. pathogens using real time PCR. Eight *D. occidentalis* pools and four *D. variabilis* pool were infected with *Rickettsia* spp. Sequencing positive samples showed that one *D. occidentalis* pool from Alamo Creek Park

(Dublin) was infected with *Rickettsia philipii*, a human pathogen. In addition, *Rickettsia rhipicephali* was found in *D. occidentalis* ticks from Anthony Chabot, Garin, Sunol and Leona Heights Regional Parks, and Augustin Bernal Park. Only *Rickettsia bellii* was present in *D. variabilis* positive pools. To date, neither *R. bellii* nor *R. rhipicephali* have been associated definitively with disease in humans or animals.

## Pacific Coast Tick Fever Case Follow-up Investigation

In August 2019 the Alameda County Health Care Services Agency (HCSA), Public Health Department notified our District of a Pacific Coast tick fever case in a young male residing in Oakland. Pacific Coast tick fever, a newly recognized disease, is caused by *Rickettsia phillipii* and transmitted to humans by the bite of the Pacific Coast tick, *Dermacentor occidentalis*. This species of *Rickettsia* is a part of the spotted fever group of rickettsioses, which include the *Rickettsia* that causes Rocky Mountain Spotted Fever. The disease is rare, and as of 2016, only 14 human cases have been reported, all from California. Symptoms include fever, headache, rash, and an eschar (a patch of dead tissue that falls off healthy skin).

After interviewing the case patient and parents by HCSA, it was determined that the likely exposure location was Peralta Hacienda Historical Park, where the patient went for a school field trip. The boy had not visited any other tick areas nor did the family have a dog.

An investigation was undertaken to determine if this was the likely location of infection and to assess the risk to the public.

Peralta Hacienda Historical Park is an “urban” park located at 2465 34th Ave., Oakland CA. The upper portion of the park contains a historical building surrounded by a community garden and lawns. The lower park consists of an open area with Peralta creek running through it.

On 8/14/2019 District staff surveyed for ticks by flagging the upper and lower areas of the park. On 8/20/2019 our staff along with 3 members of the CDPH Vector-Borne Disease Section flagged all of the upper and lower areas of the park. No ticks were collected on both occasions.

Starting in January 2020 the area along Peralta creek was flagged for ticks once monthly until October 2020. No ticks were collected.

To determine if ticks might be attached to mammals found in this park, live traps were set over two consecutive nights. There were no captures. An area upstream from the park was surveyed. This area was primarily covered with ivy and non-native trees. A carcass of a young deer was found. Live traps were set overnight, and one Norway rat and an adult opossum were captured. The opossum escaped before ectoparasites could be removed. During 2020 live traps were set on a number of occasions. In total 9 Norway rats and two very young opossums were captured. Captures were inspected for ectoparasites. No ticks were found on any of the captures. Three cat fleas, *Ctenocaphalides felis*, were removed from the opossums and 8 Northern rat fleas, *Nosopsyllus fasciatus*, and one *C. felis* were collected from the Norway rats.

As part of the District's flea-borne typhus surveillance program, the twelve fleas collected from animals trapped in Peralta Hacienda Park, Oakland were tested for presence of *Rickettsia* spp. All samples were screened for presence of *Rickettsia* using Pan-*Rickettsia* real-time PCR and R. *felis* specific real-time PCR assays. One *C. felis* flea from a Norway rat and three *C. felis* fleas from an opossum (pooled together) showed presence of *R. felis* DNA. All *Nosopsyllus fasciatus* flea DNA extracts were negative.

The results of our investigation indicate that ticks of any species are not commonly present in this park and that there is a low to non-existent risk of contracting Pacific Coast tick fever at this location.

## Downslope Movement Study of Adult Ticks, *Ixodes pacificus* and *Dermacentor occidentalis*

The Western black-legged tick, *Ixodes pacificus*, is the primary vector of the Lyme disease spirochete (*Borrelia burgdorferi* sensu stricto). The Pacific coast tick, *Dermancentor occidentalis*, has recently been found to vector *Rickettsia philipii*, the causative agent of Pacific coast tick fever. Both these ticks are commonly found in numerous public parks and open spaces throughout Alameda County. Tick abundance along trails is an important factor in the risk analysis and prevention strategies for tick-borne diseases. Several investigators have noted that *I. pacificus* adults are more numerous on the uphill side of trails than on the downhill side.

In last year's annual report, we reported the results of a 3-year mark-release-recapture (MRR) study that investigated why ticks are more numerous on the uphill side of trails. This study found that up to 5% of *Ixodes pacificus* and up to 18.5% of *Dermacentor occidentalis* ticks moved downhill from 30 meters above the trail to the trail edge..

This study indicated that the trail was a barrier to further movement. Of the 178 *I. pacificus* ticks collected along the transect and tagged with green paint, one (0.6%) *I. pacificus* female was recaptured on the other site of the fire trail. Of the 409 *D. occidentalis* ticks collected along the transect and tagged green, 34 (8.3%) *D. occidentalis* ticks were recaptured on the other side of the fire trail.

## Rabies Surveillance

The authority for the Rabies Program is the responsibility of the County Health Officer at the Alameda County 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 administer 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 may be euthanized and 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 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 160 animal heads, including bats, cats, coyotes, dogs, foxes, opossums, raccoons, squirrels, and skunks to the ACPHL for rabies testing in 2020. Three (3) bats collected from Oakland (1), Pleasanton (1), and Fremont (1) tested positive for the rabies virus. The ACPHL also reported that three bats (**) sent in for testing had inconclusive results due to a deteriorated brain that had no tissue available for testing.

| Type of Animal | Tested Negative | Tested Positive | Total Tested |
|---|---|---|---|
| Bat | 64 | 3 | 67 |
| Cat | 33 | 0 | 33 |
| Coyote | 1 | 0 | 1 |
| Dog | 15 | 0 | 15 |
| Fox | 3 | 0 | 3 |
| Oppossum | 7 | 0 | 7 |
| Raccoon | 6 | 0 | 6 |
| Skunk | 26 | 0 | 26 |
| Squirrel | 2 | 0 | 2 |
| Total | 157 | 3 | 160 |

*** Three bats sent in for testing had inconclusive results.*

# Public Information and Educational Activities


We attract a large audience through the ACVCSD web site, social media such as Facebook, media contacts, group presentations, and participation in public events. The year 2020 was quite unusual. Nearly all live outreach events in which we typically participate were cancelled due to the SARS-CoV-2 pandemic. We only had one large community event in January, the Oakland Chinatown New Year Bazaar.

District staff attended and presented at two large conferences. At the Vertebrate Pest Conference seven staff gave presentations and fourteen staff worked on presentations for the Mosquito and Vector Control Association of California (MVCAC) Annual Conference. The District continues to expand outreach programs to our ethnically diverse communities by delivering services directly to all Alameda County residents. The District received 7,258 Requests for Service (RFS) in 2020 (the second highest amount of RFS in the last 14 years) that were investigated by 22 Vector Control Biologists. This is a powerful team discussing and investigating the vector problems that County residents were experiencing. This amounted to many thousands of hours of community outreach. Other outreach included issuing press releases and responding to media requests for information and interviews.

The District 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 and continued to enhance and update it during 2020. The public can access information on current vector and public health issues, and the user-friendly on-line form simplifies service requests.

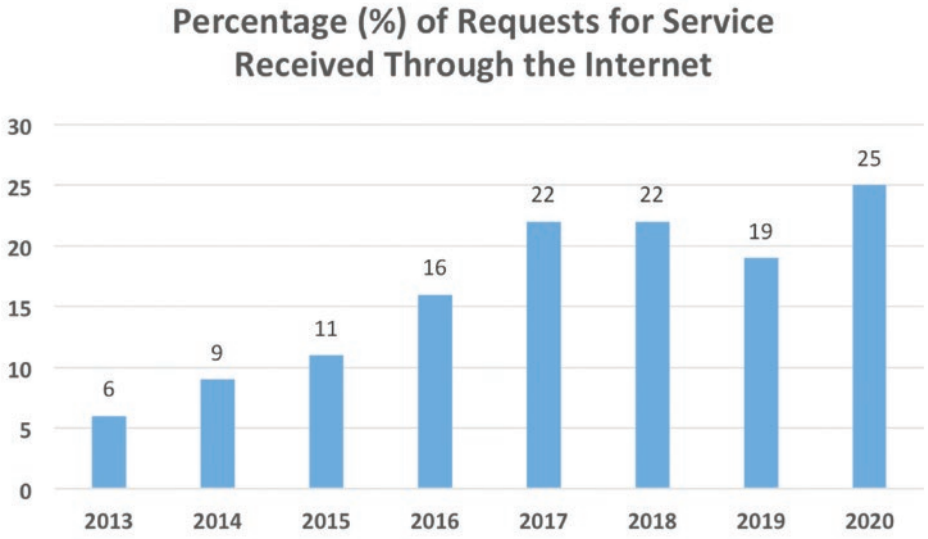
The District provides an on-going educational program aimed at “rental property management professionals” regarding bed bugs and other vector issues. The goal is to be an educational resource to help rental property owners, property managers, tenants, and Alameda County residents to effectively respond to vector issues, such as bed bug infestations in rental housing. Staff provided three educational presentations via Microsoft Teams to Alameda Housing Authority and their client landlords and property managers.

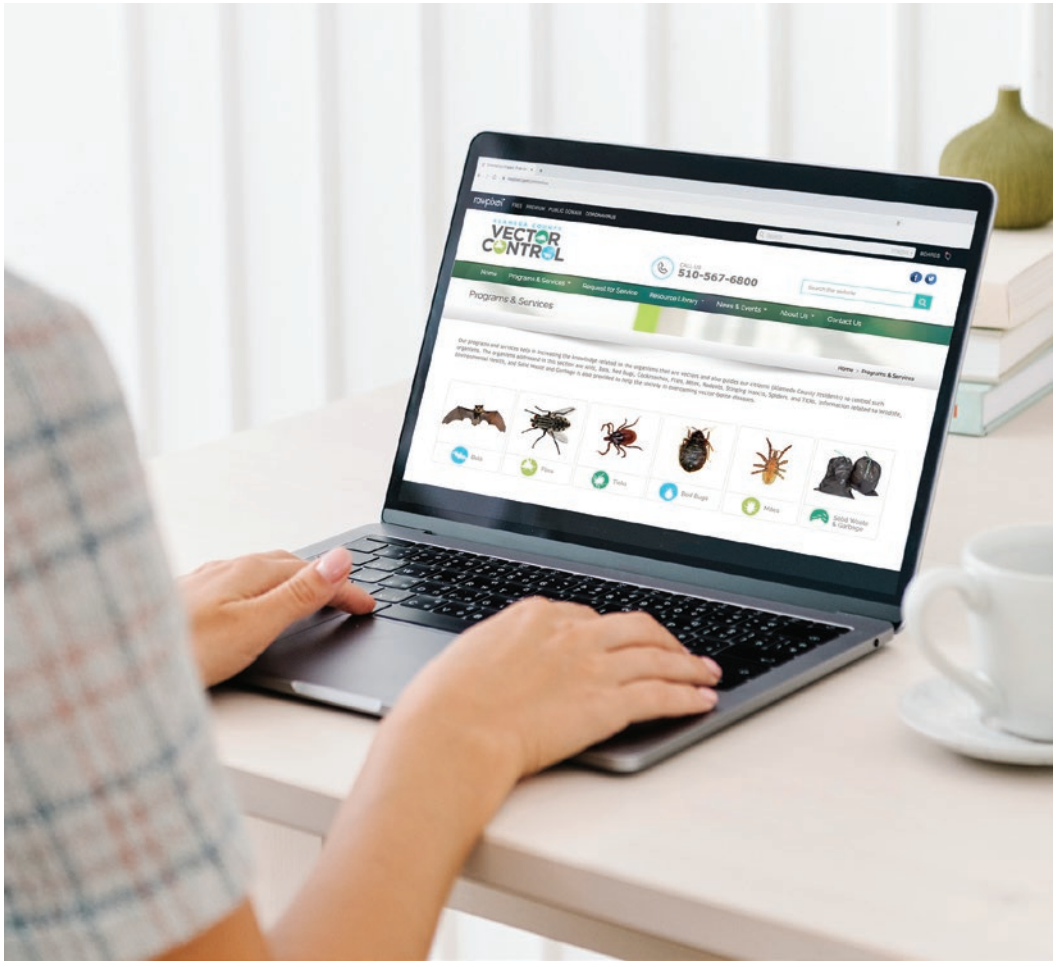
In addition, staff provided a virtual tour of our laboratory and our live animal displays. This involved nearly a dozen Vector Control Biologists and was a delightful educational experience for the attending classes. Other presentations were given live to the Fremont Garden Club and Health Care for Homeless Staff, and a virtual presentation was given to a permaculture class at Merritt College.

Mussel Quarantine (due to dangerous levels of paralytic shellfish poisoning [PSP] toxins) signs 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. Because we have the same mussel quarantine during the same timeframe every year (May 1st through October 31st) , our Community Relations Coordinator designed new, multi-language, mussel quarantine signs that were made for permanent posting. This should result in long-term cost and labor savings.

## Request for Service from District Website

In 2013, the District made an important modification to its website by creating the ability to submit a request for service online. In our expanding digital age this important adaptation was necessary and done to extend our outreach to the public. It also helped alleviate the bottleneck of thousands of phone calls received annually. In the seven years since its inception and peaking in 2020, this new feature now accounts for one quarter of all the requests for service received by the District.




# Integrated Pest Management

The District participates in a countywide *Integrated Pest Management* policy set in place by the Board of Supervisors. Most of the District's 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 ACVCSD 2020

| Pesticide | Manufacturer | Formulation | Target Pest | Amount Used | Applications |
|---|---|---|---|---|---|
| Contrac Blox | Bell Labs | 1 oz Block | Domestic Rodents | 1 lb | 4 |
| Contrac Meal | Bell Labs | Meal | Domestic Rodents | 568 oz | 2 |
| Contrac Pellets | Bell Labs | Pellets | Domestic Rodents | 730 oz | 16 |
| Contrac Super Blox | Bell Labs | 8 oz Block | Domestic Rodents | 1,088.25 lbs | 142 (# of census tracts) |
| Delta Dust | Bayer Environmental Science | Insecticidal Dust | Fleas/ Yellowjackets/ Wasps | 9.5 oz | 7 |
| Drione Dust | Bayer Environmental Science | Insecticidal Dust | Yellowjackets/ Wasps | 238.61 oz | 238 |
| EcoEXEMPT Wasp & Hornet Killer | Prentiss | Aerosol Spray | Yellowjackets/ Wasps | 30 oz | 15 |
| Maxforce Roach Gel Bait | Bayer Environmental Science | Gel | Cockroaches | 112.22 oz | 95 |
| Maxforce Large Roach Bait Stations | Bayer Environmental Science | Stations | Cockroaches | 8 Stations | 1 |
| ProVerde Wasp & Hornet Killer | Envance Technologies | Aerosol Spray | Yellowjackets/ Wasps | 41 oz | 22 |
| Prescription Treatment Brand P. I. | Whitmire | Aerosol Spray | Yellowjackets/ Wasps | 21.55 oz | 21 |
| Prescription Treatment Brand Wasp Freeze | Whitmire | Aerosol Spray | Yellowjackets/ Wasps | 43.2 oz | 4 |
| PT Wasp Freeze II | BASF | Aerosol Spray | Yellowjackets/ Wasps | 85.5 oz | 40 |
| Victor Poison-free Wasp & Hornet Killer | Woodstream | Aerosol Spray | Yellowjackets/ Wasps | 58.5 oz | 31 |
| Wasp-X | Wellmark International | Aerosol Spray | Yellowjackets/ Wasps | 0.5 oz | 1 |

** One rodent application is one day of rodent sewer inspecting and baiting. The total number of sewers inspected in 2020 were 8,109.*

# 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 2020, the City of Berkeley Environmental Health Division, Vector Control Program, responded to and investigated a total of (340) service requests and complaints in the following categories: rodents (212), vegetation overgrowth (13), field services for sewer inspections and baiting (56), wildlife (12), venomous and miscellaneous arthropods (43), nuisance abatement (21), sewage (3), neighborhood block surveys (7), waterfront surveys (10), park surveys (7), and general surveys (1). The City also participated in three community events.

## Pesticide Use for Berkeley 2020

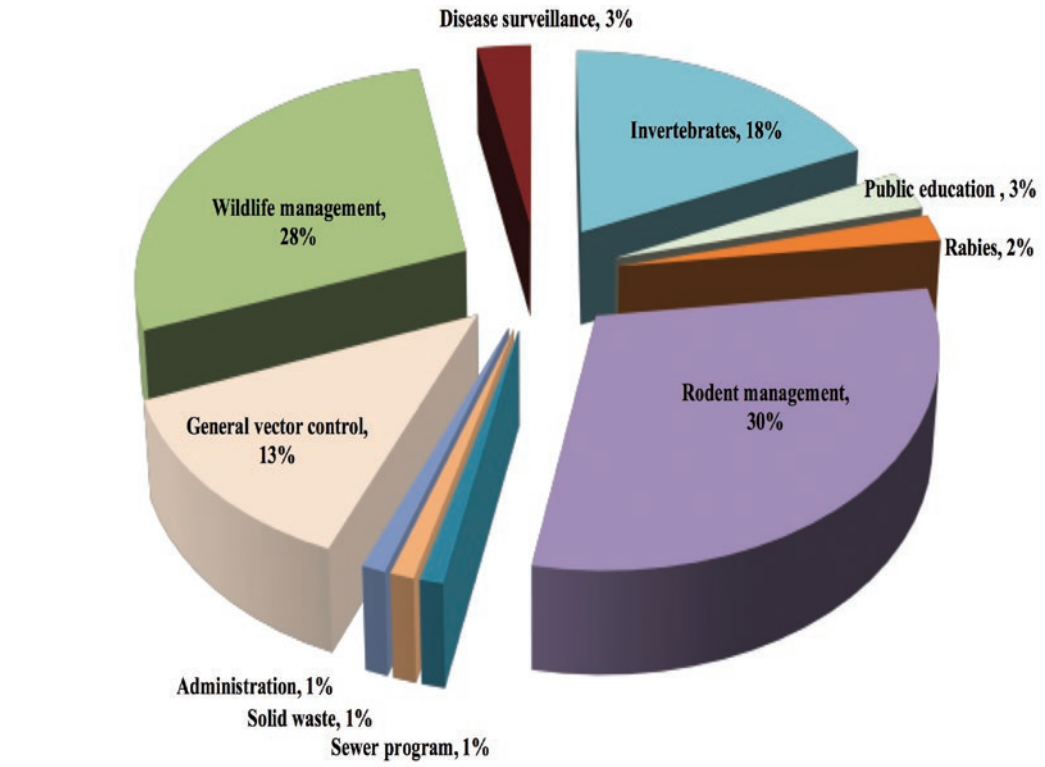
| Pesticide | Manufacturer | Formulation | Target Pest | Amount Used | Applications |
|---|---|---|---|---|---|
| Contrac Blox | Bell Labs | Solid Block | Norway Rats | 320 oz | 37* |
| Spectracide | Chemsico | Aerosol Insecticide | Yellowjackets | 2 oz | 1 |

**** Total number of sewers inspected and baited were 56.***

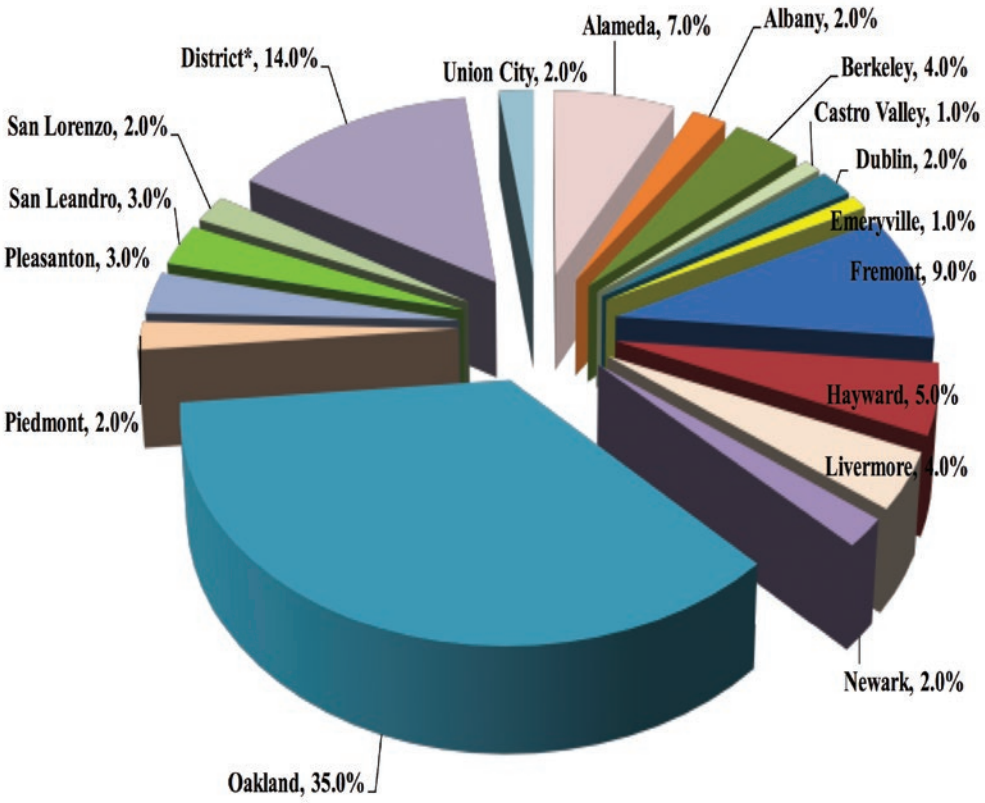


# ACVCSD: Funding and Services

## Services by Program, 2020

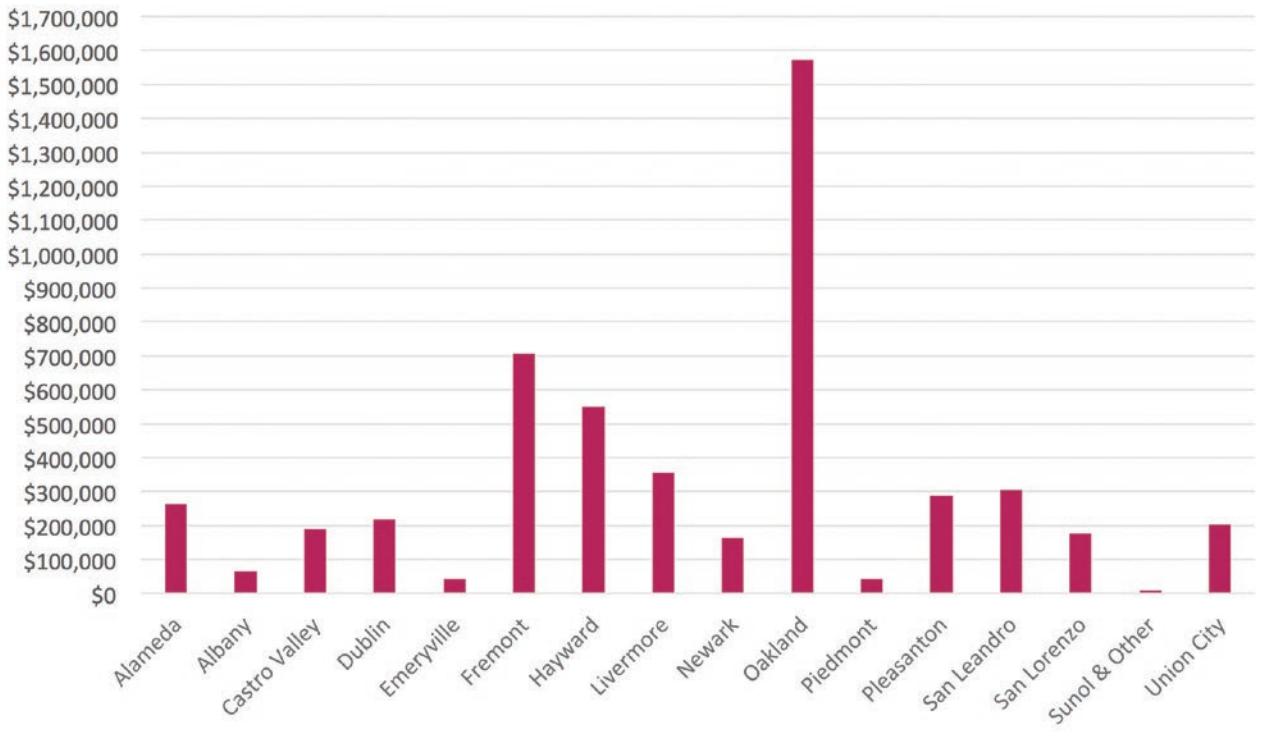



## Total Services Provided to Cities, 2020

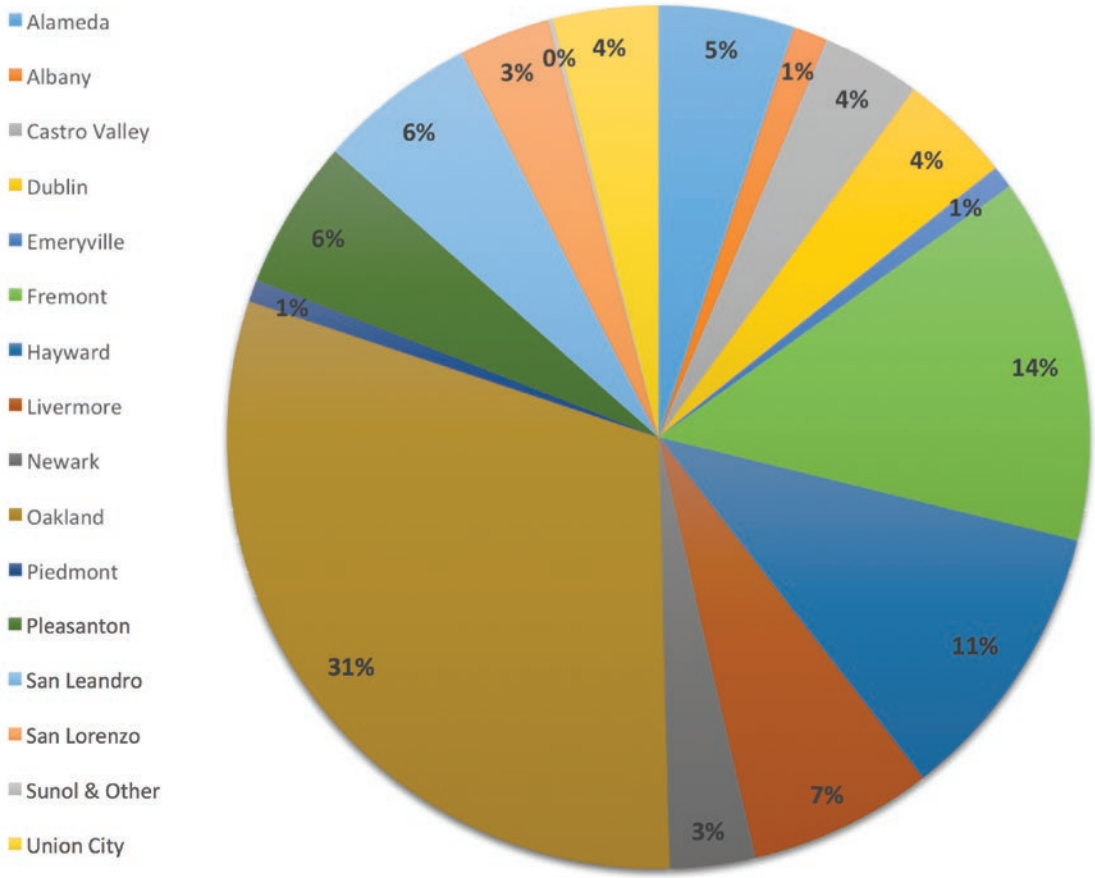



** District initiated includes disease surveillances and services to Sunol and Berkeley.*

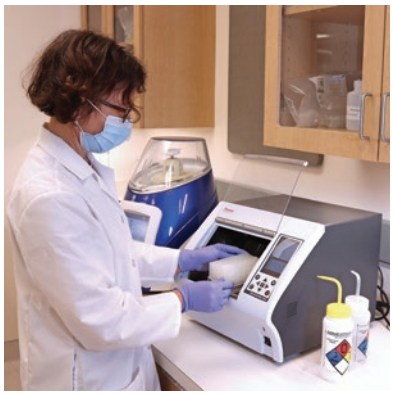
## Funding Measure Revenue Totals by City, FY 2019-20




## Funding Measure Revenue Percentages by City, FY 2019-20



# CSA Vector Control Benefit Assessment



The Board of Supervisors annually reviews the planned operations and budgets, and the corresponding proposed rate of assessment and then conducts a public hearing to establish the assessment for the upcoming fiscal year. Funding for vector services comes from two funding sources described below.

Established in 1984, the CSA Vector Control Benefit Assessment (Initial Benefit Assessment) created a rate formula and methodology primarily based on land/property use as classified by the Assessor's Office.

Established in 2007, the Vector and Disease Control Assessment (Secondary Benefit Assessment) created a rate formula and methodology determined by several factors including the ratio of population density factors in relation to the usage density for different types of property. The following table depicts some of the differences between the two rate calculation methods.

Both funding sources are levied and collected at the same time and in the same manner as the general county property taxes. These levies are subject to the same fines, penalties, and forfeiture as property taxes.

## 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 | 2 BUs | 0.08 BUs (per 10 acres) |
| Multiple Residential (5+ units) | 5 BUs | 0.32 BUs |
| Large Commercial (Hotels, Mobile Home Parks) | 5 BUs | 0.5 BUs (per 1/4-acre increments) |

## Benefit Assessments, FY 2019-2020

| 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 | $5.08/3.10 |
| Vacant Land Parcel | 5.92 | 7.20 | 1.27 |
| Multiple Residential Small (2-4 units) | 11.84 | 14.40 | 2.34[1] |
| Commercial, Industrial | 11.84 | 14.40 | 2.54[4] |
| Large Rural Property (10+ acres) | 11.84 | 14.40 | 0.41[3] |
| Multiple Residential (5+ units) | 29.60 | 36.00 | 1.63[2] |
| Large Commercial (Hotels, Mobile Home Parks) | 29.60 | 36.00 | 2.54[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 $.41 for 10 acres.*
*4. These estimates are based on per 1/4-acre increments.*


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

| 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 |
| 2018-19 | 10.00 | 1.28 | 11.28 |
| 2019-20 | 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)*

ALAMEDA COUNTY
VECTOR CONTROL

1131 Harbor Bay Parkway, Ste. 166
Alameda, CA 94502 • (510) 567-6800 • www.acvcsd.org

Alameda County Department of Environmental Health