ALAMEDA COUNTY

VECTOR CONTROL

ANNUAL REPORT 2019

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 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 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 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, 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 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.

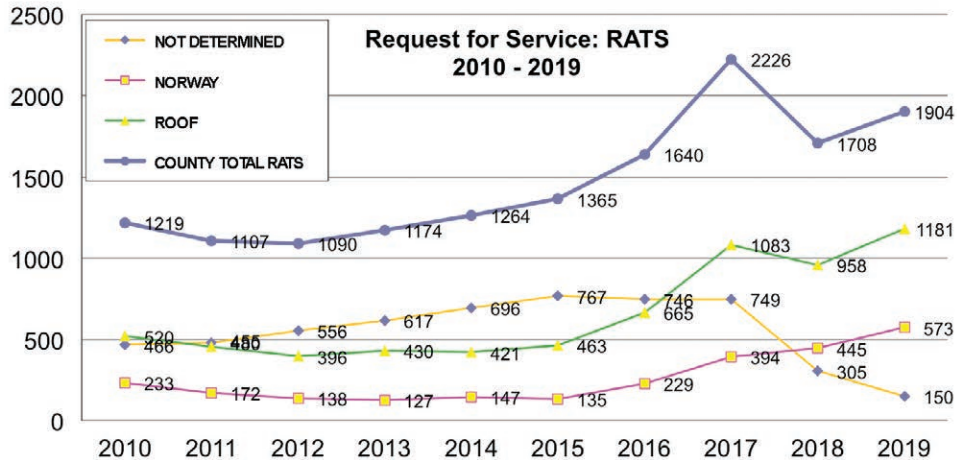
In January of 2008, SCI Consulting surveyed a sample of residents in Emeryville and Fremont; results from both cities were favorable for creating a new benefit assessment that would permit the CSA to provide vector services. In March, 2008, the BOS authorized the CSA to proceed with an application to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

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 2019, the District received 2,350 requests for service (1,961 rats, and 389 mice) from the public for domestic rodents, representing 34.8% of all service requests. Those 2,350 rodent service requests lead to staff biologists performing 15,756 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 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 2019, staff biologists found 42 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 2019, a total of 8,422 sewer inspections were made in Oakland. Those sewers in Oakland that had active rodent activity totaled 1,914 and they were treated with a Contrac rodenticide bait.

Wildlife Management Programs

In 2019, the District responded to 2,119 service requests concerning wildlife, and those service requests lead to staff performing 13,835 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 (raccoons and skunks) that account for the most wildlife service requests.

Raccoons

In 2019, the District responded to 542 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.

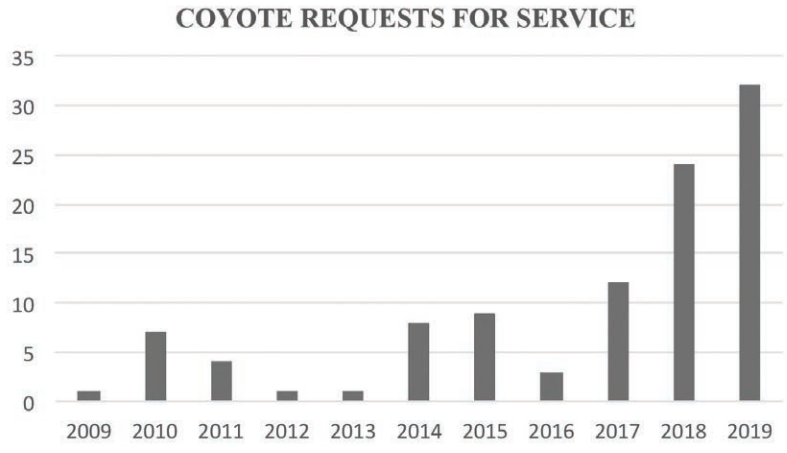
Young raccoons are generally born in April/May. Female raccoons readily nest and care for the young in attics and crawlspaces. This can result in urine and feces accumulating inside homes, creating an objectionable odor and a public health risk. These situations account for the second most common service 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 most common wildlife-related service request in 2019, totaling 577 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 Coyote Service Requests

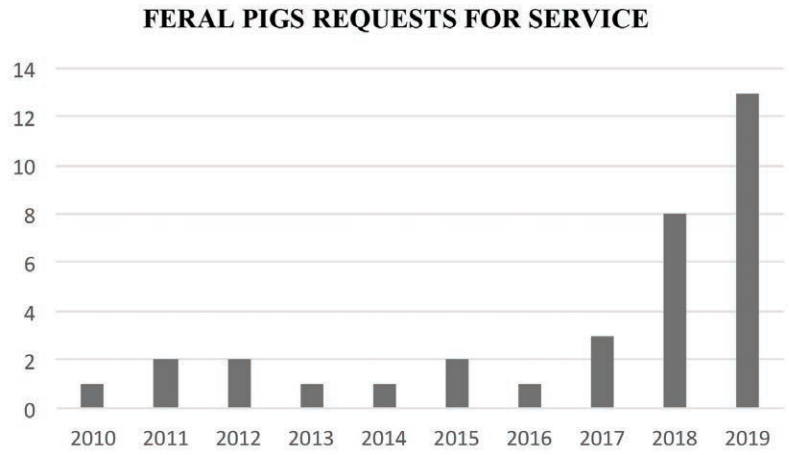
Over the last two years the Alameda County Vector Control Services District has seen a significant increase in the number of requests for service for coyotes, with 2019 being a peak year. Most of these calls are simply reporting sightings, but in some cases, pets have been taken. The District's primary response is 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 California Fish and Wildlife Service and report their incident with coyotes, as the State has the management authority over these animals.

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. In 2019, 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 it with native or drought tolerant landscaping. These calls are referred to the District's U.S. Department and Agriculture Wildlife Specialist, who works closely with the impacted community to remove these destructive animals.



Mosquito Surveillance Programs

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

In 2019, staff biologists received 3 mosquito related service requests from Albany residents, and another 28 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 2019, a total of 176 trap nights were performed, 478 female mosquitoes were captured, and 309 were tested for WNV.

Three new components were added to the program in 2015 and continued into 2019. 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 deliver them back to the District laboratory for genetic testing for WNV. In 2019, no dead birds were reported to the District from the City of Albany, although four were tested from other parts of the County. 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 2019, 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. "AGO" traps (autocidal gravid oviposition traps) were deployed to detect eggs laid by the female *Aedes* mosquitoes and no *Aedes* eggs were found in 2019.

In 2019, there were no positive mosquito pools or dead birds in Alameda County.

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. The District received 878 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. In addition, the District has an agreement with the East Bay Regional Park District (EBRPD) to control ground nesting yellowjackets within county parks. In 2019, the District responded to 426 venomous wasps (a 29% increase from 2018) and 108 honeybee complaints.

Miscellaneous Arthropod Programs

In 2019, the District responded to service requests on a variety of nuisance pests such as ants (29), cockroaches (313), flies (69) and fleas (58) 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 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 214 bed bug service requests in 2019. 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 2019, no 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 eighteen (18) cases of swimmer's itch reported at Shadow's Cliff in Pleasanton from the middle 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 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 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.

Vector Control Field Services – 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. Our 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	N	# w/ Fleas	# of Fleas	Flea Species	Flea Index	Tick Species
SYLVATIC RODENTS						
Pinon Mouse *Peromyscus truei*	24	3	3	*Opisodasys keeni*	0.12	6x larval *Dermacentor occidentalis*
Deer Mouse *P. maniculatus*	4	0	0		0.0	
Pocket mouse *Chaetodipus californicus*	1	0	0		0.0	
Meadow Vole *Microtus californicus*	2	2	4	*Malaraeus telchinum*	2.0	83 larval *Dermacentor occidentalis*
Dusty footed wood rat *Neotoma fuscipes*	1	1	22	*Orchopeas sexdentatus* (19) *Opisodasys keeni* (3)	22	1x nymph *Ixodes pacificus*
California ground squirrel *Otospermophilus beecheyi*	20	18	128	*Oropsylla montana* (116) *Hoplopsylla anomalus* (7) *Echidnophaga gallinacean* (4) *Ctenocephalides felis* (1)	6.4	*Dermacentor occidentalis* – 2 nymphs, 1 larva
Roof rat *Rattus rattus* (sylvatic)	2	2	2	*Orchopeas leucopus* *Orchopeas sexdentatus*	1.0	No ticks found
COMMENSAL RODENTS						
Roof Rat *Rattus rattus*	31	4	7	*Leptopsylla segnis* (5) *Hoplopsylla anomalus* (2)	0.22	No ticks found
Norway Rat** *Rattus norvegicus*	28	22	119	*Nosopsylla fasciatus* (7) *Ctenocephalides felis* (110) *Hoplopsylla anomalus* (2)	4.25	No ticks found
WILDLIFE						
Raccoon *Procyon lotor*	6	4	20	*Ctenocephalides felis* (13) *Pulex simulans* (7)	3.3	
Opossum *Didelphis virginiana*	11	9	459	*C. felis* (446) *Pulex simulans* (5) *Malaraeus telchinum* (2)	38.8	
Striped skunk *Mephitis mephitis*	2	1	41	*Pulex simulans* (40) *C. felis* (1)	20.5	
Gray fox *Urocyon cinereoargenteus*	4	4	115	*C. felis* (30) *Pulex simulans* (83) *Echidnophaga gallinacean* (2)	28.7	2 adult *Dermacentor variabilis*, 1 adult *Ixodes pacificus*
Coyote *Canis latrans*	2	2	245	*Pulex simulans* (240) *C. felis* (3) *Cediopsylla inaequalis* (1) *Megarthroglossus sp.* (1)	122	58 adult *Ixodes pacificus*, 14 adult *Dermacentor variabilis*
Feral pig *Sus scrofa*	7	2	7	*Pulex simulans*	1.0	1x adult *Ixodes pacificus*, 1x adult *Dermacentor variabilis*, 48x adult *D. occidentalis*
Jack Rabbit *Lepus californicus*	6	0	0		0	42 nymphal *Haemaphysalis leporispalustris* (Rabbit tick)

**Norway rats collected from homeless encampment not included. See homeless rat project section

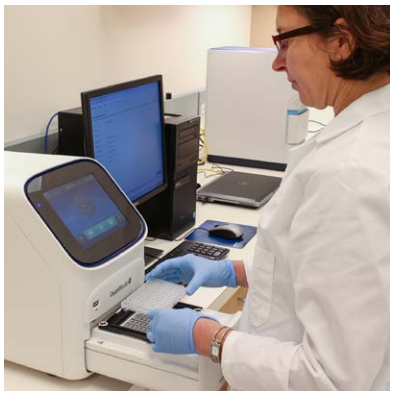
Table 1. Ectoparasites (fleas and ticks) collected from commensal and sylvatic rodents in urban and sylvatic areas (excluding rodents from homeless encampments).

Hantavirus Cardiopulmonary Syndrome (HCPS)

Hantavirus Cardiopulmonary Syndrome (HCPS) was first recognized in 1993; it is a severe, and sometimes fatal, 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.

Ten hantavirus (SNV) surveys were conducted in 2019. Nine sites were surveyed which included three East Bay Regional Parks, one residential site, two city parks and three public open spaces. Of all the rodents tested, only one Meadow vole from Pleasanton tested positive for Hantavirus (SNV).



The 2019 sites surveyed were:

East Bay Regional Parks

Garin Regional Park in Hayward: Three (3) Deer mice (*Peromyscus maniculatus*), two (2) Pinyon mice (*Peromyscus truei*), one (1) California mice (*P. californicus*) and one Harvest mouse (*Reithrodontomys megalotis*) were collected and tested. All mice were negative for Hantavirus (SNV).

Pioneer Dry Creek Regional Park in Hayward: Three (3) Pinyon mice (*P. truei*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).

Leona Heights Regional Park in Oakland: Four (4) Pinon mice (*P. truei*) were trapped and tested for Hantavirus (SNV). All mice were negative for Hantavirus (SNV).

Risk Assessment Surveys

Joaquin Miller Park, City of Oakland: One (1) Deer mouse, three (3) Pinyon mice and one (1) Harvest mouse were trapped and tested for hantavirus (SNV). All mice were negative for Hantavirus (SNV).

North Oakland Sports Centre, City of Oakland (two surveys): Five (5) Pinyon mice, two (2) Harvest mice and one Pocket mouse (*Chaetodipus californicus*) were trapped and tested for hantavirus (SNV). All mice were negative for Hantavirus (SNV).

The Preserve (Moller Ranch) in Pleasanton: Seven (7) Pinyon mice were trapped and tested for hantavirus (SNV). All mice were negative for Hantavirus (SNV).

Serenity Terrace, Pleasanton: Two (2) Pinon mice and one (1) Meadow vole (*Microtus californicus*) were trapped and tested for Hantavirus (SNV). One Meadow vole tested positive for Hantavirus (SNV).

Golf Links Road Open Space, Oakland: Fifteen (15) Pinyon mice were trapped and tested for hantavirus. All mice were negative for Hantavirus (SNV).

Livermore residential property (risk assessment): One Deer mouse and two House mice (*Mus musculus*) were trapped. Recommendations were provided to the homeowner for control, rodent proofing and clean-up.

Note: Testing was conducted by California Department of Public Health, Richmond, CA

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, the United States Center for Disease Control and Prevention (CDC) reported 8 cases of infection with Seoul virus in the states of Wisconsin (n=2) and Illinois (n=6). 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.

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, 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 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 2019 and will continue for the foreseeable future. Staff biologists conducted twenty six (26) separate trapping events at fifteen (15) different homeless encampments around the City of Oakland and Berkeley.

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 (especially 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 2019 at five 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 encampments.

Different Homeless Encampments Surveyed	Separate Trapping Events	Norway Rats Trapped	Fleas Collected for Disease Testing	Rodenticide Applications for Norway Rat Suppression
15	26	608	646	6

Table 2. Homeless encampment data.

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

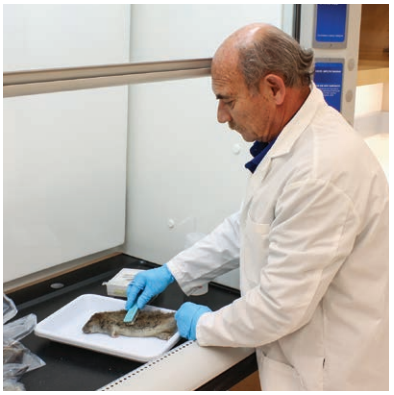
The Alameda County Vector Control Services District began a surveillance program looking at the disease prevalence found within the cat flea (*Ctenocephalides felis*) and the Oriental rat flea (*Xenopsylla cheopis*) from different host animals throughout the County in 2019.

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 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 fleas and associated rodent hosts in Alameda County.


Cat Flea

Flea-borne Typhus Surveillance

Rickettsial 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 Sates most cases occur in Texas, Hawaii and California, with approximately 300 human cases per year.



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. In 2019, our District tested 1,257 total fleas as 456 "pools" (groups of five), and found that 80 pools tested positive for *Rickettsia felis*.

NORWAY RATS. Because of the close association Norway rats have with humans, considerable focus has been given to the testing of fleas from these animals. We collected cat fleas (*Ctenocephalides felis*), Oriental rat fleas (*Xenopsylla cheopis*), northern rat fleas (*Nosopsyllus fasciatus*), *Pulex simulans* fleas, and house mouse fleas (*Leptopsylla insignis*) found on Norway rats that were trapped from 15 homeless camps in Oakland and Berkeley. Although Oriental rat fleas comprised the greatest number of pools tested, it was the common cat flea that showed the highest rates of infection.

Flea Species	Number of Fleas	Total Number of Flea Pools (5 fleas/pool)	Number of Positive Flea Pools	Minimum Infection Prevalence (%)
Xenopsylla cheopis	327	134	10	3.0
Ctenocephalides felis	88	48	7	8.0
Nosopsyllus fasciatus	226	112	4	1.7
Pulex simulans	7	5	0	0
Leptosylla segnis	5	4	0	0

Table 3. Flea pools from Norway rats tested for Rickettsia felis.

OTHER ANIMALS. Additionally, fleas collected from raccoons, opossums, skunks, Grey foxes, Red foxes, ground squirrels, tree squirrels, coyotes, roof rats, feral pigs, white-tail deer, and dogs were tested for the presence of *Rickettsia*. Sick, injured, or nuisance raccoons, opossums and skunks were trapped from several locations within the County and combed for ectoparasites, especially fleas and ticks. Cat fleas from a dog were collected from a live animal, and other animals such as coyotes and deer were roadkill specimens that came from local animal control agencies. Once the fleas are collected, they are sorted by species and then tested using standard molecular techniques for the presence of *Rickettsia*. Opossums produced the greatest number of flea pools and showed a minimum infection prevalence of 15.4%.

Flea Species	Number of Fleas	Total Number of Flea Pools (5 fleas/pool)	Number of Positive Flea Pools	Minimum Infection Prevalence (%)
FROM RACCOONS				
Ctenocephalides felis	49	14	6	12.2
Pulex simulans	37	11	3	8.1
FROM OPOSSUMS				
Ctenocephalides felis	293	66	45	15.4
Pulex simulans	13	3	0	0
FROM SKUNKS				
Pulex simulans	48	11	1	2.0
FROM GREY FOXES				
Ctenocephalides felis	10	7	2	20
Pulex simulans	43	10	0	0
Echidnophaga gallinacean	2	1	0	0
FROM RED FOXES				
Pulex simulans	38	8	0	0
FROM GROUND SQUIRRELS				
Osopsylla montanus	26	7	0	0
FROM TREE SQUIRRELS				
Osopsylla montanus	4	2	0	0
FROM COYOTES				
Ctenocephalides felis	3	1	0	0
FROM ROOF RATS				
Leptosylla segnis	5	3	0	0
FROM FERAL PIGS				
Pulex simulans	9	3	0	0
FROM WHITE-TAIL DEER				
Pulex simulans	20	4	0	0
FROM DOGS				
Ctenocephalides felis	4	2	2	50

Table 4. Flea pools from Animals tested for Rickettsia felis other than Norway rats.

In 2019, we have found *Rickettsia felis* in fleas from animals collected from the following cities: Alameda, Oakland, Hayward, Union City, Emeryville, and Berkeley. However, no recent reports of flea-borne rickettsioses are known from Alameda County.

Tick Surveillance Program

Tick-borne diseases threaten the health of people. For over 20 years the District has conducted countywide tick surveillance program concurrently with the surveillance for pathogens in ticks that may cause disease in humans. In 2019, a total of 606 adult and 851 nymphal *Ixodes pacificus* ticks, 12 nymphal *Ixodes spinipalpis* ticks, 408 *Dermacentor occidentalis* adult ticks, and 21 *Dermacentor variabilis* adult ticks were collected from six regional parks, three city parks and selected open spaces.

Ixodes pacificus Tick Surveillance

Ixodes pacificus (*I. pac.*) or the Western blacklegged tick is the primary vector of Lyme disease, which is caused by the bacterium *Borrelia burgdorferi*. It is also a 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. In 2019, 22 sites in six East Bay Regional parks and two city parks were selected for surveillance based on previous data, habitat types, and the risk to humans of being bitten by an *Ixodes pacificus tick*. The ticks were collected using a standard flagging method from January through March for adult ticks and from March through July for nymphal ticks.

Location	*I. pac* Nymphs Collected	Nymphal Collection Sites	*I. pac* Adults Collected	Adult Collection Sites
Anthony Chabot Regional Park	76	1	68	1
Augustin Bernal Park, Pleasanton	20	1	92	2
Del Valle Regional Park	6	1	52	1
Garin Regional Park	16	1	0	0
Joaquin Miller Park, Oakland	341	3	120	3
Pleasanton Ridge Regional Park	351	4	153	1
Redwood Regional Park	24	1	121	1
Sunol Regional Parks	17	1	0	0
Total	851	13	606	9

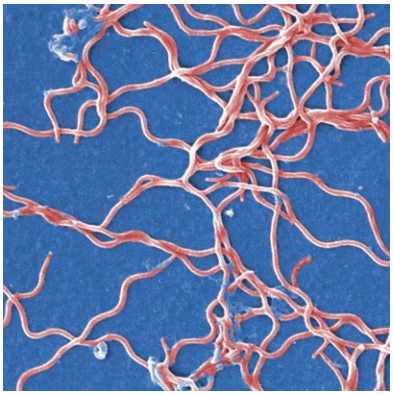


Photo: Jamice Haney Carr, Claudia Molins USCDCP

In total, 724 nymphal and 438 adult *I. pac.* ticks were tested in pools (up to 5 ticks per pool) by real-time PCR for the presence of *Borrelia burgdorferi sensu lato* (*Bbsl*) and *Borrelia miyamotoi* (*B.miy.*). The results are reported as a minimum infection prevalence (MIP) which expresses the proportion of infected ticks, assuming that only one tick in a given pool was infected. Countywide, MIP of *Borrelia burgdorferi sensu lato* and *Borrelia miyamotoi* was 2.5% and 0.9%, respectively, in adult *Ixodes pacificus* ticks and 3.0% and 1.0%, respectively, in nymphal *Ixodes pacificus* ticks.

Location	*I. pac* Adults Tested	Tick Pools	*Bbsl* Positive Pools	*B. miy.* Positive Pools	Minimum *Bbsl* Infection Prevalence in *I. pac.* Adult Ticks	Minimum *B. miy.* Infection Prevalence in *I. pac.* Adult Ticks
Anthony Chabot Regional Park	95	20	0	1	0.0%	1.1%
Augustin Bernal Park, Pleasanton	69	16	1	1	1.4%	1.4%
Joaquin Miller Park, Oakland	90	21	5	1	5.6%	1.1%
Pleasanton Ridge Regional Park	152	33	5	0	3.3%	0.0%
Recreational areas, Fremont	7	5	0	0	0.0%	0.0%
Redwood Regional Park	25	5	0	1	0.0%	4.0%
Total	438	100	11	4	2.5%	0.9%

Location	*I. pac* Nymphs Tested	Tick Pools	*Bbsl* Positive Pools	*B. miy.* Positive Pools	Minimum *Bbsl* Infection Prevalence in *I. pac.* Nymphs	Minimum *B. miy.* Infection Prevalence in *I. pac.* Nymphs
Anthony Chabot Regional Park	71	16	0	1	0.0%	1.4%
Augustin Bernal Park, Pleasanton	16	4	0	0	0.0%	0.0%
Del Valle Regional Park	30	6	1	0	3.3%	0.0%
Garin Regional Park	17	4	1	0	5.9%	0.0%
Joaquin Miller Park, Oakland	335	69	13	3	3.9%	0.9%
Pleasanton Ridge Regional Park	214	36	7	3	3.3%	1.4%
Redwood Regional Park	24	5	0	0	0.0%	0.0%
Sunol Regional Park	17	4	0	0	0.0%	0.0%
Total	724	144	22	7	3.0%	1.0%

The trails in Joaquin Miller park and Garin Regional park yielded a higher minimum infection prevalence for *Borrelia burgdorferi sensu lato* which was observed previously. An MIP of 1-3% in adult and 1-6% in nymphal *Ixodes pacificus* ticks for *Borrelia sensu lato* and an MIP of 1% in *Ixodes pacificus* adult and nymphal ticks for *Borrelia miyamotoi* are typical in our county and do not indicate an elevated level of risk.

Dermacentor Species Tick Surveillance

In 2019, the District started a surveillance for the tick-borne diseases in *Dermacentor occidentalis* and *Dermacentor variabilis* ticks. According to California Department of Public Health records, *Dermacentor 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 in late spring-early summer. During the period February-July 2019, 315 *D. occidentalis* and 19 *D. variabilis* adult ticks from four regional parks, three city parks and open spaces in five cities were tested in pools for the presence of *Borrelia* spp. and *Rickettsia* spp. pathogens using real time PCR.

Location	*D. occidentalis* Ticks Tested	Tick Pools	*Bbsl* Positive Pools	*Rickettsia* spp. Positive Pools
Anthony Chabot Regional Park	64	16	0	6
Augustin Bernal Park, Pleasanton	80	18	0	0
Del Valle Regional Park	4	1	0	0
Garin Regional Park	19	4	0	0
Joaquin Miller Park, Oakland	31	8	0	1
Pleasanton Ridge Regional Park	28	10	0	2
Sycamore Grove Park, Livermore	89	15	0	0
Total	315	72	0	9

Location	*D. variabilis* Ticks Tested	Tick Pools	*Bbsl* Positive Pools	*Rickettsia* spp. Positive Pools
Livermore, open spaces	2	1	0	0
Pleasanton, open spaces	3	2	0	0
Fremont, open spaces	1	1	0	0
Oakland, open spaces	3	3	0	0
Sunol, open spaces	10	2	0	1
Total	19	9	0	1

Nine *D. occidentalis* pools and one *D. variabilis* pool were infected with *Rickettsia* species. Sequencing 381bp of citrate synthase (gltA) gene indicated the presence of *Rickettsia massiliae* and *Rickettsia rhipicephali* in *D. occidentalis* ticks and *Rickettsia bellii* in *D. variabilis* ticks. To date, neither *R. bellii* nor *R. rhipicephali* have been associated definitively with disease in humans or animals. *Rickettsia massiliae* can infect humans and it was found previously in Southern California. Further investigation is needed to fully understand the distribution of *Rickettsia* spp. in *Dermacentor occidentalis* and *Dermacentor variabilis* ticks.

Pacific Coast Tick Fever Case

In August of 2019, the District received notification from the California Department of Public Health that a resident of the City of Oakland tested positive for a rare tick-borne disease, Pacific Coast tick fever. This pathogen is transmitted by the Pacific Coast tick, *Dermacentor occidentalis*, and the causative agent of the disease is *Rickettsia philipii*. 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 of healthy skin). The exact location of where the Oakland resident acquired the pathogen is not known with 100% certainty, however it is believed to be an

Oakland city park in a suburban neighborhood. District staff have done extensive tick surveillance and rodent trapping at this park, and have not collected any tick samples.

Downslope movement study of adult ticks, *Ixodes pacificus* and *Dermacentor occidentalis*

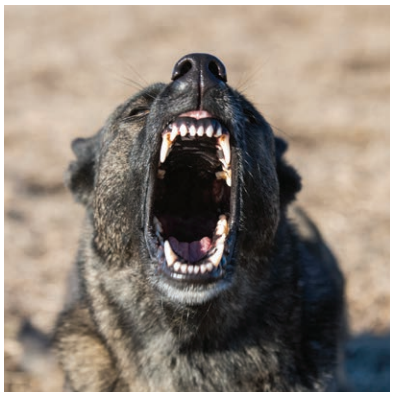
A three-year mark and recapture study to determine if adult ticks move downhill from uphill areas to trail margins and if the trail acts as a barrier to further movement was presented at the MVCAC conference in 2019 and published in their proceedings.

A percentage of the 506 marked *I. pacificus* females (3.6% – 5.5%) and 453 marked males (0.35% – 0.87%) did travel down slope (30m) to the trail margin. A higher percentage of the 163 marked *D. occidentalis* were recaptured, 18.5% females and 7.3% males.

This study demonstrated that *I. pacificus* transverse the downslope at 0.9 m/day and *D. occidentalis* at 0.7 - 3m/day. Five *D. occidentalis* marked in 2017 and recaptured in 2018 indicated that they survived through to the next season. We also demonstrated adult *I. pacificus* and *D. occidentalis* move downhill towards the trail margin. And that ticks do not readily cross the trail which explains, in part, why more ticks are found on the uphill margins of trails.

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 179 animal heads, including bats, cats, dogs, foxes, opossums, raccoons, and skunks to the ACPHL for rabies testing in 2019. Seven (7) bats collected from Hayward (3), Pleasanton, Fremont, Sunol and Livermore tested positive for the rabies virus. The ACPHL also reported that one bat (**) 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	70	7	78
Cat	38	0	38
Dog	21	0	21
Fox	6	0	6
Oppossum	5	0	5
Raccoon	9	0	9
Skunk	22	0	22
Total	171	7	179

** ***One bat sent in for testing had inconclusive results.***

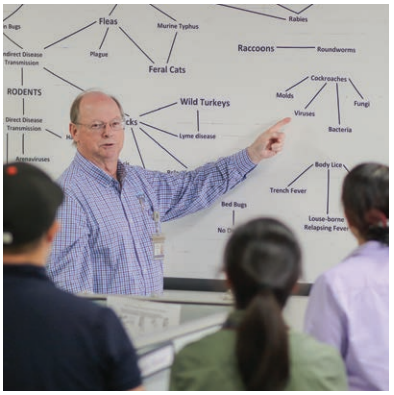
Public Information and Educational Activities

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 our outreach program to the public and our ethnically diversified 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 and continued to enhance and update during 2019. 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 rental property owners, property managers, tenants and the Alameda County public to effectively respond to the bed bug infestations in housing. Staff provided bed bug educational presentations at two senior homes, where bed bugs have become a problem.

The District provided 25 vector management educational training sessions to other statewide and local organizations. Of these, six district staff spoke about District research and projects at the Mosquito and Vector Control Association of California’s (MVCAC) 2019 Annual Conference to over five hundred attendees. Our staff also presented at the Northern California Parasitology Conference, Cal State Hayward, as well as providing three days of training for Santa Clara County Vector Control on wildlife, and rodent control at homeless encampments.



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. Our Community Relations Coordinator designed new, multi-language, mussel quarantine signs that were made for permanent posting, since every year we have the mussel quarantine, during the same timeframe (May 1st thru October 31st). This should result in long-term cost and labor savings.

Community Events Programs

Over forty-two days of community events were attended by staff biologists, including city fairs, health events, schools, and organizations throughout the county. Among them were the Fremont Earth Day, Eden Area Ag Day event, San Leandro Cherry Festival, Citizens Academy, 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, and many other local venues. The staff biologists also provided educational support at the District’s booth during the twenty-day, Alameda County Fair, which is the largest county fair in Northern California. The events in which we participated attracted about 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 2019, the City of Berkeley Environmental Health Division, Vector Control Program, responded to and investigated a total of (332) service requests and complaints in the following categories: rodents (93), vegetation overgrowth (3), field services for sewer inspections and baiting (198), wildlife (14), venomous and miscellaneous arthropods (97), nuisance abatement (29), sewage (4), neighborhood block surveys (6), waterfront surveys (14), park surveys (51), and general surveys (13). The City also participated in one community event.

Integrated Pest Management

The District participates in a countywide *Integrated Pest Management* policy set in place by the Board of Supervisors. Most of 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, 2019

Pesticide	Manufacturer	Formulation	Target Pest	Amount Used	Applications
Contrac Super Blox	Bell Labs	8 oz Block	Domestic Rodents	1,037 lbs	148*
Contrac Pellets	Bell Labs	Pellet	Domestic Rodents	42.63 lbs	5
Contrac Meal	Bell Labs	Meal	Domestic Rodents	44.63 lbs	4
Ditrac Tracking Powder	Bell Labs	Insecticidal Dust	Domestic Rodents	8 oz	4
Fastrac Pellets	Bell Labs	Pellet	Domestic Rodents	18 lbs	3
Drione Dust	Bayer Environmental Science	Insecticidal Dust	Yellowjackets/ Wasps	20.83 lbs	255
Delta Dust	Bayer Environmental Science	Insecticidal Dust	Fleas/ Yellowjackets/ Wasps	3.55 lbs	36
Wasp Freeze	Whitmire	Aerosol Spray	Yellowjackets/ Wasps	6.80 lbs	10
Prescription Treatment Brand P. I.	Whitmire	Aerosol Spray	Yellowjackets/ Wasps	13.70 lbs	12
Wasp-X	Wellmark International	Aerosol Spray	Yellowjackets/ Wasps	2.07 lbs	5
PT Wasp Freeze II	BASF	Aerosol Spray	Yellowjackets/ Wasps	7.21 lbs	16
Victor Poison-free Wasp & Hornet Killer	Woodstream	Aerosol Spray	Yellowjackets/ Wasps	1.13 lbs	7
EcoEXEMPT Wasp & Hornet Killer	Prentiss	Aerosol Spray	Yellowjackets/ Wasps	7 oz	5
ProVerde Wasp & Hornet Killer	Envance Technologies	Aerosol Spray	Yellowjackets/ Wasps	4 oz	3
Maxforce Roach Gel Bait	Bayer Environmental Science	Gel	Cockroaches	9.36 lbs	49
Zoecon Altosid XR-G	Wellmark International	Granule	Mosquito Larvae	14.4 oz	3

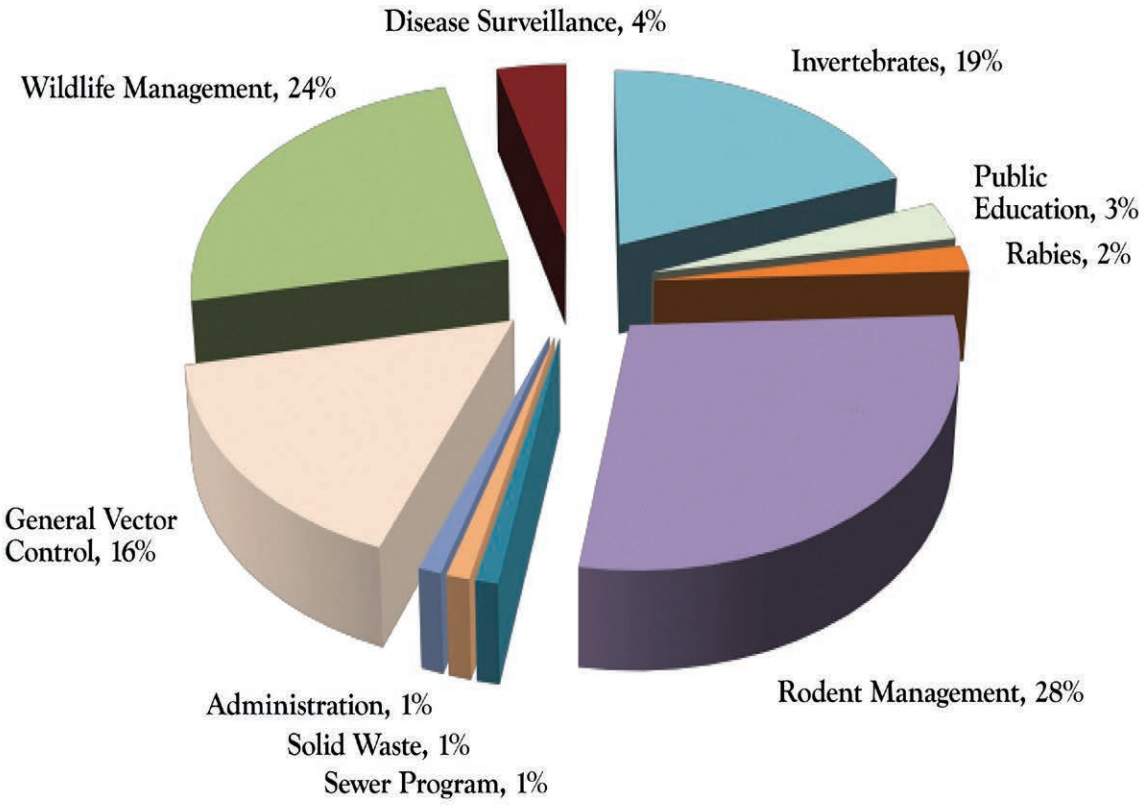
** One rodent application is one day of rodent sewer inspecting and baiting. The total number of sewers inspected in 2019 were 8,422.*

Pesticide Use for Berkeley, 2019

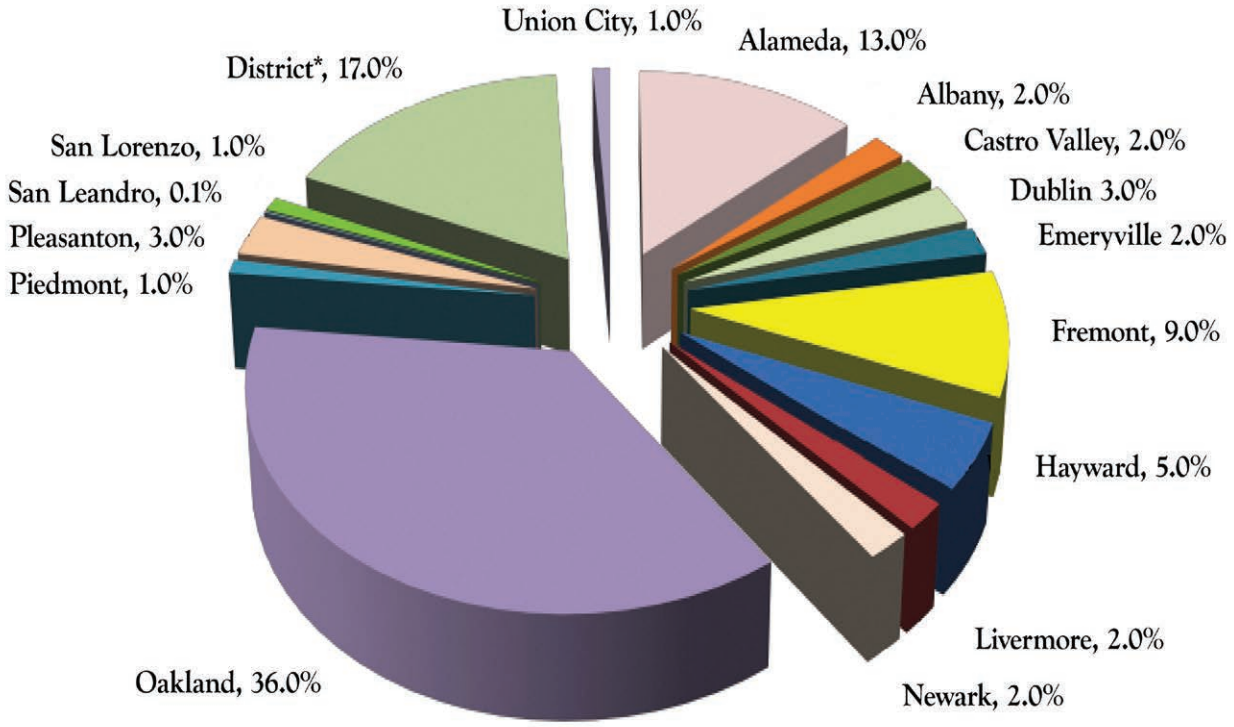
Pesticide	Manufacturer	Formulation	Target Pest	Amount Used	Applications
Bromethalin Top Gun	J.T. Eaton	Solid Block	Norway rats	39 lbs	127*
Drione Dust	Bayer	Insecticide Dust	Yellowjackets/ Wasps	2 oz	15

** Total number of sewers inspected and baited were 198.*

Services by Program, 2019

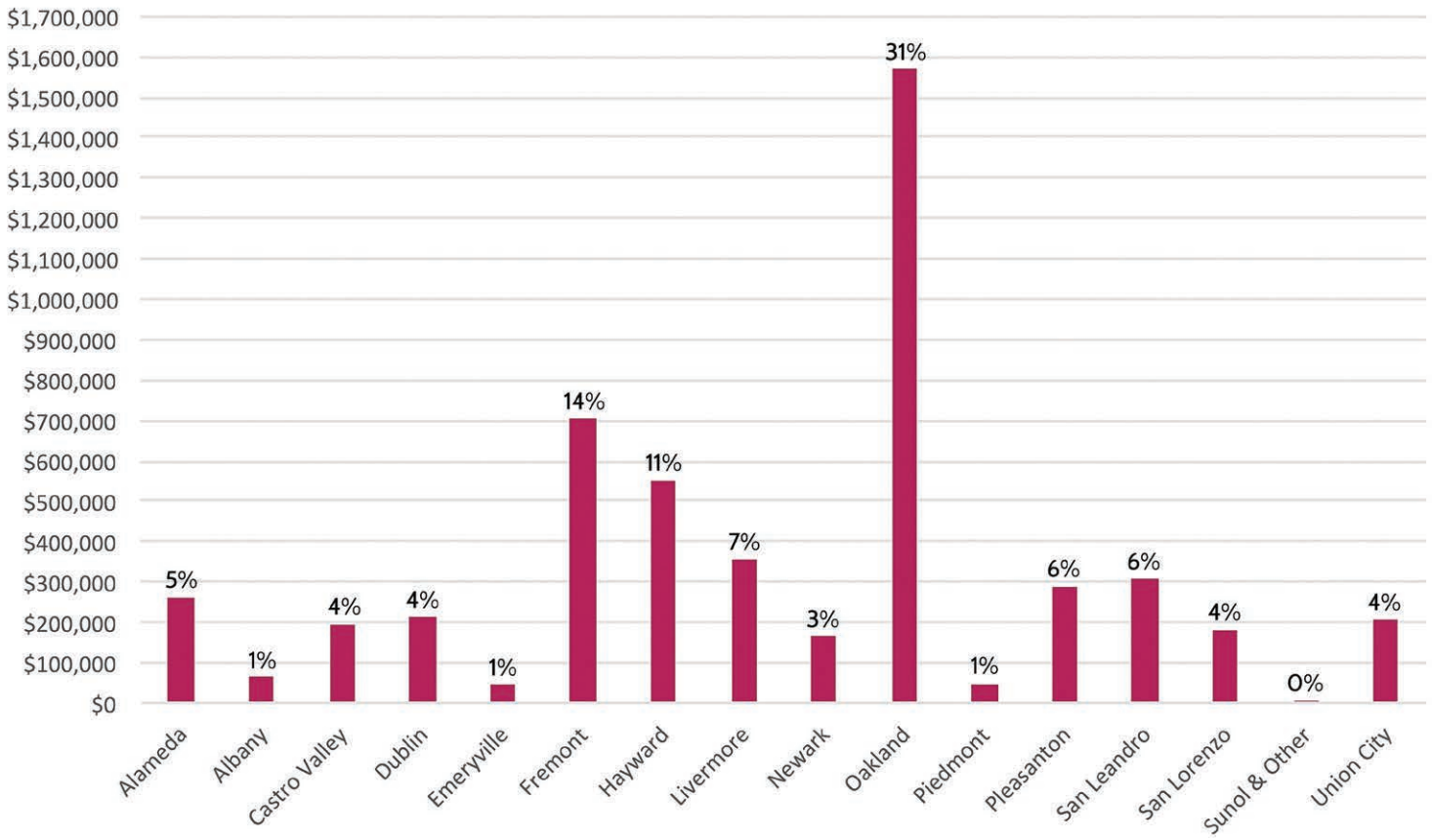


Total Services Provided to Cities, 2019



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

Funding Measure Revenue Totals 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 table below 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 2018-2019

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	1.27
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)
1984-2019

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

**Includes Oakland Supplemental (initiated 1988-89)*
***Includes Initial and Secondary Benefit Assessments*
****Includes Emeryville and Fremont (annexed 2009-10)*

ALAMEDA COUNTY
VECTOR CONTROL

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