ALAMEDA COUNTY

VECTOR CONTROL

ANNUAL REPORT 2023

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.

Introduction

This 2023 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, or "the District") was formed, explains how the assessments are calculated, and includes assessment tables since the CSA was formed in 1984.

In addition, this report includes highlights from the District's field operations as well as a summary of disease surveillance activities and our public outreach program.

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

Among the 2023 highlights were the following:

- Norway rats were detected in the City of Fremont for the first time in the District's history.
- The District collaborated with a University of California Cooperative Extension Integrated Pest Management Advisor on a "biting mite" research project.
- Laboratory staff initiated an active plague surveillance program for the first time in decades.
- On two separate occasions, West Nile virus was detected in the District's sentinel chicken flock in Livermore.
- With the COVID-19 pandemic in retreat, the County implemented a "return to the office" policy.
- District staff have initiated the task of updating and improving the District's database.

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 (especially 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 potentials.

- 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 (HCPS), 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.

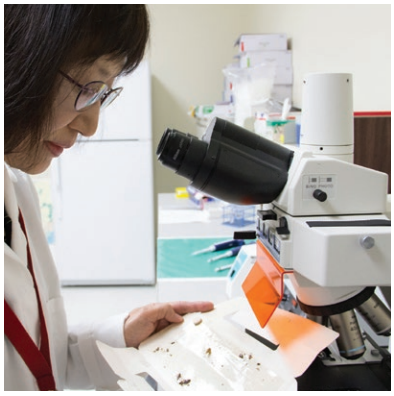
Legal Enforcement

- 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.

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 ballot 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 original 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 approval of the 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 the newly proposed Vector and Disease Control Assessment of $10 for a 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.

Since the CSA's original assessment and Emeryville and Fremont's annexation, BA rates remained at $4.08 and $10.00 per single-family residence, respectively. For FY 2019-20, the BA rates increased $1.00 to $5.08 and $11.00 per single-family residence. With BOS approval, CSA assessed $5.92 and $6.01 for basic and secondary vector control services throughout the county for FY 2022-23, an increase of $0.93 from the previous fiscal year. For Emeryville and Fremont, the assessment rate increased by $0.93 to 11.93 per single-family residence. In FY 2023-24, the CSA, with BOS approval, increased the rate for secondary vector control services by $0.19 to $6.19, while the basic rate remained unchanged at $5.92. The assessment rate for Fremont and Emeryville was raised to $12.11 per single-family residence, marking a $0.19 increase. For the 2024-25 fiscal year, the proposed rate for secondary vector control services is $6.38, reflecting a $0.19 increase from the previous year. Similarly, the proposed assessment rate for Fremont and Emeryville is set to rise to $12.30 per single-family residence, also up by $0.19. Funding for vector control services throughout the County comes from these assessments.

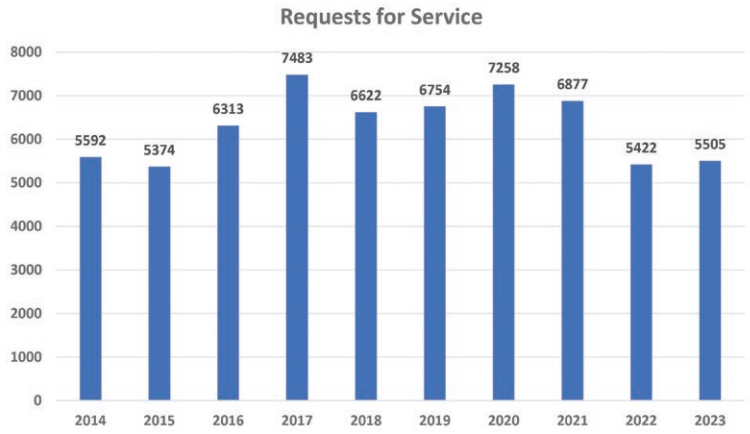
Vector Control Field Services – Operations

Requests for Service

Requests for service (RFS) numbers in 2023 were like those in 2022; there was a slight increase from 5,422 to 5,505. The 10-year average is 6,320, so 2023 would be considered a significant decrease from the District's historical trend and may represent a post pandemic pattern. In 2023, the district saw a decline in roof rat "outside" RFS and skunk RFS. In contrast, the district saw a significant increase in yellowjacket RFS. Possible reasons for this are discussed below.

There was also a similar number of actual calls to the district between these two years. In 2022, the District received 4,517 calls, and in 2023 the District received 4,658 calls. A call to the district can take the form of a direct phone call to the

receptionist, filling in an online form found on our website, an email, or an in-person report. A single call may be comprised of more than one request for service. For example, a caller may report having issues with cockroaches and mice. This represents one call and two request for service.



The Seasons of Our Local Vectors

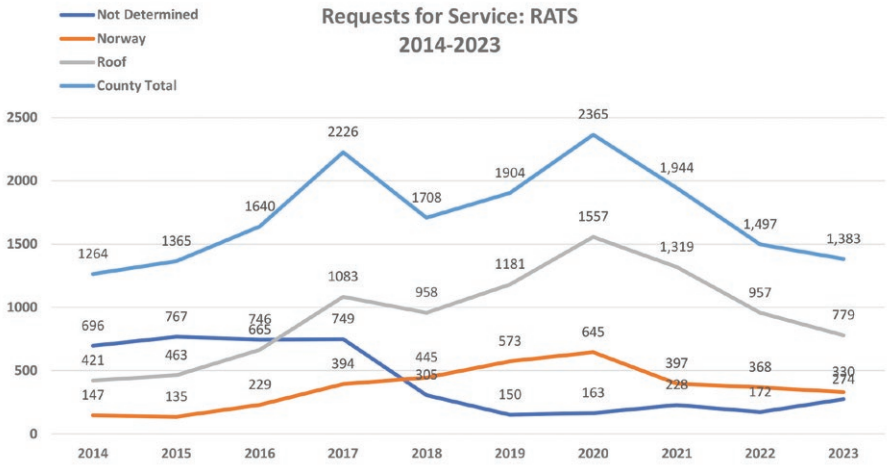
A breakdown of calls received per month and averaged over ten years (2013-2022) reveals the busiest and slowest times of the year for the District's field staff. There are two distinct peaks, one relatively small and the other large. High numbers in January are due to skunk mating season, which can extend from December through February. Even though these vectors are nocturnal and avoid people, they receive a great deal of attention because of the overpowering odor they are capable of spraying. Data show that February is the slowest time of the year, with overall vector activity steadily increasing each month until its peak in August. Warmer spring weather initiates and accelerates reproductive cycles for several vectors, including rodents, cockroaches, raccoons, fleas, and yellowjackets. Populations of several different species tend to peak towards the end of summer before declining with cooler fall temperatures. Human behavior during the summer may also impact the number of received calls, as many residents are taking time off work and spending some time at home, making interactions with vectors more likely. For our vector control biologists, July through October is clearly the busiest time of the year.

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 2023, the District received 1,684 requests for service (1,402 rats, and 282 mice) from the public for domestic rodents, representing 31.0% of all service requests. Compared to 2022, these numbers reflect a slight decrease in rat service requests and an increase in mice service requests but are

still well below the peak seen in 2020. Those 1,684 rodent service requests lead to staff biologists performing 10,914 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 items, 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 2023, staff biologists conducted 17 smoke tests and found two broken sewer laterals.

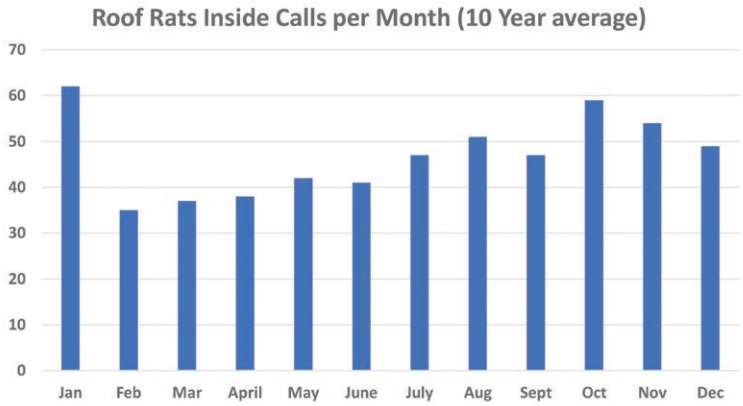
As part of the City of Oakland's supplemental assessment targeting rodent populations in sanitary sewers, staff biologists conduct weekly inspections of underground sewer access structures (manholes) for signs of rodent activity (live rats or their droppings). To control rodent populations in areas with activity, rodenticide bait blocks are suspended in sewers to allow easy access for feeding. In 2023, a total of 8,213 sewer inspections were made in Oakland. Those sewers in Oakland that had active rodent activity totaled 1,756 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 (177).

Beginning in October 2022, the District initiated a baiting strategy referred to as "pulse bating". Essentially, this means targeting those areas in the sewer system where Norway rat activity is heaviest. It involves re-inspecting the manholes that have recently been baited (within a specific time frame) and if the bait has been at least 50% consumed, the manhole is immediately re-baited. This process continues until the bait is no longer consumed. This strategy contrasts with inspecting manholes strictly on a calendar basis and is likely to have a greater impact on sewer rat populations.

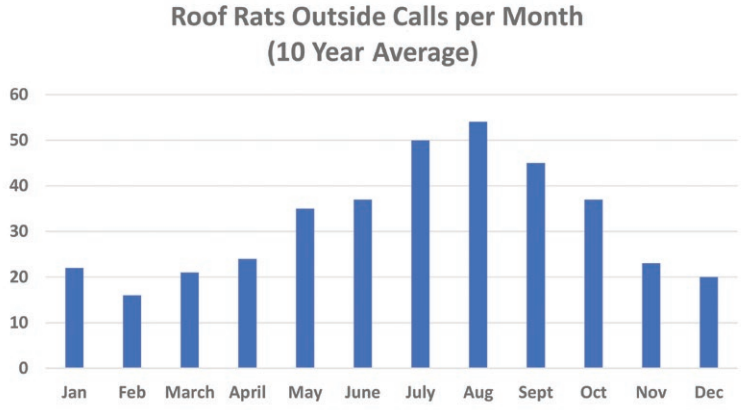
Roof Rats: A Closer Look

The District's database has two main categories for tracking roof rat calls, "Roof Rats Inside" (RRI) and "Roof Rats Outside" (RRO). Understandably, Vector Control receives far more calls regarding roof rats inside than roof rats outside.

To better understand roof rat seasonality in Alameda County, RRI and RRO calls were separated by month and averaged over a ten-year period (2013-2022). RRI calls are driven by the animal's need to seek shelter from harsher winter conditions and establish safe nesting locations. Although roof rat activity in Alameda County can be year-round, RRI calls show two separate peaks, one in October and the other in January. (Typically, the bulk of roof rat breeding occurs in the spring and fall). Calls from February through October show a slow and gradual increase and then decline slightly in November and December. The October peak is consistent with the fall breeding cycle as the rats respond to shortening day length and colder nighttime temperatures and the need to create a nest in a protected environment. The January peak may be due to the maturation and increased activity of the fall brood, resulting in more rat-human contact.

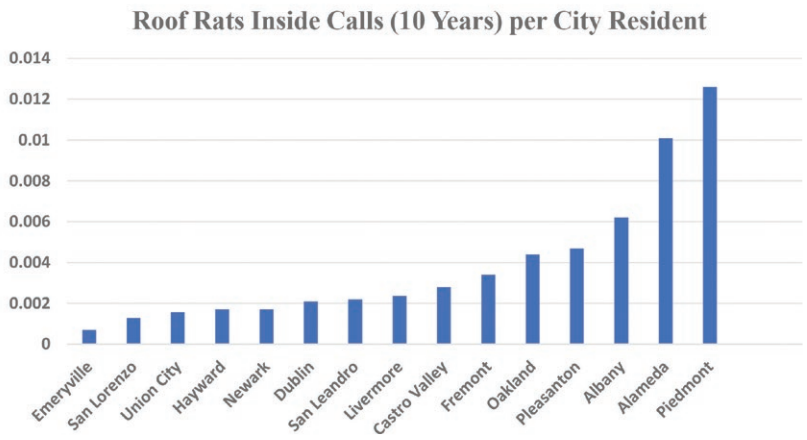


RRO calls show a very distinctive trend, with peak activity in August and the least activity in February. As roof rats mature and move out of their nesting locations, their behavior is driven by the need for food and daily need for water. Emerging vegetation in the spring can serve as a food source, and as winter rains decline, the animals may need to explore their environment in search for water. The peak in RRO calls during the summer months may be due largely to the increased amount of time that residents spend outdoors, observing roof rats on their property.



Using numbers from the 2020 census, calculations of RRI calls (over a ten-year period, 2013- 2022) per Alameda County city resident was performed. Cities reporting the highest per capita RRI complaints were Albany, Alameda, and

Piedmont. Reasons for this are unclear, but possible explanations may include: residents in these areas belong to a higher socioeconomic demographic and may possess a lower tolerance for rodent vectors; houses here are part of an older infrastructure and are more likely to be structurally compromised; relatively mature landscaping, including an abundance of fruit trees may provide roof rats with more harborage and food sources; and residents in these cities might be more community-centric, sharing information (for example on internet forums) regarding available government services.



Are Norway Rats Expanding Their Range?

Rat populations in Alameda County appear to be in a state of flux. Since its formation in 1984, the Alameda County Vector Control Services District has observed that the two invasive rat species – *Rattus norvegicus* (Norway rat) and *Rattus rattus* (Roof rat) have settled into distinct geographical "zones". There are parts of the County that appear to be dominated only by the roof rat (primarily Fremont, Pleasanton, Dublin, and Livermore). Other areas are dominated by the Norway rat (mostly the heavily urbanized portions of Oakland). A third geographical area includes territories where both species can be found, for example Alameda, large parts of Oakland, and San Leandro. Although the Norway rat is larger and physically dominant, the roof rat is more adaptable and a superior competitor.

Recently, there have been two separate appearances of Norway rats found in areas historically occupied by roof rats. The first occurred in the summer of 2019 at a transfer station in Pleasanton. As a facility that processes waste, it is not inconceivable that these rats were initially transported to this location from a Norway rat endemic area. Aggressive trapping and baiting around the facility eliminated a thriving population.

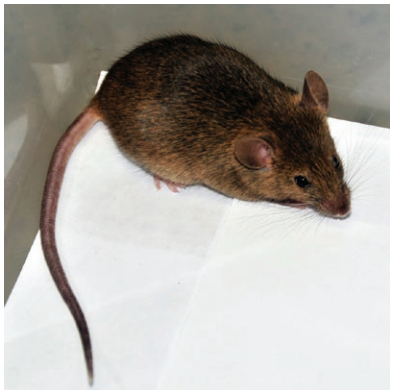
The second discovery happened during the summer of 2023 in the City of Fremont, and involved two separate locations, three miles from each other. One was near a homeless encampment and the other was in a residential neighborhood. Based on the distance between the two sites, our staff believe that these were two separate introductions. Sewers (where Norway rats can be found) in both areas were inspected and no activity was observed. Trapping removed some of the invasive animals, but it is unlikely that the populations have been eradicated. Further remedial actions are being planned.

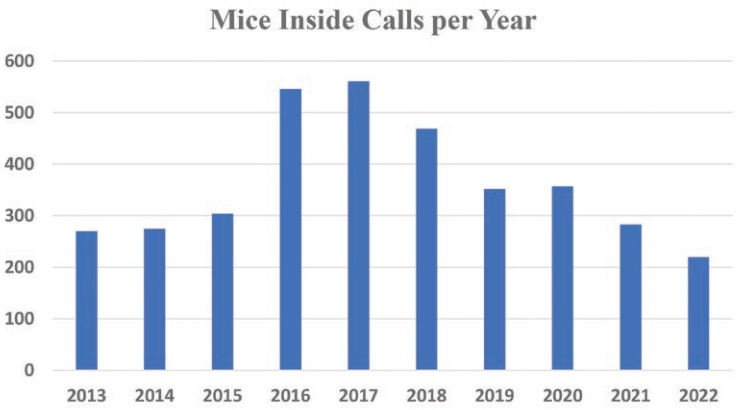
Mice Inside Calls: A Closer Look

A look at (house) "mice inside" calls over the previous 10 years (2013-2022) shows how dramatically these requests to the District have fluctuated. Ranging from a low of 220 calls in 2022 to a high of 561 calls in 2017, this variance reflects the potential for explosive population growth of this troublesome rodent.

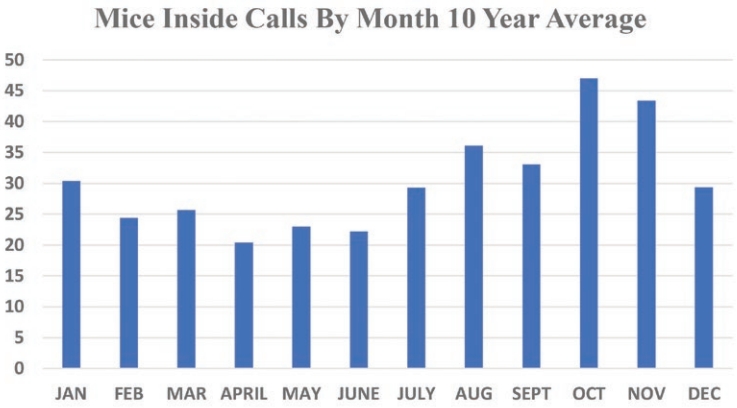
Mus musculus is highly adaptable and widespread, but what uniquely characterizes this rodent is its rapid reproductive potential. In one year (under ideal conditions), a female mouse may produce 5-10 liter per year, each averaging between 6-8 pups per liter. The gestation period is about 20 days and breeding in our area can occur throughout the year.

The large increase in calls from 2015 to 2016 is attributed to a severe rainfall event in the fall of 2016 that flooded fields on the Eastern portion of Livermore. Seeking shelter and higher ground, large numbers of mice invaded residential neighborhoods, gaining access to homes and garages.

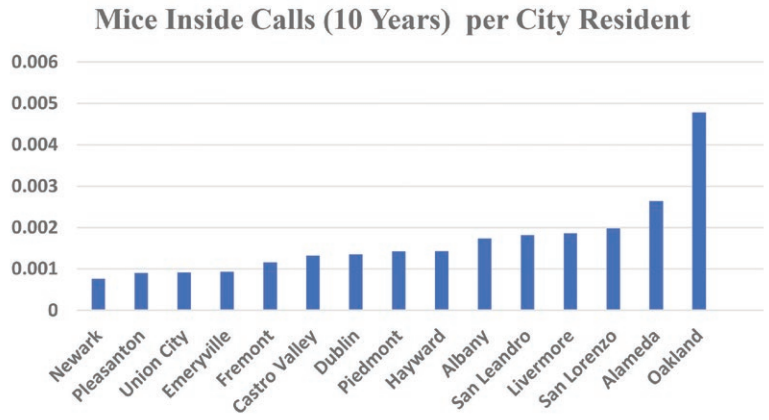




A monthly analysis of these calls (averaged over 10 years, 2013-2022) reveals that although mice may enter homes at any time of the year, there is a seasonal peak in the months of October and November. As nighttime temperatures drop and the rainy season begins, mice are more likely to seek protection from the elements. Because of their small size, it can be a challenge for a Vector Control Biologist to determine how mice are gaining access to the interior of a structure. Common points of entry include poorly sealed garage doors and thresholds, broken foundation vents, cracked foundations, or compromised vents or breaks in vent tubes.



Using data from the 2020 Census, the total number of "mice inside calls" over 10 years (2013-2022) divided by the "total population" from each city in the County reveals where mice tend to create the most issues. San Lorenzo, Alameda, and Oakland all have the highest rates of mice inside calls per city resident. In particular, Oakland has a significantly higher rate of these calls compared to other cities in the county. Mice populations here are likely to be historically well-established. Additionally, aging residential infrastructure and substandard housing may contribute to this problem.



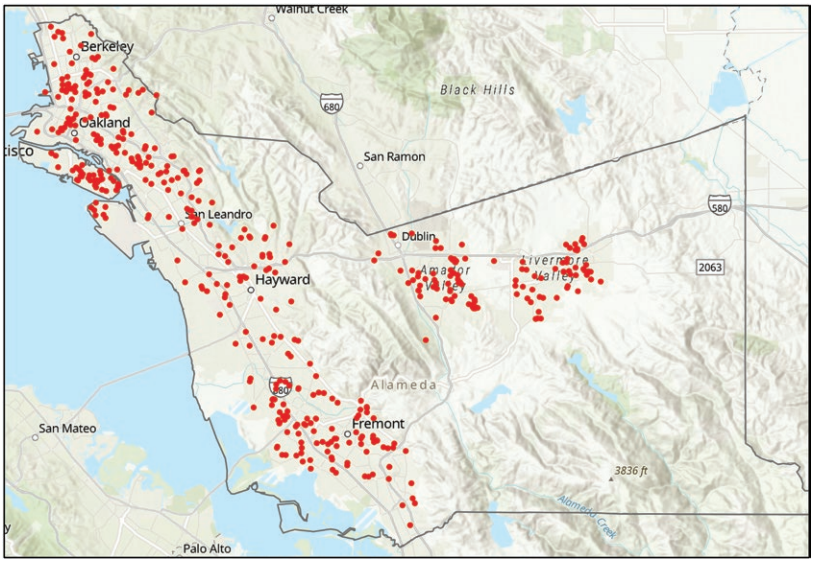
Wildlife Management Programs

In 2023, the District responded to 1,698 service requests concerning wildlife, and those service requests led to staff performing 11,059 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 most wildlife service requests.

Raccoons

In 2023, the District responded to 483 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 one of the leading reasons 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.

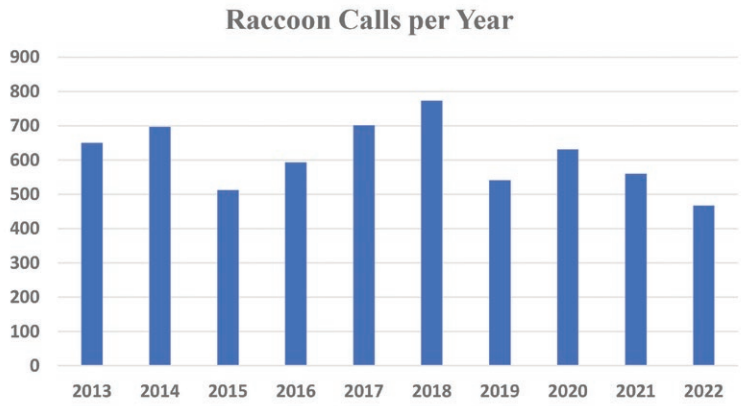
Young raccoons are generally born in April/May. Female raccoons readily nest and care for their young in attics and crawl spaces. This can result in urine and feces accumulating inside or underneath homes, creating an objectionable odor and a public health risk. These situations are a common Service Request 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.



Raccoon Requests for Service 2023

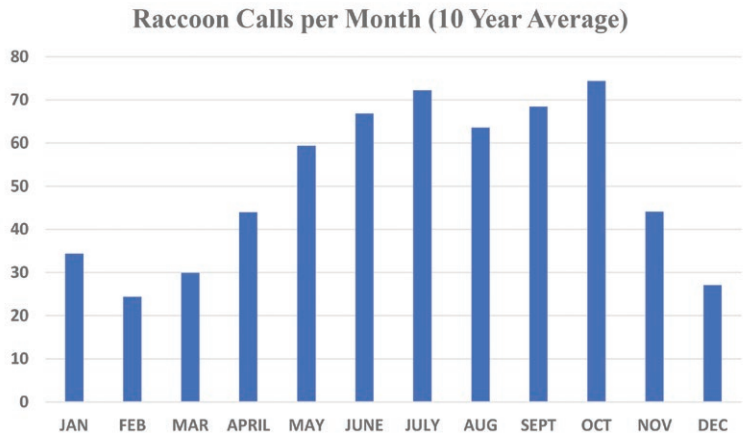
Raccoons: A Closer Look

Graphing the total raccoon calls over the previous 10 years (2013-2022) reveals that this vector has been responsible for approximately 500 to 800 calls per year. The average number of raccoon calls per year during this time is 613, accounting for approximately 11% of all service calls. Overall, numbers climbed from 2015, peaked in 2018, and then declined in subsequent years. Exact reasons for this trend are unclear. One explanation may be that in 2018 raccoon numbers reached their "carrying capacity", defined as the maximum population that a species can sustain itself given specific environmental constraints. Without active predators in our urban/suburban county, limitations to raccoon populations might include access to food, water, and space (shelter and denning locations). When local communities of these animals reach high enough levels, infighting and disease transmission increase, resulting in more mortality and subsequent population declines.

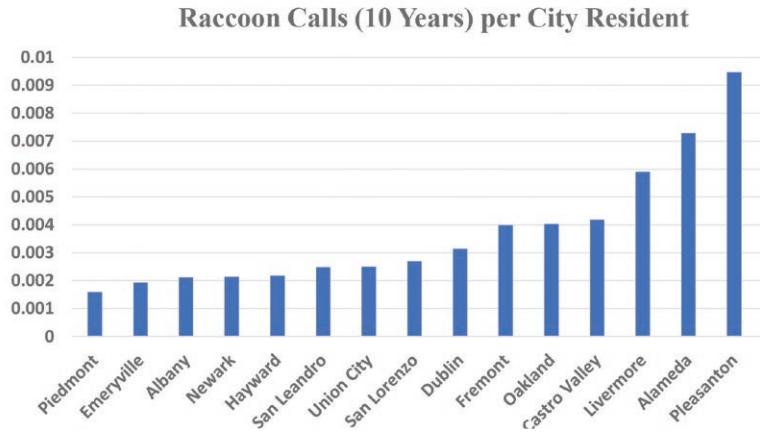


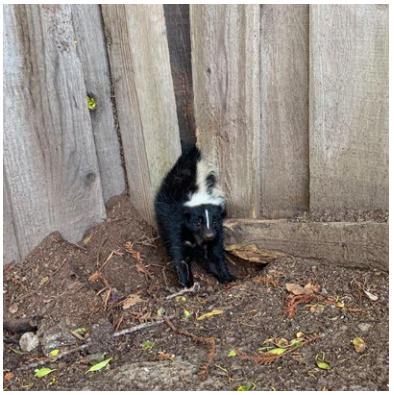
Averaging raccon calls by month over this 10 year period shows that there is a pattern to their activity. In our area, raccoon mating season is primarily from January through March. Gestation lasts approximately two months, usually occurring between February though May, and raccoon kits are typically in their den from April through June. This timeline is somewhat flexible, as mating, denning, and newborn kits have been observed by our field staff well into the summer months. Newborns will make chirping sounds at night, alerting residents that they are sharing their property with wildlife. During this time – April, May, and June – the District receives a sharp increase in the number of raccoon calls. Mother raccoons are fiercely protective of their offspring, which may stay with mom for up to a year. Raccoon calls also show a peak in October.

As the summer progresses and food sources diminish with the approach of autumn, raccoons dig into lawns searching for mature beetle grubs.



Using data from the 2020 census, the number of raccoon calls (over the 10 year period 2013-2022) per city resident was calculated. Pleasanton, Alameda, and Livermore have received the greatest number of raccoon calls per city resident, while Piedmont, Emeryville, and Albany received the fewest raccoon calls per city resident. Both Pleasanton and Livermore are surrounded by large open spaces with accompanying wildlife, and residents here tend to be more responsive to simple racccoon sightings. Most of the city of Alameda is densely populated, with older infrastructure and residential structures. The raccoon population here is firmly established and an abundace of food sources and harborage sites contribute to the problem.



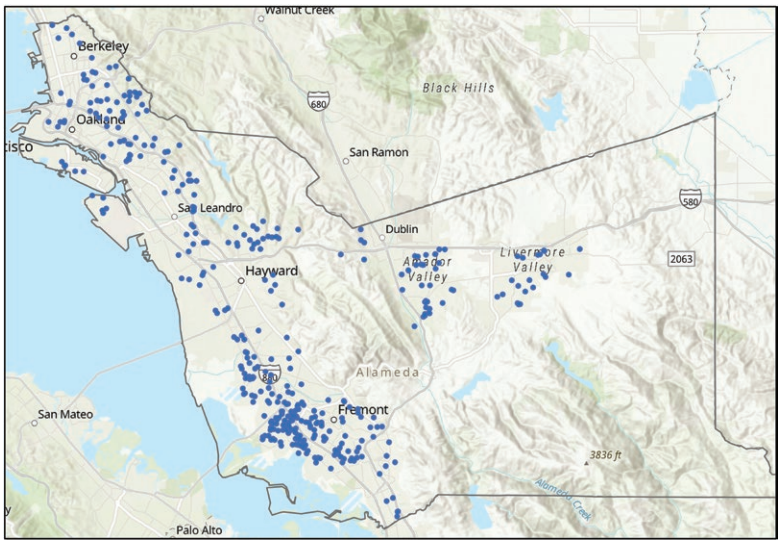


Skunks

Skunk problems were one of the most common wildlife-related Service Requests in 2023, totaling 417 Service Requests. However, this number is well below the 10-year average of 543. In fact, District staff reported observing increased numbers of sick skunks this past year, most likely due to distemper spreading among local populations.

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 crawl spaces of homes. Additionally, skunks can be a carrier of rabies in California, creating a potential serious 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

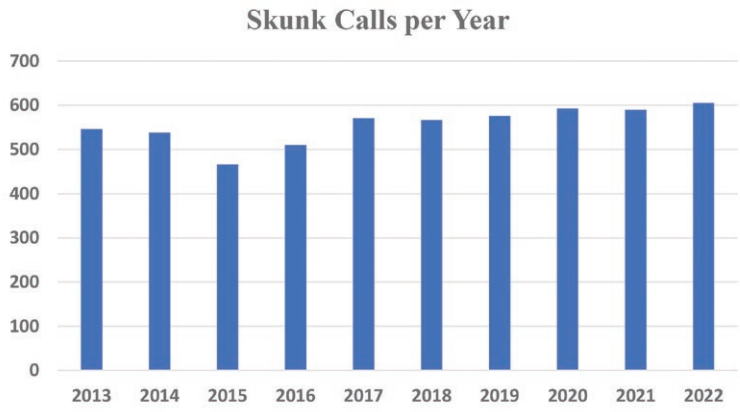
screening and the use of 1/4-inch mesh hardware cloth. Homeowners can spray lawns with an approved insecticide to control grubs and other insects, thus discouraging grubbing behavior.



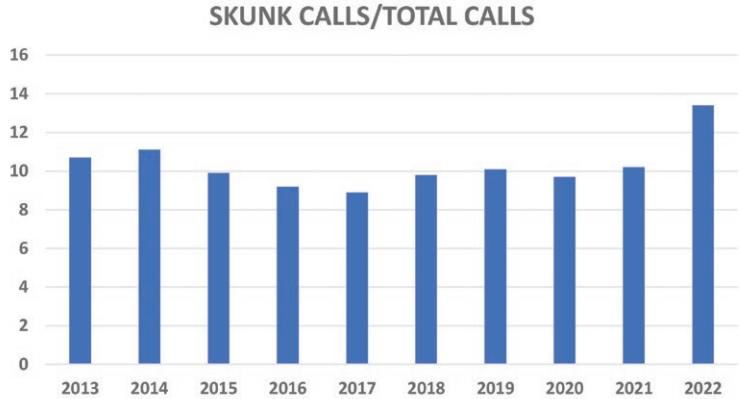
Skunk Requests for Service 2023

Skunks: A Closer Look

Reviewing 10 years (2013-2022) of skunk calls to the District reveals how consistent this important vector has been in Alameda County. Skunk calls have routinely numbered between 500 and 600 for each of the past 10 years.



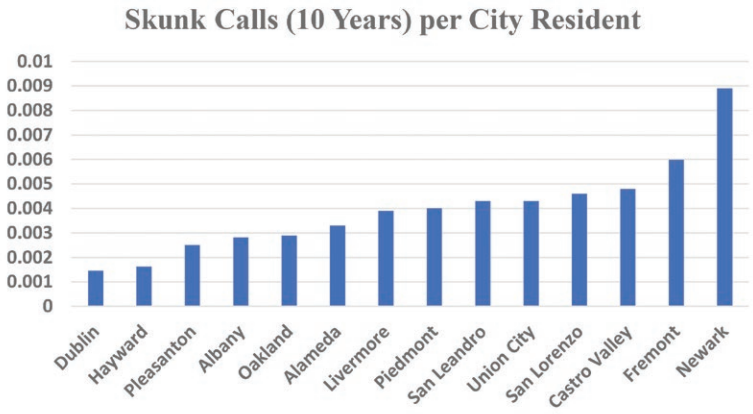
Looking at these calls as a percentage of total calls per year shows how skunks have constituted a regular part of the District's wildlife program. In 2022 skunks accounted for a greater percentage of calls to the District (13.4%) than any of the previous nine years, with the lowest point occurring in 2017 (8.9%).



Graphing skunk calls by month (averaged over the 10-year period, 2013-2022) shows that although skunks can be a year-round nuisance, there are patterns to their seasonality with two distinct peaks. In our area, mating season occurs during the winter months, with a high point of activity in January. During this time, males compete (fight) with one another for mating opportunities, and once impregnated, females look for a location to den. Calls to the District report of animals fighting in their subarea or beneath a deck, often with an accompanying obnoxious odor.

Gestation lasts about two months and newborns are dependent on their mother's milk for about a month and a half. After this time young skunks leave their dens with their mother, where they learn to forage on their own. Immature skunks may stay with their mother for up to a year. In Alameda County, there is a summer peak from June through September, when these young skunks are exploring their new environment and causing distress for residents. Often these youngsters have yet to sync with their natural biological rhythms and can be seen during daylight hours.

Using data from the 2020 census, 10 years (2013-2022) of skunk calls can be divided by individual city populations to determine which cities are the "skunkiest". With a total of 424 calls and a population of just over 47,000, the City of Newark produces the greatest number of skunk calls per capita than any other city in the County, while the City of Dublin produces the least number of skunk calls per capita. The high density of skunk calls in Newark also spills over into the northern Fremont area. Exact reasons for this concentration of skunks are not clear. Possible explanations include the large number of residences in this area with unsecured foundation vents and open decks (providing harborage locations); the proximity of these cities to large natural open spaces (Don Edwards National Wildlife Refuge, Coyote Hills Regional Park and Ardenwood Historic Park); and an abundance of food sources and a paucity of natural predators.



Venomous Arthropod Programs

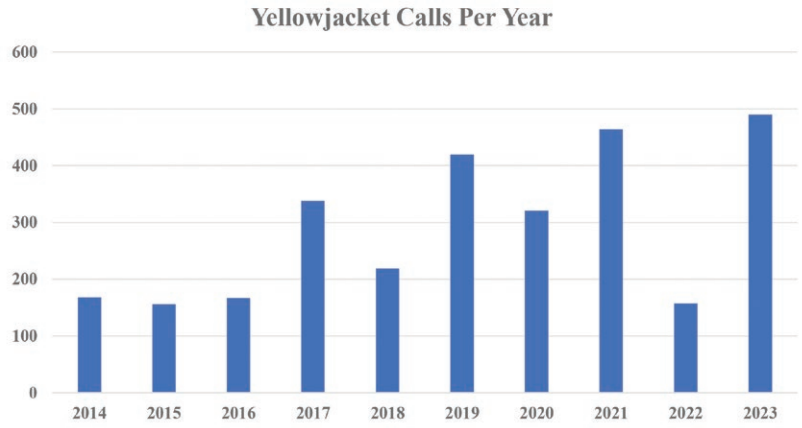
Venomous arthropods include mites, ticks, spiders, wasps (and other insects) that can sting, bite, secrete venoms, or cause allergic reactions in humans and domestic pets. In 2023, the District received 830 service requests for venomous arthropods. County residents can request the identification of various stinging insects and arachnids that they find in and around their homes. A staff biologist will collect and identify the arthropod and advise residents on how best to control the insect while minimizing the risks of bites and stings.

The District works quickly to 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 the Alameda County Beekeepers Association to safely remove honeybee swarms and hives when possible. In 2023, the District responded to 617 venomous wasps and 86 honeybee complaints.

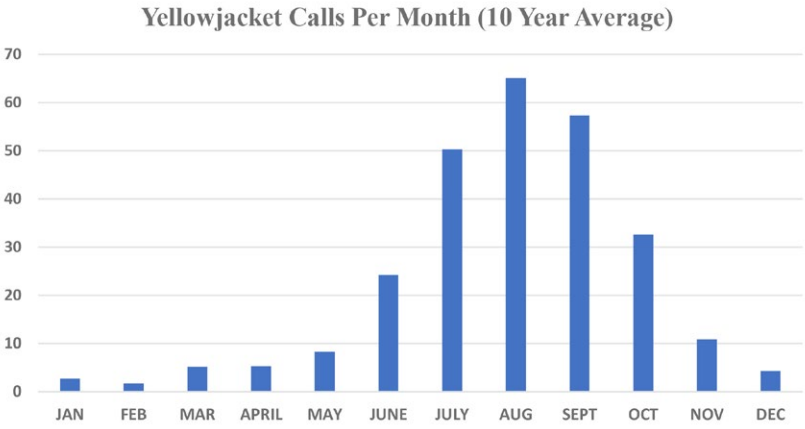
Yellowjackets: A Closer Look

Over the previous 10 years, yellowjacket calls to the District have shown an interesting repetitive pattern. From 2014 through 2016 these calls totaled less than 200 per year, but beginning in 2017, numbers began to increase significantly. Each peak year has been followed in the subsequent year by a marked decline, only to be followed again in the next year by an even larger increase. In 2023, the District recorded the highest number of yellowjacket calls in its history, totaling 495 (nearly 11% of all calls).

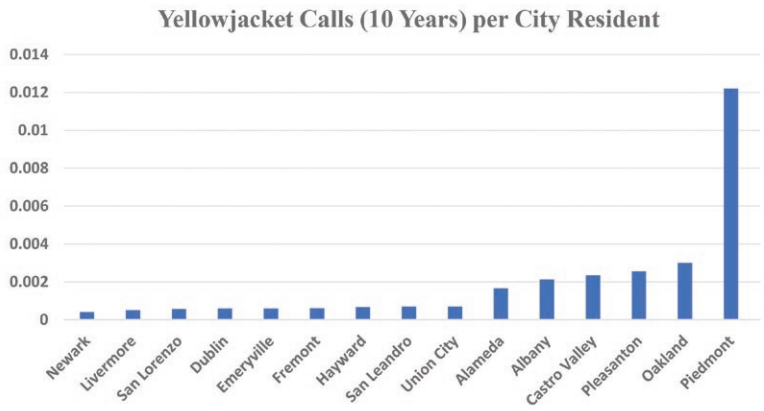
Exact reasons for this “high-low” pattern are unclear, and there may be several factors at play. For example, a “low” year may have been preceded in the fall by a rapid onset of harsh weather conditions (cold and wet) that reduce the survival of overwintering queens, leading to an early colony decline. Whereas mild autumn conditions may prolong colony growth and survival, leading to a rapid acceleration of yellowjacket numbers, resulting in a “high” year. Available prey items (food) and nectar sources can be affected by rainfall abundance and temperature and may impact the rate at which a colony grows. Human behavior such as more residents working from home, more time spent outdoors, and/or an increase in online networking and media attention may also play a role.



Averaging 10 years (2013- 2022) of monthly yellowjacket calls shows that there is a distinct seasonal pattern to their abundance. Calls peak in August and are at their lowest in February. During a "high" year (e.g., 2023) the District may continue to receive a substantial number of calls well into October (N=91) or even November (N=26). During the winter, colonies collapse, but are survived by the queen. In the spring she constructs a new nest and lays eggs which give rise to workers, which maintain the expanding colony. During the early summer months, developing yellowjacket larvae are typically fed other insects such as caterpillars and flies. As the colony continues to grow and summer progresses, these resources become scarcer, so the workers tend to do more scavenging for different food items. Around this time their aggressiveness increases, and they become more noticeable to the public.



Using data from the 2020 census, 10 years (2013-2022) of yellowjacket calls can be divided by individual city populations to determine per capita yellowjacket rates. Oakland and Piedmont have the highest number of yellowjacket calls per city resident, and Newark and Livermore have the lowest number of yellowjacket calls per city resident. The city of Piedmont particularly stands out. Its rate of yellowjacket calls is four times higher than the next city, Oakland. It is unclear why this is the case. The city has a well-developed and lush mature landscape, providing an abundance of food sources and nesting opportunities for yellowjackets. Residents here also are very responsive to vector issues and have a high awareness of County services.



Miscellaneous Arthropod Programs

In 2023, the District responded to service requests on a variety of nuisance pests such as ants (25), cockroaches (323), flies (102) and fleas (49) 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 since then has significantly increased its range and abundance.

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 2023, between June through August, 6 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 Cliffs in Pleasanton.

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

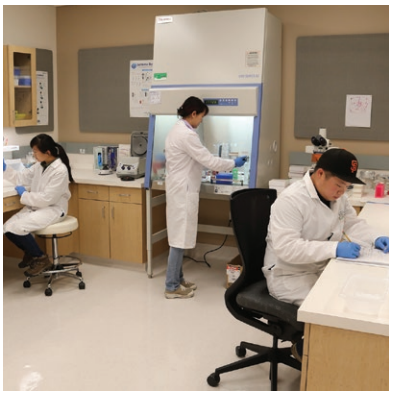
The District maintains an inventory of stables and kennels and inspects them occasionally to prevent nuisance problems such as odors, insects, or rodents. Upon request by the Alameda County Animal Control, animal hobbyist facilities are inspected during annual permit renewal. Currently, there is no statutory 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, dog and cat wastes, and animal manure stockpiles can become public nuisances when left unattended prior to disposal. In addition, these situations may provide

harborage and food sources for rodents, flies, and other pests that might result in disease transmission to humans.

In 2023, staff biologists responded to 132 nuisance service requests of furniture, garbage, abandoned vehicles, overgrown vegetation, or rubbish. This resulted in 228 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.



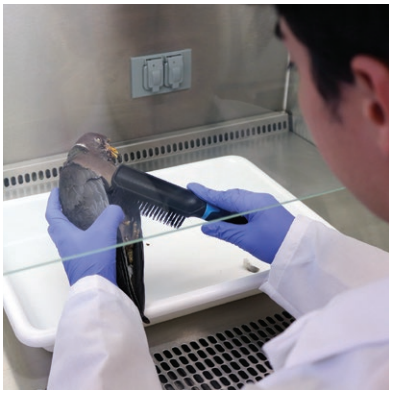
Vector Control Laboratory Surveillance

Biting Mite Research Project

Several species of ectoparasitic biting mites are known to feed on human blood within homes and other structures in California. These pests can cause significant dermatitis and often lead to indoor applications of pesticides, some of which are of known regulatory or health concern. This pest situation is especially common in association with structural infestations of the preferred primary hosts of these mites – commensal rodents or birds – and tends to initially increase in frequency when these hosts have been removed or eliminated. There are no established monitoring protocols used to detect biting mites as they wander throughout homes and other structures, though they are often suspected in cases of unexplained dermatitis or even expected following rodent or bird abatement programs. Assisting the University of California Integrated Pest Management program (UC IPM), ACVCSD set out to evaluate several monitoring tactics for detecting biting mites. This includes building and curating a statewide collection of biting mite specimens, use this collection to develop user-friendly identification and management resources, and share these resources with stakeholders throughout the state. This project has the potential to directly enhance urban integrated pest management (IPM) systems by developing capacity for identification and monitoring of significant, yet cryptic, household pests of public health concern.

Avian Influenza Surveillance

Beginning in the fall of 2022, the District assisted the USDA Wildlife Services Branch and the California Department of Fish and Wildlife with surveillance of Highly Pathogenic Avian Influenza (HPAI) H5N1. Samples taken from waterfowl in Union City in September 2022 confirmed the first cases of avian influenza in the County. In total, nine birds from different locations were tested and seven were confirmed as positive. In 2023, the District continued to be “on call” with further surveillance and tested a total of nine specimens. One, a goose from Hayward, was confirmed positive for HPAI.



Avian influenza is an infectious disease of birds caused by type A influenza viruses. The HPAI H5N1 strain causes significant disease in poultry, resulting in mortality of backyard and commercial flocks. Infections in wild birds may cause mild to severe disease or death, depending on the species. These viruses naturally circulate among waterfowl and waterbird populations. Raptors that scavenge on these species are in jeopardy of acquiring infection. The Center for Disease Control states that the probability of infection in humans is low, however some individuals may be at higher risk due to job-related or recreational exposure.

Ectoparasite Surveillance on Sylvatic Rodents, Commensal Rodents and Wildlife

Sylvatic rodents such as pinyon and 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 near 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 Pulmonary Syndrome (HPS), 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.

Host Species	# of Hosts	# w/Fleas	# of Fleas	Flea Species (# of Fleas)	Flea Index
SYLVATIC RODENTS					
Pinyon Mouse *Peromyscus truei*	30	0	0		0
Deer Mouse *Peromyscus maniculatus*	12	1	0	*Opisodasys keeni (1)*	0.1
California Vole *Microtus californicus*	2	0	0		0
COMMENSAL RODENTS					
Norway Rat *Rattus norvegicus*	207	54	193	*Nosopsylla fasciatus (43)* *Xenopsylla cheopis (76)* *Ctenocephalides felis (6)* *Leptopsylla segnis (66)* *Hoplopsylla anomolus (1)* *Echidnophaga gallinacea (1)*	0.9
Roof Rat *Rattus rattus*	19	2	2	*N. fasciatus (1)* *X. cheopis (1)*	0.1
WILDLIFE					
Ground Squirrel *Otospermophilus beecheyi*	0	3	17	*Oropsylla montana (9)* *H. anomolus (5)* *E. gallinacea (2)* *L. segnis (1)*	1.9
Fox Tree Squirrel *Sciurus niger*	28	14	72	*Orchopeas howardii (69)* *C. felis (3)*	1.9
Opossum *Didelphis virginica*	6	5	359	*C. felis (359)*	59.8
Raccoon *Procyon lotor*	4	3	226	*C. felis (142)* *Pulex spp. (84)*	56.5

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

Hantavirus Cardiopulmonary Syndrome (HCPS)

Hantavirus Cardiopulmonary Syndrome (HPS) 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

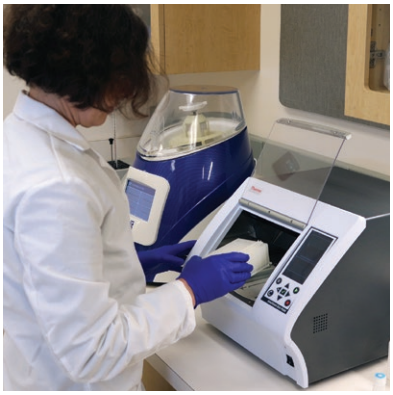
buildings and potentially expose human occupants to the virus. Past surveillance conducted at various localities within the county detected 6-18% of deer mice are infected with SNV.

In collaboration with the California Department of Public Health (CDPH), the CSA conducts hantavirus surveys in local parks to increase public awareness of the disease and to reduce exposure to deer mice and the structures they may inhabit.

Eight hantavirus (SNV) surveys were conducted in 2023. A total of 43 deer mice and pinyon mice were collected, and none tested positive via serology or PCR. Testing was conducted by California Department of Public Health by serology and PCR (Table 2).

Date	Site	Specific Location	Species	Number Tested	Result
3/24	Pleasanton	Private Residence	*Peromyscus truei* (Pinyon Mouse) *P. maniculatus* (Deer mouse)	2 1	Negative Negative
5/16	Oakland	North Oakland Sports Center	*P. maniculatus*	2	Negative
5/31	Oakland	Joaquin Miller Park	*P. maniculatus* *P. truei*	1 1	Negative Negative
6/14	Sunol Regional Park	Little Yosemite	*P. truei* *P. maniculatus*	2 6	Negative
6/27	Pleasanton	Serenity Terrace	*P. truei*	7	Negative
8/15	Livermore	Brushy Peak Regional Preserve	*P. maniculatus*	5	Negative
10/27	Del Valle Regional Park	Eagle View Group Camp	*P. maniculatus* *P. truei*	1 9	Negative Negative
11/22	Del Valle Regional Park	Family Camp	*P. truei*	5	Negative

Table 2. Hantavirus Surveillance 2023



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 type of Hantavirus 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 the roof rat (*Rattus rattus*). Seoul virus cases have been reported in patients with exposure to wild rats in Texas, Maryland, and Washington DC. In 2017, the United States Center for Disease Control and Prevention (CDC) conducted a multistate outbreak investigation after the confirmation of Seoul virus infections in people and pet rats in the states of Wisconsin and Illinois. The symptoms and signs of Seoul virus infection are not specific, but may include fever, headache, nausea, joint pain, cough, and a mild to moderate form of hemorrhagic fever with renal syndrome.

In 2019, the District began collecting rat blood samples as a part of the Seoul virus surveillance program. In 2023, a total of 105 Norway and roof rats from five cities in the County were screened for the presence of infection (Table 3).

During 2019-2023 period, a total of 960 Norway and roof rat blood samples have been tested serologically by our lab or submitted to the CDC recommended diagnostic lab to test for Seoul virus. To date, we have not had any rat blood samples test positive for Seoul virus infection.

City	# of Locations	# of Norway and Roof Rats Tested
Berkeley	1	9
Fremont	1	16
Livermore	1	2
Oakland	9	77
Pleasanton	1	1

Table 3. Summary of 2023 Seoul virus testing.

Leptospirosis Surveillance

Leptospirosis is the most widespread zoonosis in the world and is most common in temperate and tropical zones. It is caused by a bacterium that is spread through the urine of infected animals, which can get into water and soil where it can survive for weeks to months at a time. Various domestic and wild animals can carry the bacteria and excrete it for months to several years. Dogs are the most infected domestic animal. Humans can become infected through contact with urine, or other bodily fluids (except saliva) from infected animals or contact with soil, water or food that has been contaminated with the urine from infected animals. People most at risk are those that work outdoors or with animals. Symptoms in humans range from mild to severe, with most cases going unnoticed. Leptospirosis was reinstated as a nationally notifiable disease by the CDC in 2013.

Using a commercially available serology test kit, the District began screening rats for Leptospirosis in 2020. In 2023, a total of 110 Norway and roof rats from five cities in the County were tested for the presence of infection. To date we have tested 386 rats within the County and have not detected the presence of Leptospira infection in the blood of tested rats (Table 4).

City	# of Rats Tested	Species
Alameda	14	Norway & Roof Rat
Albany	9	Norway Rat
Berkeley	31	Norway Rat
Oakland	291	Norway Rat
San Leandro	1	Norway Rat
Fremont	19	Norway & Roof Rat
Livermore	4	Roof Rat
Pleasanton	2	Roof Rat
Union City	12	Roof Rat
Emeryville	3	Norway Rat

Table 4. Summary of 2020-2023 Leptospirosis testing.

Plague Surveillance

Plague is a bacterial disease associated with certain rodents, other small mammals, and their fleas. It is famously known as the "black death" and was responsible for killing millions throughout Europe during the Middle Ages. The bacteria that cause this disease – *Yersinia pestis* – can currently be found in parts of Africa, Asia, and the Western United States. However, prior to its introduction

this pathogen was not present in the US. It is believed that it was introduced here from rat-infested ships arriving to San Francisco from China in 1900. Within 2-3 years, over 100 known plague cases were reported in San Francisco and by 1909 plague was detected in Alameda County in rats, ground squirrels, and humans. By 1910, plague had spread to eight California counties. Over the decades surveillance and detection of plague in Alameda County has been sporadic and minimal. It was last found in 1981 in the eastern part of the County when a ground squirrel and two coyotes tested positive. In 2023, in conjunction with the California Department of Public Health, District staff conducted plague surveillance in small mammals for the first time in decades. In total, five ground squirrels and 20 Peromyscus mice were trapped and tested. All samples were negative for plague.

West Nile Virus Surveillance

Our District has been assisting with monitoring for the presence and spread of West Nile Virus in Alameda County for many years. Initially this program consisted of testing live mosquitoes, dead birds, and sentinel chickens. Currently, the District maintains a sentinel chicken flock as part of its disease surveillance program for both avian and mosquito-borne diseases. This program is implemented in conjunction with the California Department of Public Health's (CDPH) Vector Borne Disease Section. In 2023, CDPH confirmed that on two separate occasions, sentinel chickens at the District's flock in the city of Livermore tested positive for the West Nile Virus. This is the first positive detection of West Nile virus by the District in its history. CDPH and Alameda County Mosquito Abatement District used this data to help inform their West Nile Virus programs and responses.

Homeless Encampment Rodents, Fleas, 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 began live-trapping at a few of the larger encampments to ascertain the size of the Norway rat populations. Our Norway rat surveillance stopped for a time due to the COVID-19 pandemic but resumed in 2021. In 2023, staff biologists conducted 11 separate trapping events at 9 different homeless encampments around the cities of Oakland and Fremont and collected 191 Norway rats (Table 5).

Staff biologists set out live-wire cage 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 2023 at one 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.

Homeless Encampments Surveyed	# of Separate Trapping Events	# of Norway Rats Trapped	# of Fleas Collected for Disease Testing	# of Rodenticide Applications for Norway Rat Suppression
9	11	191	170	1

Table 5. Homeless encampment data 2023.

Flea-borne Rickettsial Diseases Surveillance

Rickettsial diseases are found worldwide and are transmitted to humans via an arthropod host, specifically fleas, lice, ticks and mites. Most cases of flea-borne typhus occur in Texas, Hawaii and California, with approximately 300 human cases per year. Los Angeles and Orange counties are known endemic areas for flea-borne rickettsioses but sometimes cases are reported from other parts of California. Humans become infected with flea-borne *Rickettsia* through the infectious bite of a flea or through infectious flea fecal material.

In 2020, the Alameda County Vector Control Services District began a surveillance program investigating the incidence of flea-borne Rickettsial disease by collecting fleas from different host animals throughout the County. The cat flea (*Ctenocephalides felis*) and the Oriental rat flea (*Xenopsylla cheopis*) are the primary focus of the surveillance program. Alameda County has historical populations of Oriental rat fleas and Norway rats, the rodent hosts.

Rickettsia typhi, the causative agent of endemic typhus, is maintained in a rat-flea-rat cycle involving Norway rats, *Rattus norvegicus*, and the Oriental rat flea, *X. cheopis*. Although *X. cheopis* is considered the major vector of murine typhus, natural infection with *R. typhi* has been reported in other flea species including *Leptopsylla segnis*, *Pulex spp.*, and *Nosopsylla fasciatus*.

Rickettsia felis, the etiologic agent of flea-borne spotted fever, is suspected to be a human pathogen. *Rickettsia felis* appears to share the same suburban transmission cycle as *Rickettsia typhi* where the cat flea, *C. felis*, serves as the primary vector and domestic animals and urban wildlife act as potential reservoir hosts. The cat flea is cosmopolitan in nature and is highly associated with people and pets.

In 2023, the Alameda County Vector Control Services District continued its flea borne Rickettsial disease surveillance program, collecting and testing fleas from different mammals. In total, 499 fleas were tested in pools (up to five fleas per pool, up to 50 fleas per host) using *Rickettsia* genus-specific real time PCR assay. Out of 81 animals, nine were infested with fleas that showed the presence of Rickettsial DNA (Table 6). The nine animals were one Norway rat, four opossums, two raccoons and two fox squirrels.

Host	# of Animals	# of Fleas Tested	Animals with Positive Fleas	Percent of Animals with Fleas, %
Norway rat	54	193	1	1.9
Raccoon	3	116	2	66.7
Opossum	5	88	4	80.0
Fox squirrel	14	72	2	14.3
Ground Squirrel	3	27	0	0
Roof rat	1	2	0	0
Deer mouse	1	1	0	0
Total	81	499	9	10.9

Table 6. Infestation of commensal rodents and wildlife animals with Rickettsia spp. positive fleas.

In total, 77 *Xenopsylla cheopis*, 159 *Ctenocephalides felis*, 44 *Nosopsylla fasciatus*, 67 *Leptopsylla segnis*, 3 *Echidnophaga gallinacea*, 6 *Hoplopsyllus anomalus*, 69 *Orchopeas howardi*, 1 *Opisodasys keeni*, 19 *Oropsylla montana*, and 54 *Pulex spp.* were tested for the presence of Rickettsial DNA (Table 7). The highest percent of infected pools was found in the C. *felis* flea population. Our results showed that Rickettsial infections are not common in *X. cheopis*, *N. fasciatus*, *O. howardi*, and *L. segnis* fleas in Alameda County. (Note: numbers of collected *E. gallinacea*, *H. anomalus*, and *O. keeni* fleas were less than 10).

To identify *Rickettsia* species, the positive samples were screened using an additional real time PCR assay specific for *Rickettsia felis*. *R. felis* was confirmed for all *Rickettsia* positive samples.

Flea spp.	# of Fleas Tested	Pools Tested	Positive Pools	Percent of Positive Pools, %	Minimum Infection Prevalence, %
C. felis	159	43	30	70	18.9
X. cheopis	77	29	0	0	0
O. howardi	69	23	0	0	0
L. segnis	67	26	0	0	0
Pulex spp.	54	12	2	17	3.7
N. fasciatus	44	33	1	3	2.2
O. mont	19	6	0	0	0
H. anomalus	6	3	0	0	0
E. gallinacea	3	2	0	0	0
O. keeni	1	1	0	0	0
Total	585	259	21	8	3.6

Table 7. Rickettsia felis Infections in fleas collected in 2023.

Table 8 summarizes the testing results for all fleas by the host animal. In total, 33 flea pools were positive. Rickettsial DNA was often found in *C. felis* with the minimum infection prevalence (MIP) of 18.9% (30 positive pools, 159 cat fleas tested). Occasionally, *R. felis* was present in *N. fasciatus* and *Pulex spp.* fleas from Norway rat and raccoons. *R. typhi* was not detected in any of the fleas collected in 2023.

Host	# of Animals	Number of positive pools (Number of fleas tested)										
		X. cheop	*C. felis*	*N. fasc*	*Pulex* spp.	*L. segn*	*O. mont*	*E. gall*	*H. anom*	*O. how*	*O. keen*	Total
Norway rat	54	0 (76)	0 (6)	1 (43)		0 (66)		0 (1)	0 (1)			1 (193)
Fox squirrel	14		2 (3)							0 (69)		2 (72)
Opossum	5		17 (88)									17 (88)
Ground Squirrel	3					0 (1)	0 (19)	0 (2)	0 (5)			0 (27)
Raccoon	3		11 (62)		2 (54)							13 (116)
Roof rat	1	0 (1)		0 (1)								0 (2)
Deer mouse	1										0 (1)	0 (1)
Total:	82	0 (77)	30 (159)	1 (44)	2 (54)	0 (67)	0 (19)	0 (3)	0 (6)	0 (69)	0 (1)	33 (499)

Abbreviations: *X. cheop (X. cheopis), N. fasc (N. fasciatus), L. segn (L. segnis),O. mont (O. montana), E. gall (E. gallinacean),H. anom (H. anomalus), O. how (O. howardi), O. keen (O. keeni)*

Table 8. Rickettsia felis infection in fleas by host animal and by flea species.

Understanding the flea distributions on commensal rodents and urban wildlife animals is of public health concern because they regularly interact with humans in parks and housing communities. An analysis of the flea infestation on hosts and *R. felis* infections in fleas (Figure A) shows that opossums and racoons have more fleas with a Rickettsial agent compared with other mammals.

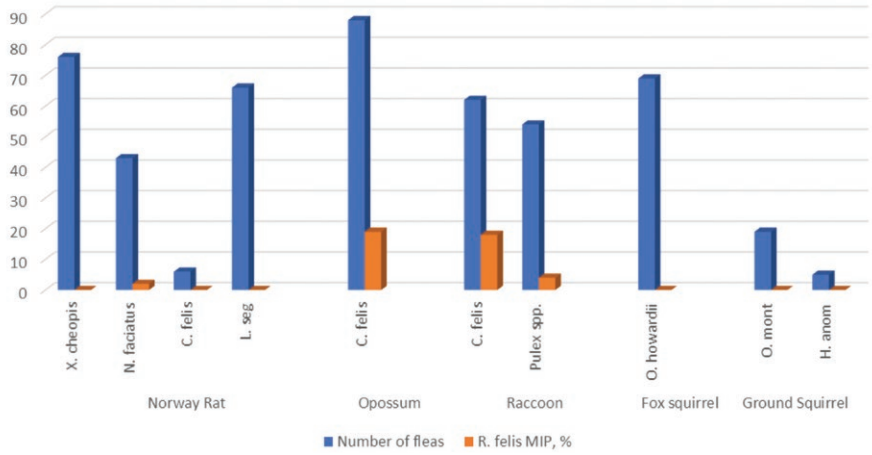


Figure A. Comparison of R. felis Minimum Infection Prevalence (MIP) in fleas from Norway rats, opossums, raccoons, and squirrels.

The *R. felis* positive fleas were found on mammals collected in Oakland, Fremont, Pleasanton, Newark, and Union City (Figure B). The analysis of flea-borne surveillance data from 2021 to 2023 shows that *Rickettsia* positive fleas are distributed throughout the County. In 2021-2022, fleas from many locations in Oakland were infected with *Rickettsia* spp, but in 2023, *Rickettsia* infected fleas were detected less frequently from Oakland. The Union City-Newark-Fremont area experienced a wider distribution of *Rickettsia* infected fleas in 2023 compared to the previous years. Most of the locations included in the flea borne Rickettsial disease surveillance program are considered urban or suburban. Due to ecological, biological, and behavioral factors promoting contact between humans and fleas, it is important to continue monitoring flea borne rickettsioses in Alameda County.

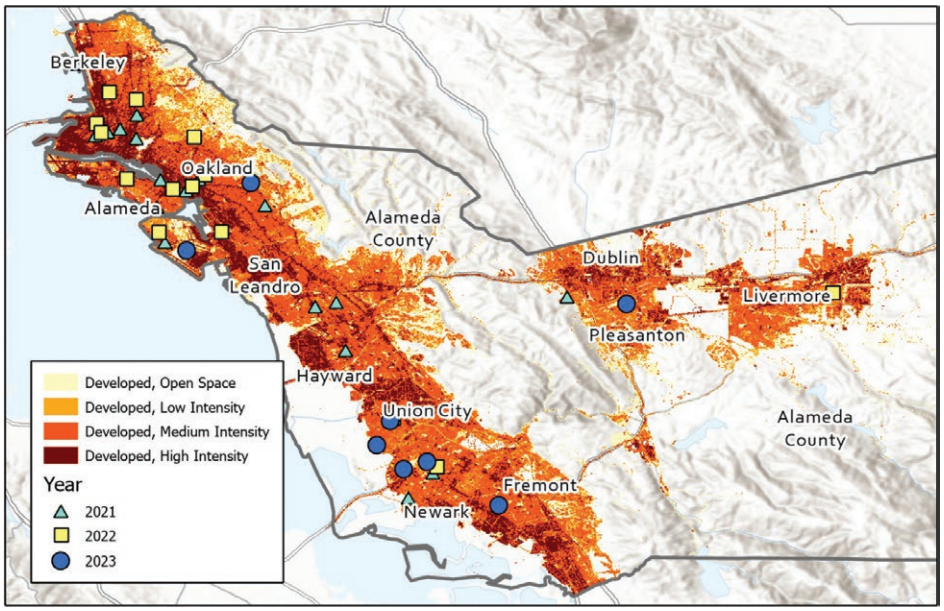


Figure B. Distribution of Rickettsia positive fleas in Alameda County in 2021, 2022 and 2023.

Tick Surveillance Program

Tick-borne diseases threaten the health of people. For over 25 years, Alameda County Vector Control Services District has conducted a tick surveillance program concurrent with the surveillance of pathogens in ticks that may cause disease in humans. Using a standard flagging method, ticks are collected in regional parks, city parks and public open spaces. In total, 5,324 *Ixodes pacificus*, 6,083 *Dermacentor occidentalis*, 164 *Dermacentor variabilis*, 21 *Ixodes spinipalpis*, 16 *Haemaphysalis leporispalustris* ticks were collected. The largest number of ticks (2,911) was collected in Redwood Regional Park. Anthony Chabot Regional Park and Joaquin Miller Park demonstrated the highest tick species diversity (five species). (Table 9).

Location	*Ixodes pacificus*	*Dermacentor occidentalis*	*Dermacentor variabilis*	*Ixodes spinipalpis*	*Haemaphysalis leporispalustris*	Total
Anthony Chabot Regional Park	883	761	4	7	6	1,661
Augustin Bernal Park, Pleasanton	142	757	27			926
Callippe Preserve, Pleasanton		14	23			37
Chabot Park, San Leandro	5	143	2			150
Cull Canyon Regional Recreational Area	541	119	3			663
Del Valle Regional Park	1					1
Dry Creek Pioneer Regional Park	1	7	4			12
Joaquin Miller Park, Oakland	1,142	594	8	14	10	1,768
Leona Canyon Regional Open Preserve	94	106	1			201
Mission Peak Regional Park	4	106	6			116
Pleasanton Ridge Regional Park	847	1,750	66			2,663
Redwood Regional Park	1,222	1,674	15			2,911
Sunol Regional Park	6					6
Tassajara Creek Regional Park	4	3				7
Vargas Plateau Regional Park		4				4
Open spaces, Berkeley	97	41	5			143
Open spaces, Oakland	7	2				9
Open spaces, Sunol	328	2				330
Total Per Species	5,324	6,083	164	21	16	11,608

Table 9. Tick Collection Summary.

Ixodes pacificus Tick Surveillance

***Borrelia* spirochetes**

Ixodes pacificus (*I. pacificus*) or western blacklegged tick is the 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. The western blacklegged tick has three life stages: larva, nymph, and adult. All three stages can be found in parks and open spaces in Alameda County, but tick abundance varies across the County.

Nymphal and adult ticks can bite humans and transmit bacteria. In 2023, 4,092 adult and 928 nymphal *I. pacificus* ticks were collected as a part of the tick surveillance program (Table 10).

Location	Female	Male	Nymph	Larvae	Total
Anthony Chabot Regional Park	403	358	122		883
Augustin Bernal Park, Pleasanton	73	69			142
Chabot Park, San Leandro	4	1			5
Cull Canyon Regional Recreational Area	176	157	42	166	541
Del Valle Regional Park	1				1
Dry Creek Pioneer Regional Park		1			1
Joaquin Miller Park, Oakland	381	336	289	136	1,142
Leona Canyon Regional Open Preserve	49	45			94
Mission Peak Regional Park	2	2			4
Pleasanton Ridge Regional Park	380	325	140	2	847
Redwood Regional Park	629	592	1		1,222
Sunol Regional Park			6		6
Tassajara Creek Regional Park	2	2			4
Open spaces, Berkeley	55	42			97
Open spaces, Oakland	2	5			7
Open spaces, Sunol			328		328
Total	2,157	1,935	928	304	5,324

Table 10. Ixodes pacificus Collection Summary.

The likelihood of encounters with *I. pacificus* ticks depends upon life stage-specific host-seeking behavior and seasonality. Adult ticks seek hosts openly from grass and brush; nymphal ticks can be found in leaf litter or tree trunks. Tick activity is seasonal and depends on temperature and humidity. Figure A demonstrates the seasonal patterns in host-seeking *I. pacificus* based on the number of collected ticks observed during the January-September period in 2023. Adult ticks were active from January through May. May and June were the months of the highest activity for nymphal *I. pacificus* ticks.

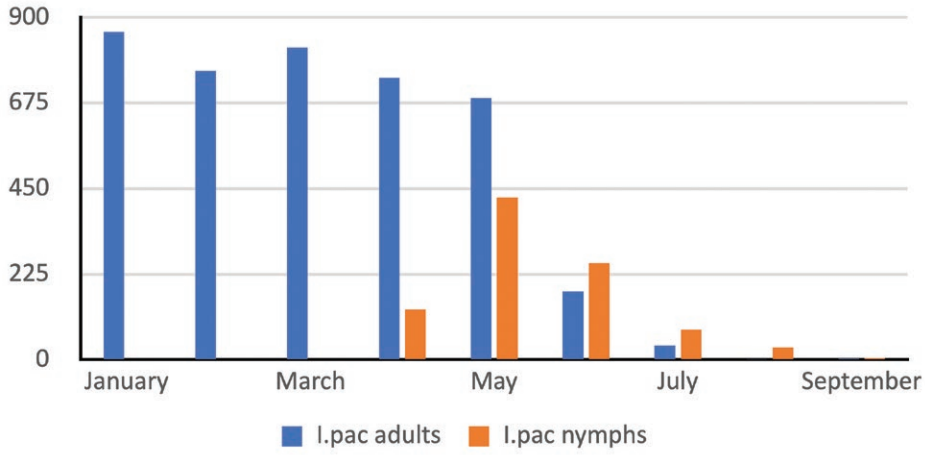


Figure A. Monthly Numbers of Collected I. pacificus in 2023.

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 and two nymphs, for presence of *Borrelia sensu lato (Bbsl)* and *Borrelia miyamotoi (B.miya.)*. In 2023, 1,911 *I. pacificus* ticks (1,234 adults, 487 nymphs, and 190 larval ticks) were evaluated using real-time PCR. The results are reported as a minimum infection prevalence, or MIP (Table 11). MIP is the ratio of the number of positive pools to the total number of ticks tested. This is the standard way of expressing the proportion of vectors infected with a specific pathogen assuming that only one vector in a positive pool is infected.

I. pacificus Life Stage	# of Ticks	# of Pools	*Bbsl* Positive Pools	*B.miya* Positive Pools	*Bbsl* MIP, %	*B.miya* MIP, %
Adults	1,234	250	25	8	2.0	0.6
Nymphs	487	244	34	4	6.9	0.8
Larvae	190	5	0	0	0	0
Totals	1,911	499	59	12		

Table 11. Borrelia sensu lato and Borrelia miyamotoi infections in Ixodes pacificus ticks.

County-wide, *Borrelia sensu lato* and *B. miyamotoi* were detected at 2.0% and 0.6% MIP in adult *I. pacificus* ticks respectively. In nymphal *I. pacificus* ticks, *Borrelia sensu lato* and *B. miyamotoi* were detected at a MIP of 6.9% and 0.8% respectively. The MIP values recorded in 2023 are in a typical range of *Bbsl* and *B.miya*. infection prevalence for Alameda County.

The spacial analysis of *Borrelia* infected ticks (Figure B) illustrates a patchy distribution of *Borrielia* whose maintenance depends on tick vectors, vertebrate hosts, habitat, and climate. Two areas in the county have an elevated risk of exposure to a tick infected with *Borrelia sensu lato* or *B. miyamotoi*.

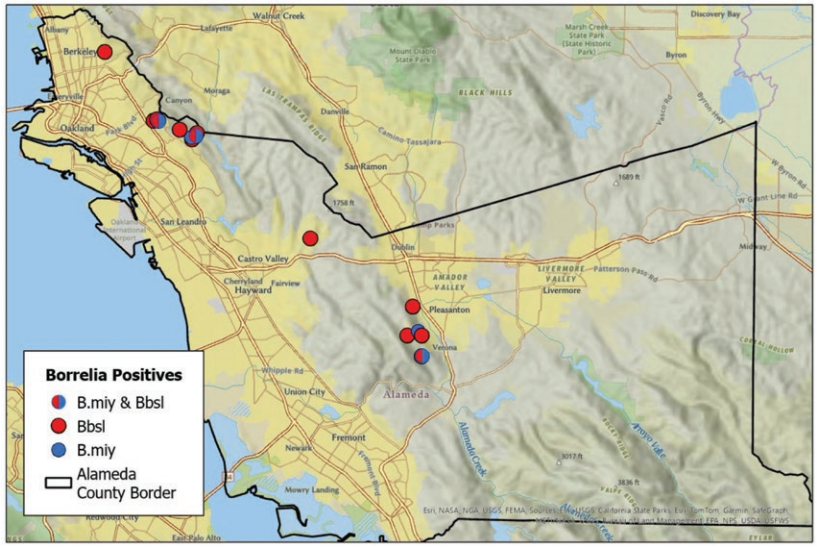


Figure B. Distribution of Borrelia Positive Ticks in Alameda County 2023

Anaplasma phagocytophilum

I. pacificus ticks can transmit *Anaplasma phagocytophilum*, a bacterium which causes human granulocytic anaplasmosis. The annual incidence of anaplasmosis in the U.S. has increased in recent years and in 2022 the District started to test *I. pacificus* ticks for *A. phagocytophilum*. In 2023, 1,186 adult ticks and 484 nymphal ticks from various sites were evaluated using real-time PCR. Out of 240 adult tick pools, 13 were positive for *A. phagocytophilum* which corresponds to a county-wide MIP of 1.1%. Out of 243 nymphal tick pools, 2 were positive which corresponds to a MIP of 0.4%. The infected ticks were found on the trails of Joaquin Miller, Anthony Chabot Regional, Redwood Regional, and Mission Peak Regional parks. More than half of the *A. phagocytophilum* positive pools came from Joaquin Miller Park. The minimum infection prevalence in *I. pacificus* ticks from this park is double that of the county averages.

The spacial analysis of *A. phagocytophilum* infected ticks in 2022 and 2023 (Figure C) demonstrates that only two areas in Alameda County have an elevated risk of exposure to a tick infected with *A. phagocytophilum*.

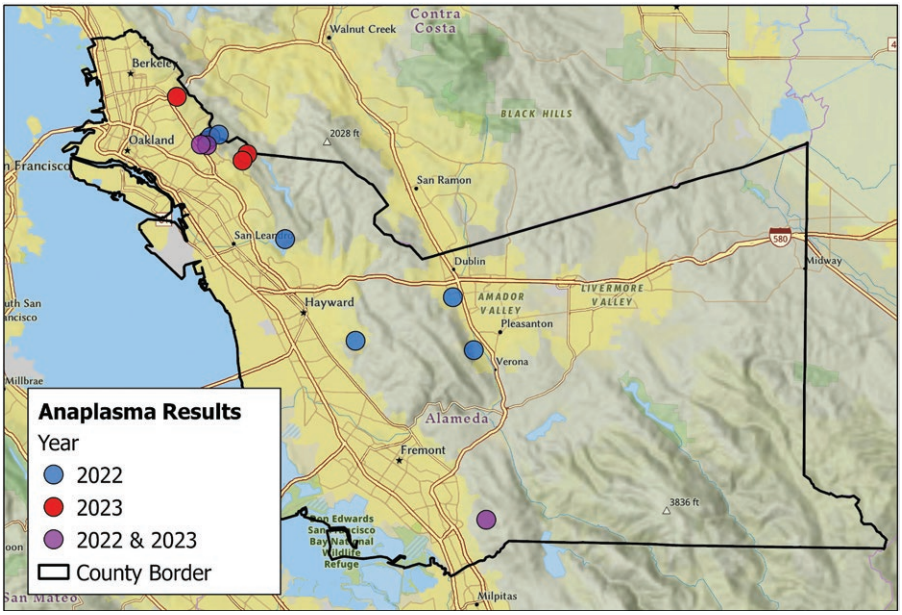


Figure C. Distribution of A. phagocytophilum Positive Ticks in Alameda County 2022-2023.

Dermacentor Tick Surveillance

Tick species in the genus *Dermacentor* are very important from medical and veterinary standpoints. In 2019, the District started surveillance for the tick-borne diseases in *Dermacentor occidentalis* and *Dermacentor variabilis* ticks. According to California Department of Public Health records, the Pacific Coast tick (*D. occidentalis*) is second only to *I. pacificus* in total numbers of tick attachments to humans and is the primary vector of *Rickettsia philipii*, the causative agent of Pacific Coast tick fever. The American dog tick (*D. variabilis*) is a vector of various viral and bacterial pathogens including *Rickettsia rickettsii*, the causative agent of Rocky Mountain spotted fever.

In 2023, 6,077 *D. occidentalis* and 164 *D. variabilis* adult ticks were collected in regional parks, city parks and open spaces (Table 12). *D. occidentalis* adult ticks were significantly (≥ 30 times) more common along trails compared to *D. variabilis* adults. *Dermacentor* nymphal ticks were not commonly found, and only six *D. occidentalis* nymphs were collected from all study sites.

Location	*Dermacentor occidentalis*		*Dermacentor variabilis*		Total
	Female	Male	Female	Male	
Anthony Chabot Regional Park	425	332	2	2	759
Augustin Bernal Park, Pleasanton	385	372	21	6	778
Callippe Preserve, Pleasanton	10	4	5	18	19
Chabot Park, San Leandro	84	59	2		145
Cull Canyon Regional Recreational Area	61	58	1	2	120
Dry Creek Pioneer Regional Park	4	3	2	2	9
Joaquin Miller Park, Oakland	326	267	5	3	598
Leona Canyon Regional Open Preserve	45	61		1	106
Mission Peak Regional Park	50	56	2	4	108
Pleasanton Ridge Regional Park	952	798	31	35	1,781
Redwood Regional Park	933	740	10	5	1,683
Tassajara Creek Regional Park	2	1			3
Vargas Plateau Regional Park	2	2			4
Open spaces, Berkeley	28	13	4	1	45
Open spaces, Oakland	2				2
Open spaces, Sunol	1	1			2
Total	3,310	2,767	85	79	6,162

Table 12. Dermacentor spp. Collection Summary.

Pacific Coast ticks (*D. occidentalis*) may be found year-round in Alameda County but they are most abundant in the late spring and early summer (Figure D).

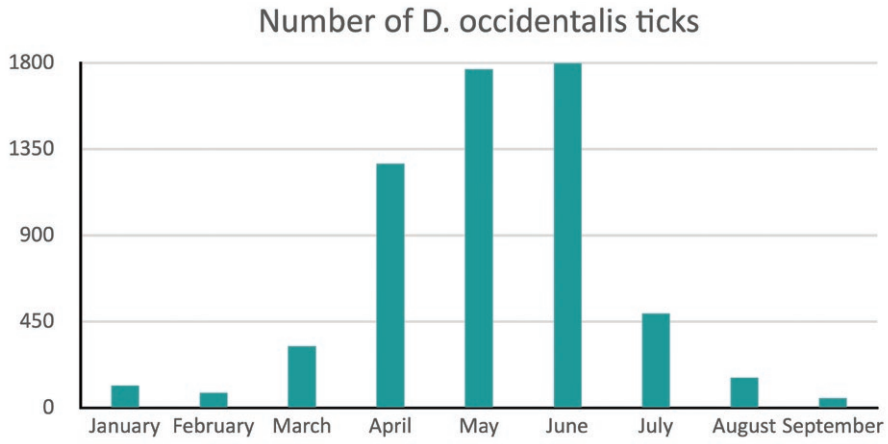


Figure D. Monthly Numbers of D. occidentalis ticks Collected in 2023.

In 2023, 1,017 *D. occidentalis* and 143 *D. variabilis* were tested in pools for the presence of rickettsia pathogens using PCR. 32 *Dermacentor* pools from Berkeley, Castro Valley, Oakland, Pleasanton, San Leandro, and Union City were infected with rickettsia. An additional sequencing assay identified rickettsia species as *Rickettsia philipii*, *Rickettsia bellii*, and *Rickettsia rhipicephali*. *R. philipii*, a human pathogen, was detected in one *D. occidentalis* pool collected in Anthony Chabot Regional Park. Previously, *R. philipii* positive ticks were collected in 2020 and 2021 in Alamo Creek Park and Joaquin Miller park. *R. rhipicephali* and *R. bellii* were present in *D. occidentalis* and/or *D. variabilis* ticks from the areas where large populations of *Dermacentor* ticks were found. To date, neither *R. bellii* nor *R. rhipicephali* have been associated definitively with disease in humans or animals.

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 submitted to the Alameda County Public Health Laboratory (ACPHL) for rabies testing.

If requested, the District, along with Animal Control Agencies, investigates 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. In 2023, the District submitted 126 samples, including bats, cats, dogs, opossums, raccoons, squirrels and skunks to the ACPHL for rabies testing. Two (2) bats, one from Hayward (1) and one from Fremont (1) tested positive for the rabies virus. Eight submitted specimens were not testable.

Type of Animal	Number Negative	Number Positive	Total Tested
Bat	39	2	41
Cat	26	0	26
Dog	25	0	25
Opossum	3	0	3
Raccoon	4	0	4
Skunk	14	0	14
Squirrel	3	0	3
Total	114	2	116

Public Information and Engagement

We attract a large audience through our website, social media such as Twitter, YouTube and Facebook, media contacts, group presentations, responding to Requests for Service (RFS) and event participation. The year 2023 was a return to a normal, as previously canceled live outreach events (due to the SARS-CoV-2 pandemic) were now regularly scheduled. Though some events were still cancelled due to SARS-CoV-2 concerns, we nonetheless participated in 45 days of fairs, shows, presentations and exhibits. These included Sobrante Park Health (2-separate days) and Information Fair in Oakland, the Festival of India in Fremont (2-days), Oakland Chinatown Lunar New Year Bazaar (2-days) and StreetFest (2-days), Newark Days Information Fair (1-day), Ashland/Cherryland FamFest (1-day) Castro Valley Fall Fest (2-days), Ashland Reach Youth Center Recourse Fair (1-day), San Leandro Cherry Festival (1-day), Fremont Earth Day (1-day), Quest Science Fair (1-day) and the wonderful 19-day Alameda County Fair in Pleasanton. In addition, our staff gave six-presentations at the Mosquito and Vector Control Association of California Annual Conference, and several other presentations to groups such as the Oakland Housing Authority Landlord Workshop, Tri-Valley Rotary Club, Health Care for the Homeless and the services provider network, Pesticide Regulation continuing education, the Oakland

Encampment Management Team and Livermore-Amador Garden Club. Finally, several of our staff created a school outreach program that was shared with students at Walnut Grove Elementary School in Pleasanton.

Our District continues to expand our outreach program to the public and our ethnically diverse communities by delivering our services directly to all Alameda County residents. Our District received 5,505 Requests for Service (RFS) in 2023 that were investigated by our 18 Vector Control Biologists. This is a powerful outreach team, meeting, discussing, and investigating the vector problems our residents were experiencing, which amounted to many thousands of hours of community outreach. 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 it during 2023. The public can access information on current vector-related issues, and the user-friendly on-line form simplifies making service requests. There are current plans to modernize the website. This will include making changes to the visual design and overall aesthetic, improving the user experience and navigation, creating a new site map, ensuring cross-platform compatibility, streamlining site content and structure to enhance clarification and precision of information, and making the site ADA compatible. District staff are participating in this overhaul.

The District provides an on-going educational program aimed at “rental property management professionals” regarding bed bugs, cockroaches and other vector issues. Our 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 bugs, cockroaches and rodent infestations in housing.

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 potential risks of consuming local fish and shellfish. Our Community Relations Coordinator designed new, multi-language, mussel quarantine signs that were made for permanent posting. The mussel quarantine occurs during the same timeframe (May 1st thru October 31st) and this should result in long-term cost and labor savings.

Integrated Pest Management Strategy

The District participates in a countywide *Integrated Pest Management* policy set in place by the Alameda County Board of Supervisors. Most pesticide applications are used to suppress Norway rats in sanitary sewers or to destroy ground-nesting yellowjacket 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.

2023 Pesticide Use

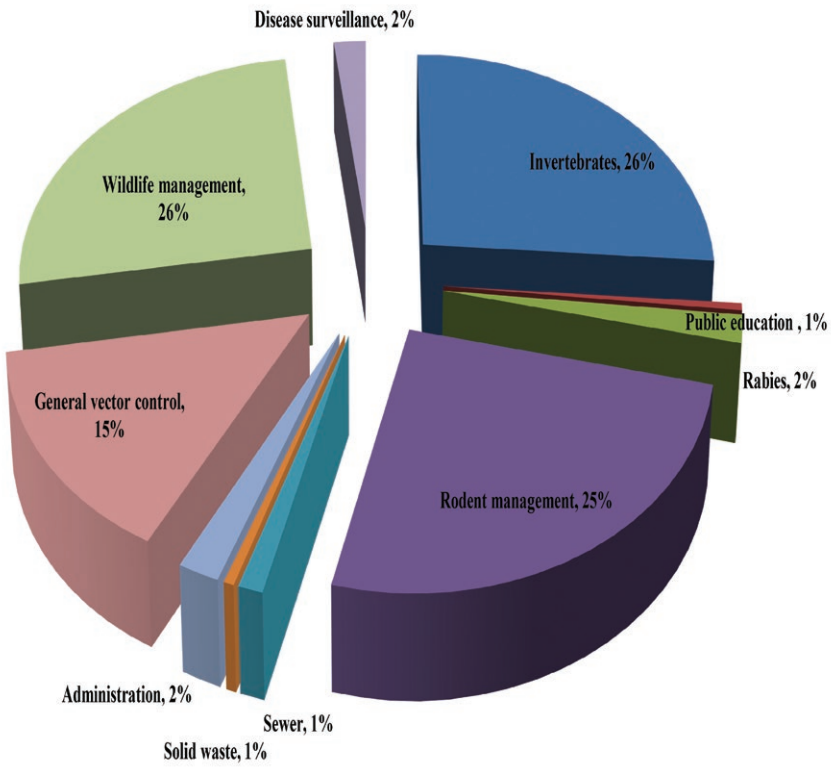
Pesticide	Manufacturer	Formulation	Target Pest	Amount Used (Oz)	Applications
Contrac Bulk Pellets	Bell Labs	Pellets	Domestic Rodents	92	2
Contrac Super Size Blox	Bell Labs	8 oz. Block	Domestic Rodents	15,752	141 # of census tracts
Delta Dust	Bayer	Insecticidal Dust	Fleas, Yellow-jacket/Wasps	8.9	14
Drione Dust	Bayer	Insecticidal Dust	Yellowjacket/ Wasps	187.02	331
EcoExempt D	EcoSMART Technologies Inc.	Aerosol Spray	Yellowjacket/ Wasps	1.1	5
EcoVia WH	Wellmark International Inc.	Aerosol Spray	Yellowjacket/ Wasps	32	2
EcoExempt Essentria Wasp & Hornet Spray	Zoecon	Aerosol Spray	Yellowjacket/ Wasps	76.86	15
Maxforce Roach Gel Bait – FC Select	Bayer	Gel	Cockroaches	58.724	76
Maxforce Roach Gel Bait – Impact	Bayer	Gel	Cockroaches	11.939	34
ProVerde Wasp & Hornet Killer (PV1)	Envance	Aerosol Spray	Yellowjacket/ Wasps	1.05	3
Prescription Treatment P.I.	Whitmire	Aerosol Spray	Fleas, Yellow-jacket/Wasps	14.75	6
Prescription Treatment Wasp Freeze (PT515)	Whitmire	Aerosol Spray	Yellowjacket/ Wasps	0.5	1
Prescription Treatment Wasp Freeze II (PT18)	BASF	Aerosol Spray	Yellowjacket/ Wasp	61.25	17
Victor Poison-Free Wasp & Hornet Killer (P15)	Woodstream	Aerosol Spray	Yellowjacket/ Wasp	12	4
Wasp-X Wasp & Hornet Spray	Zoecon	Aerosol Spray	Yellowjacket/ Wasp	3	1

City of Berkeley Vector Control Program

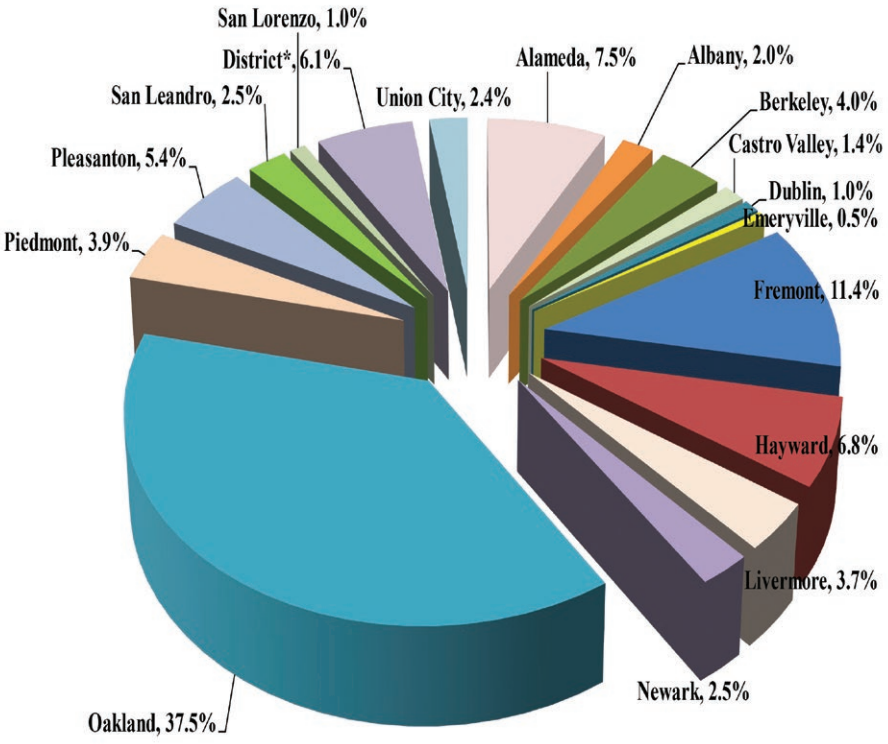
The City of Berkeley is one of four cities in California with its own environmental health jurisdiction. In 1976, the City adopted several environmental health ordinances that provide a mechanism to protect public health from vectors. The voters of Berkeley approved Measure A in 1984 and became part 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.

ACVCSD: Funding and Services

Services by Program, 2023

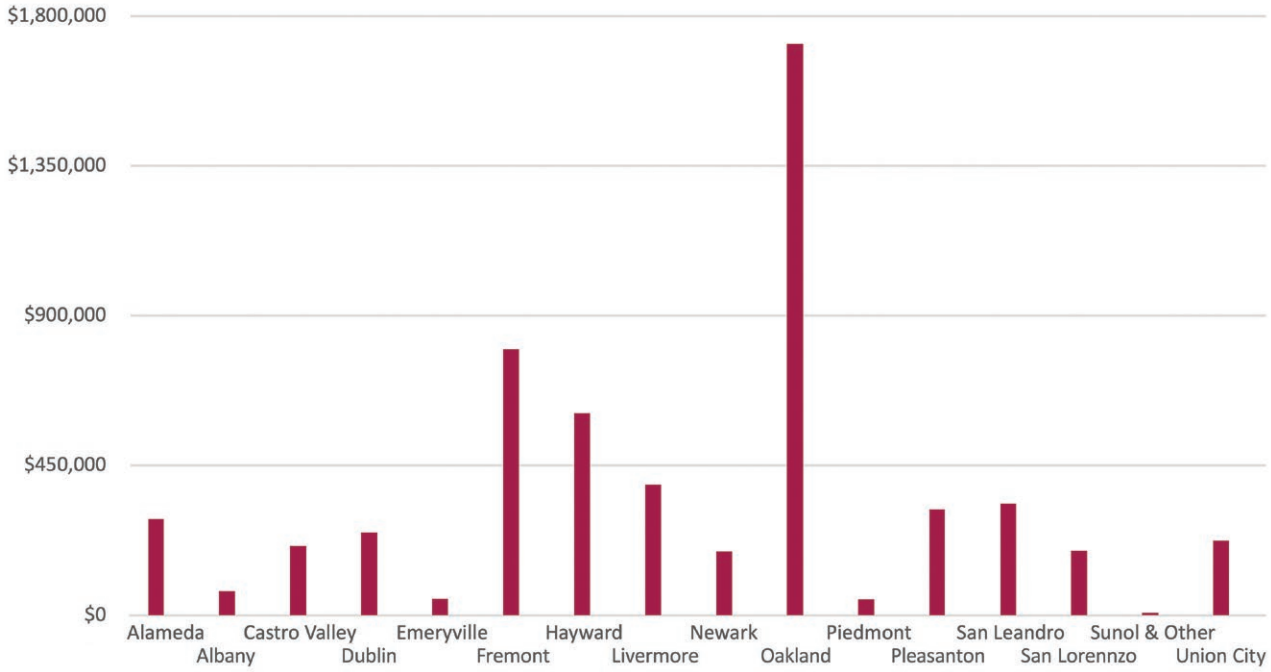


Total Services Provided to Cities, 2023

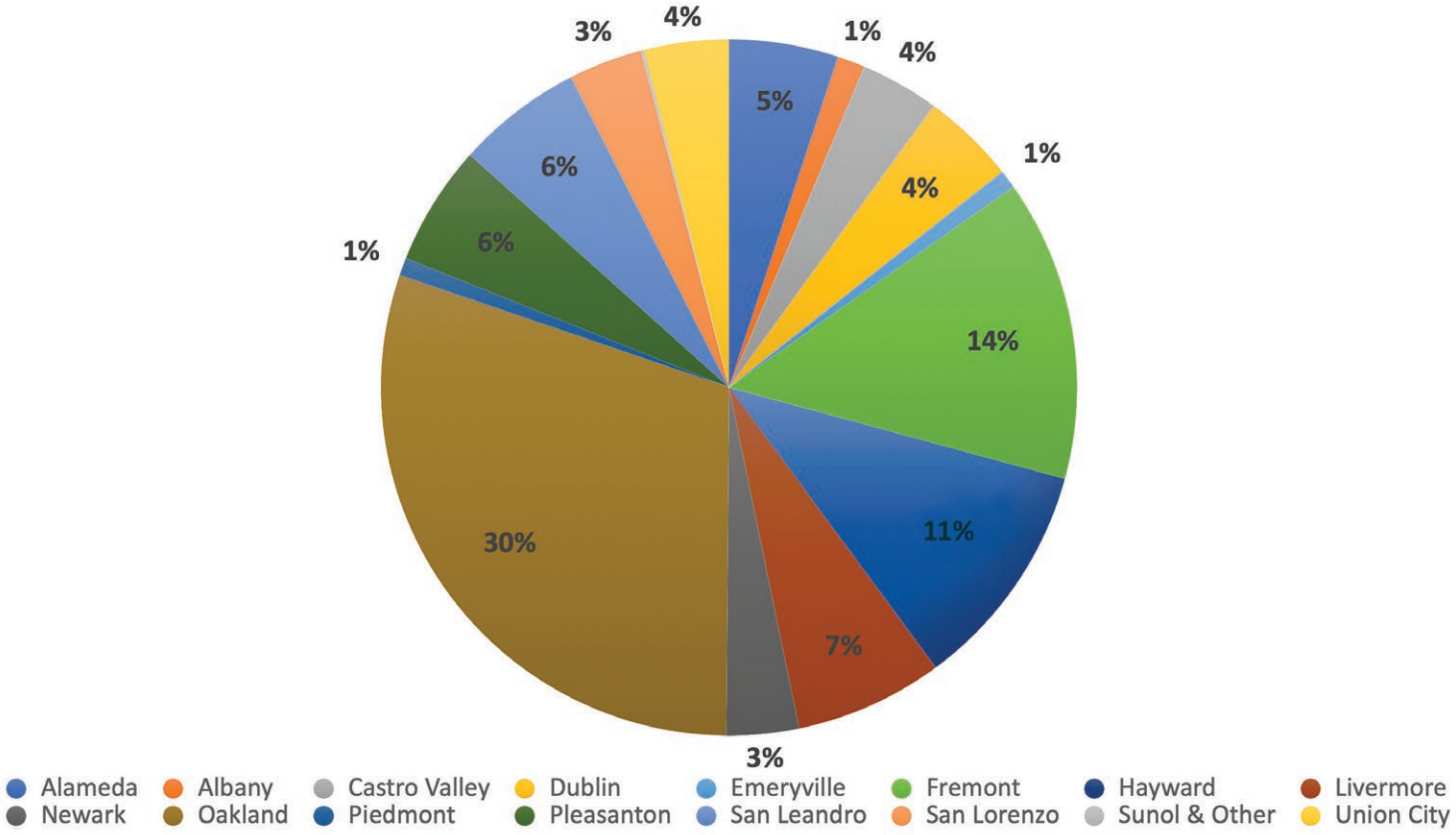


** District initiated includes disease surveillances and services to Sunol and Ashland.*

Funding Measure Revenue Totals by City, FY 2023-24



Funding Measure Revenue Percentages by City, FY 2023-24



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	0.017 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 2023-2024

Use/Size	CSA Vector Control Initial Benefit Assessment	Oakland (Residence Only) + Supplement Assessment ($1.28)	CSA Vector Control Secondary Benefit Assessment	CSA Vector Control Emeryville/Fremont Assessment
Single Family Residence/Condominiums	$5.92	$7.20	$6.19/3.71	$12.11/7.27
Vacant Land	5.92	7.20	1.55	3.03
Multiple Residential Small (2-4 units)	11.84	14.40	2.85[1]	5.57[1]
Commercial, Industrial	11.84	14.40	3.10[4]	5.06[4]
Large Rural Property (10+ acres)	11.84	14.40	0.52[3]	1.02[3]
Multiple Residential (5+ units)	29.60	36.00	1.98[2]	3.88[2]
Large Commercial (Hotels, Mobile Home Parks)	29.60	36.00	3.10[4]	6.06[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.
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	11.00	1.28	12.28
2020-21	11.00	1.28	12.28
2021-22	11.00	1.28	12.28
2022-23	11.93	1.28	13.21
2023-24	12.11	1.28	13.39

* *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