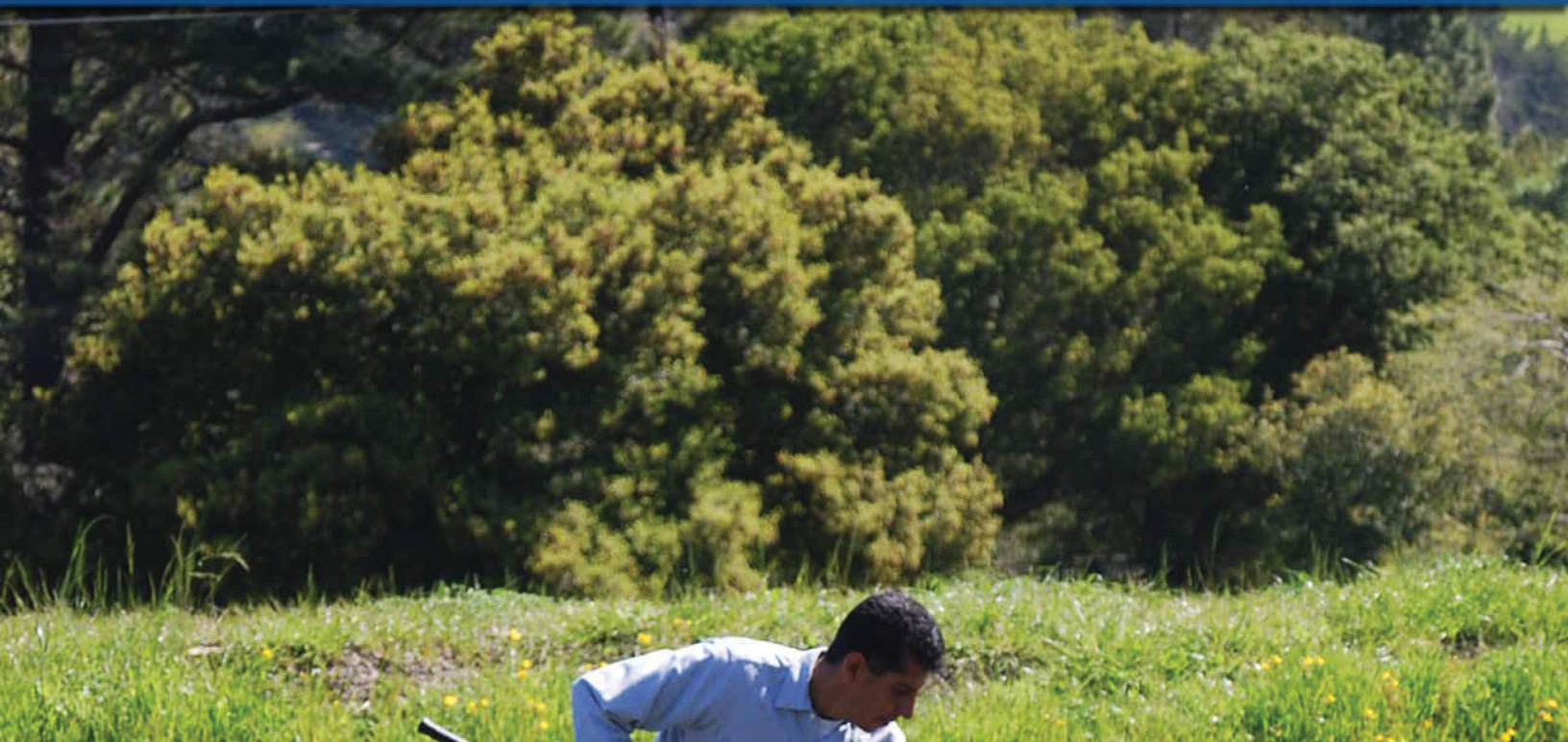




CONTRA COSTA
**MOSQUITO
& VECTOR
CONTROL**
DISTRICT

Protecting Public Health Since 1927

2013 ANNUAL REPORT



MOSQUITO CONTROL MATTERS



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Healthy people...

who can live, work, and play in a healthy environment is the vision of the Contra Costa Mosquito & Vector Control District.

The District exists to reduce the risk of vector-borne disease or discomfort to the residents of Contra Costa County. Besides being nuisances by disrupting human activities including the use and enjoyment of public and private areas, certain insects and animals (vectors) may transmit a number of diseases. Most vectors are extremely mobile and cause the greatest hazard or discomfort away from their breeding site. Each potential vector has a unique life cycle and occupies a specific habitat. In order to effectively control these vectors and their related disease(s), the District employs an integrated vector management program. There are seven key elements required to deliver a successful control program for infectious or vector-borne diseases: workforce, laboratory, vector ecology and surveillance, information systems, communication, policy and evaluation, and preparedness and response. The following pages explain these elements in more detail with highlights of activities for the year 2013.

Programs & Services

Most District programs and services are funded by tax dollars and are therefore provided at no charge.

Mosquitoes

Our county's diverse ecological regions create a range of mosquito sources. The District regularly surveys more than 10,000 acres of marshland along the waterfront, acres of irrigated farmland in the eastern portion of the county, and numerous ponds, creeks, and residential sources countywide. Upon request for service, the District will inspect your property for mosquito problems and provide advice on controlling their populations. With **23 kinds of mosquitoes** inhabiting a variety of water sources, we can determine where to look if the homeowner or caller provides our District employee with a mosquito sample. Simply swat and kill a mosquito (try not to squish it too much) and save it or tape it to a piece of paper for the District employee. Mosquitoes can transmit a variety of diseases including West Nile virus.

Mosquitofish

FREE mosquitofish are available for private ponds, horse troughs, non-maintained swimming pools and spas, rain barrels, and more. Mosquitofish can eat up to 500 mosquito larvae per day.

Rats & Mice

Homeowners, business owners or any group in Contra Costa County can request a site visit to assist them with rodent issues. District services include identification of rodent problems (rodent need not be present) and advice for prevention and control. District employees do not bait nor set traps, but provide valuable, detailed information, guidance, and recommendations. Rats can transmit various diseases through contamination from their droppings and urine.

Skunks

In an effort to reduce the risk of rabies to humans by reducing the likelihood of skunk and human contact in residential areas, the District works with homeowners to discourage skunks from visiting their property. District employees survey properties, provide guidance and recommendations, and may loan live-catch skunk traps.

Yellowjackets

The District provides extermination of ground-nesting yellowjackets only. Simply locate the nest and call the District for service. The nest's location must be identified and the location shared with District employees. This can be achieved by drawing a map, pointing a garden tool, or identifying the site with a marker (red sock, garden glove, etc.). Yellowjackets are beneficial insects that eat garden pests and pollinate crops through daily foraging; however, if aggravated, they can bite and sting repeatedly and painfully and their stings can be dangerous for those people allergic to their venom.

Ticks & Lyme Disease

The District surveys public parks and other areas for the ticks that transmit Lyme disease. The District also provides tick identification services to the public and doctors. People who are concerned about possible Lyme disease infections should contact their physician. Information on Lyme Disease testing on ticks may be found at [Lyme Disease Q & A](#). Several commercial laboratories will test ticks for Lyme disease for a fee. Visit [Tick Testing Labs](#) for more information.

Public Information & Education

The Public Affairs Department staff work closely with residents and the media to inform and educate about important health topics. Staff provide general and tailored presentations to various groups and school children of 12 or more people. District personnel also participate in social media interaction, a variety of events, workshops, and community discussions.

Principles

Vision

Healthy people who can live, work, and play in a healthy environment.

Mission

To protect and promote public health and welfare through integrated vector management services and programs utilizing best management practices and least toxic components by:

Community Value

Providing essential services to prevent, detect, and suppress public health pests, and to reduce the risk of vector-borne disease transmission to the people who live, work or play within the county

Service Area

Serving all of Contra Costa County

Public Confidence

Delivering accessible, accountable, efficient, transparent and cost effective services

Public Relations

Working closely with all constituents, private and public, to ensure prompt delivery of accurate information, to raise public awareness, and to develop relationships that promote healthy living

Environmental Commitment

Meeting or exceeding federal, state, and local environmental standards, practicing responsible environmental stewardship, enhancing value of wetlands, and considering relevant environmental factors as an integral component of mosquito and vector control

Research

Investigating environmental concerns and developing and/or testing new materials, methods and technologies to ensure quality control oversight on all services and programs, while anticipating resurgent and/or newly introduced vectors or vector-borne diseases

Interagency Relations

Integrating and communicating District programs and services with other public agencies to ensure cooperative, cohesive, and innovative program delivery

History

Contra Costa County encompasses some of the most diverse environments found in one area. This wide range of environments makes our county one of the most desirable places to live in Northern California. The Contra Costa Mosquito & Vector Control District plays a vital role in maintaining this environment while protecting the residents from insects and animals that can carry disease. The District helps to ensure Contra Costa County remains a great place to live where people can enjoy the outdoors.

As early as 1772, hordes of mosquitoes welcomed the first Europeans as they explored the San Francisco Bay Area. Interestingly enough, the diary of the expedition mentioned seeing few signs of "heathens." The Native Americans were smart enough to avoid the mosquito infested area.

More than 100 years later, thousands of men were dying of an unknown illness while working on the construction of the Panama canal. It was in the late 1800s that Dr. Walter Reed and Associates identified mosquitoes as the vector (carrier) of malaria and yellow fever. This discovery was not only important to the workers of the canal, but to Californians because some of them had contracted malaria. Not only were mosquitoes a nuisance, they carried diseases as well.

In California, mosquito abatement activities in the early 1900s focused on controlling the mosquito that carries malaria and reducing the numbers of nuisance salt marsh mosquitoes. Before 1915, mosquito control in the state was financed by subscription and donation. In 1915, a bill was passed through the State Legislature and signed by the governor that provided for the formation, organization, and financing of mosquito abatement districts. Noble Stover, manager for both Marin County Mosquito Abatement District and Three Cities Mosquito Abatement District in San Mateo County coauthored the Act.

Quite often, schools in Contra Costa County had to be closed, waterfront industry was periodically shut down, and recreational areas were abandoned, all due to salt marsh mosquitoes, a severe nuisance mosquito. Periodically, citizens of Pittsburg lined the street curbs with smudge pots in an attempt to drive the mosquitoes away. Realtors found it difficult to attract home buyers into mosquito-infested neighborhoods. So, the citizens of Contra Costa County, together with several waterfront industries, formed a committee in 1926 to address the need for mosquito control.

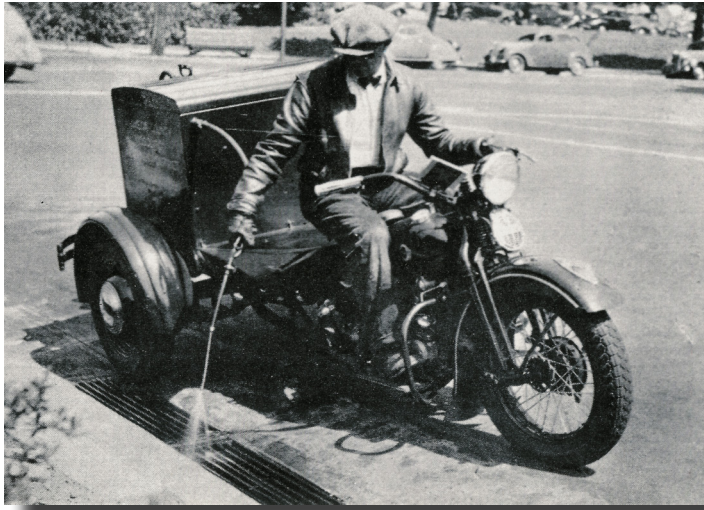


In 1926, Stover responded to requests from Contra Costa County and directed the first operations of Contra Costa Mosquito Abatement District (CCMAD #1), concurrently with his duties in Marin and San Mateo Counties. The purpose of the District was to control marsh mosquitoes in north central Contra Costa County. CCMAD #1 was formed and work began on April 15, 1927. The District, with two employees, began various engineering projects near the cities of Martinez, Concord, and Pittsburg. Much of the work was contracted out to dredging and construction companies. Stover was a pioneer in drainage and engineering methods, which were his primary approaches to controlling salt marsh mosquitoes. Many of those early projects still exist and are functional now more than 80 years later. Stover served as manager/engineer for CCMAD #1 until his death on September 17, 1935. Ernest Campbell, who had worked for the District since its inception, was appointed manager/engineer by the Board of Trustees upon the death of Stover.

In the summer of 1930 there was an outbreak of a horse plague in the San Joaquin Valley that resulted in the death of 3000 horses. In 1933, it became known that mosquitoes could transmit what is now called western equine encephalomyelitis. This virus was isolated from the brain of a dead child in 1938. Human cases of another virus, St. Louis encephalitis, were isolated in California in 1938 as well. Before the early 1940s, people thought that it was only the *Aedes* mosquitoes that transmitted disease. In 1941, *Culex tarsalis* was found to transmit the encephalitis virus.

In its early years, CCMAD #1 relied primarily on engineering methods of control such as creating ditch networks, dredging, building or repairing levees, installing tide gates and pumps. In 1927, the District contracted with Delta Dredging Company to excavate ditches at the cost of \$5 per hour. The District supplemented the program by spraying standing water with light oil, such as stove or diesel oil to kill the mosquito larvae. They also stocked various sources with mosquitofish.

Until 1941, the District's jurisdiction only covered the waterfront and marsh areas from Martinez to Antioch. On November 25, 1941, the communities of Saranap, Danville, and the City of Walnut Creek petitioned the CCMAD #1 Board of Trustees, requesting annexation into the District. Annexation took place on



Mosquito Spraying in Contra Costa County. Date unknown.

December 19, 1941. In November 1943, CCMAD #1 annexed the area comprising the Lafayette and Orinda School Districts upon their request. Oak Grove School District was annexed in July 1946 upon their request. In the midst of these events, Ernest Campbell, while serving as District manager/engineer for CCMAD #1, helped found and manage Northern San Joaquin Mosquito Abatement District.

Other portions of Contra Costa County were also in need of mosquito control, which led to the formation of CCMAD #2, CCMAD #3, and Antioch-Live Oak MAD. Under the leadership of Ernest Campbell and the Board of Trustees, CCMAD #1 merged with Antioch-Live Oak MAD, CCMAD #2, and CCMAD #3 in December of 1952. As of January 1953, CCMAD #1 provided mosquito control for the communities of Orinda and Port Costa in the west to the Antioch-Live Oak school District in the east, an area of 509 square miles.

Mosquito control was established in the eastern portion of Contra Costa County by the formation of the Diablo Valley Mosquito Abatement District (DVMAD) in 1952. The Diablo District was 136 square miles in size and encompassed the communities of Oakley, Brentwood and Byron. The Diablo District's headquarters was located in the community of Brentwood. The primary purpose of creating DVMAD was for the control of pasture and irrigation mosquitoes.

Diablo Valley MAD came into existence in time for the largest human outbreaks of western equine encephalomyelitis the state had experienced. In 1952, there were 375 human cases of western equine encephalomyelitis and 45 human cases of St. Louis encephalitis in California. There were eight reported human cases of western equine encephalomyelitis in Contra Costa County that same year. In the 1940s and 1950s, with the introduction of broad spectrum chemicals such as DDT the District changed to other strategies to control mosquitoes in the county. A "flit gun" was used to create a pesticide fog to kill adult mosquitoes. Jeeps were used to gain access to hard-to-reach areas and aircraft were used to spray large areas that were producing mosquitoes. The first entomologist, James Mallars, was hired in 1952. The District also expanded its focus from the marshes and began treatment of creeks in the county. In 1956, the District treated 1080 miles of creek at a cost of approximately \$5.10 per mile. By the late 1950s, the District began to see mosquitoes developing resistance to DDT.

From 1945 to 1957, CCMAD #1 retained a commercial telephone answering service, utilized part-time secretarial service, owned limited yard facilities for automotive and other equipment, and raised mosquitofish on Berrellessa Street in Martinez. In 1955, the District purchased approximately one acre of land on Concord Avenue in Concord and embarked on building its new headquarters, which opened in January 1957. Prior to that time, the District office was located in the various managers' homes from 1927 until 1957. The Board of Trustees held their board meetings at one of the local oil refineries until the completion of the new headquarters.



Mosquitofish rearing. Date unknown.

Timeline

In April of 1955, CCMAD #1 expanded its program to include fly control. Contra Costa County in the 1950s was primarily a rural county with commercial rabbitries, poultry ranches, stables, cattle ranches, and orchards. This was the first time CCMAD #1 officially sought to control a disease vector other than mosquitoes. On occasion, the District would also remove or destroy bee hives.

In 1959, the employees joined the County Employees Association. From that date to the present, field employees of the District have been represented by Associations or Public Employee Unions.

In the 1960s, in response to DDT resistant mosquitoes, CCMAD #1 switched to organophosphate pesticides as the primary method for control of mosquitoes. By the 1970s, mosquitoes were beginning to show resistance to these pesticides as well.

Contra Costa County had its most recent reported human cases of St. Louis encephalitis in 1967 and western equine encephalomyelitis in 1968. The District continued an active source reduction program into the 1970s. In 1970, the District started treating non-structural yellowjacket nests located in the ground.

Ernest Campbell retired in March of 1966 due to poor health. In July of 1966, John Brawley became the new manager. Under John Brawley's tenure the District annexed the western portion of the county in June of 1969. Before June 1969, West County, which included the City of Richmond and the communities of El Cerrito, Kensington, San Pablo, El Sobrante, Pinole, Hercules, and Crockett, had no organized mosquito control. However, in the 1930s, some ditching was conducted in the Richmond marshes under the supervision of Harold Gray, the manager of Alameda MAD. John Brawley retired in September 1976.

Brawley's replacement was Brad Anderson who became manager in November of 1976. His misfortune was becoming manager just before Proposition 13, which reduced funding for mosquito abatement districts throughout the state. CCMAD #1 lost 50 percent of its revenues. In response, the District's Board of Trustees laid off 13 of the 21 full-time employees in November of 1978. Brad Anderson chose to resign so that his position and the entomologist's position could be combined. Charles Beesley, Ph.D. who was already employed by CCMAD #1 as the entomologist, became the new manager. The Board chose to cease all services to the public except for mosquito and yellowjacket control. The District's source reduction program also ended at this time and equipment was sold to keep the District afloat. After Proposition 13, there were only four of 14 field personnel retained. Employees who worked for the District in 1978 remember it as a lean and depressing time.

Early in the century, Northern California suffered through epidemics of encephalitis and malaria, diseases transmitted by mosquitoes. At times, parts of Contra Costa County were considered uninhabitable, with waterfront areas and schools shut down during peak mosquito seasons.

1926 - mosquito control committee formed by Contra Costa County citizens and several waterfront industries

March 31, 1927- Contra Costa Mosquito Abatement District (CCMAD) began operations in Martinez

In the 1950s - CCMAD began using mosquitofish as biological control of mosquitoes

January 15, 1957 - CCMAD relocated to Concord

July 1, 1970 - CCMAD annexed to West County

In 1970 - CCMAD began treating ground-nesting yellowjacket nests

July 1, 1986 - CCMAD consolidated with east county to become countywide

In 1986 - CCMAD expanded services by conducting field surveys and testing ticks for Lyme disease

In 1993 - the District added the rodent control and rabies risk reduction programs previously operated by the county Environmental Health Department. Name changed to Contra Costa Mosquito & Vector Control District

In 1997 - the District began the Africanized Honey Bee ("killer bee") response program

2004 - West Nile virus detected for the first time in dead birds in Contra Costa County

2005 - First West Nile virus human case in Contra Costa County

2006 - Two residents die from West Nile virus in Contra Costa County

Today, the District services 736 square miles in Contra Costa County.

In 1986, CCMAD #1 and DVMAD merged to create one countywide agency, Contra Costa Mosquito Abatement District (CCMAD). In 1988, CCMAD purchased land on Mason Circle in Concord and built a new facility that included an indoor mosquitofish rearing greenhouse. The District began modernizing its equipment with the purchase of new vehicles, modern spray equipment, and eight-wheel all-terrain vehicles. The work that took 16 field employees before Proposition 13 (including DVMAD) was now being done by nine. The District expanded services by conducting field surveys and testing the *Ixodes pacificus* tick for the Lyme disease spirochete. Research projects on wetlands was also initiated to determine ways to eliminate mosquito production and enhance wildlife habitat in the county.

In 1993, the County of Contra Costa transferred its rat and rabies reduction programs to CCMAD. Along with the program, three employees and equipment were transferred to CCMAD from the county. Subsequently, the District changed its name to Contra Costa Mosquito & Vector Control District (District). In 1993, the District's mosquito arbovirus surveillance program detected western equine encephalomyelitis in sentinel chickens and in mosquitoes collected in Contra Costa County. Fortunately, there were no human cases reported. Surveillance and control of *Culex tarsalis* mosquitoes once again became the District's primary focus. In the spring of 1994, the District purchased a custom built landing craft from a boat builder in Seattle, Washington. The landing craft could transport all-terrain vehicles, which allowed for regular inspection and treatment of islands in the Sacramento and San Joaquin Rivers.

In 1993 and 1994, the state of California took 40 percent of the District's property tax revenues to be used to balance the state budget. Due to the leadership of the District manager and the Board of Trustees, the District was prepared for this event, unlike Proposition 13, and enacted a county parcel fee to replace the local property tax revenues that the state had taken.

The District was able to continue tick surveillance and Lyme disease testing while the mosquito control program relied more on "biorational" methods (biopesticides and mosquitofish) that have minimal environmental impact. The District was considered to be in the forefront of wetland restoration and protection of endangered species and the environment. In 1996, the District received an Environmental Achievement Award in marsh management. Due to changing legislation (Proposition 218), the District anticipated the loss of its parcel fee that originated in 1993 and established a benefit assessment fee to ensure sufficient operating funds in 1996 and beyond.

In 1999, West Nile virus was first detected on the East Coast of the United States and the District began preparing for its eventual migration into California.

In 2001, after 27 years of distinguished service, General Manager Charles Beesley, Ph.D., retired. The building at 155 Mason Circle in Concord was dedicated in his honor. Assistant Manager Craig Downs was promoted to general manager. Downs began his career at the District as a vector control technician in 1981, advanced to biologist, superintendent, and assistant manager prior to his appointment to general manager.

By 2003, West Nile virus reached California. The District detected West Nile virus in Contra Costa County for the first time in 2004 in dead birds submitted for testing. The first human cases were in 2005. The virus was also detected that year for the first time in mosquitoes. To date, every year since 2005, West Nile virus has been detected in the county with several human cases. In 2006, two people died from the virus.

District employees continue to serve and protect the public by monitoring and controlling vectors of disease in Contra Costa County. For more than 86 years, the District remains steadfast in protecting public health from vector-borne diseases.



A technician sprays a sedimentation pond for mosquitoes. Date unknown.

Contra Costa Mosquito & Vector Control District

155 Mason Circle
Concord, CA 94520
925-685-9301
www.ContraCostaMosquito.com

Personnel

Administration

General Manager: Craig Downs

Assistant Manager: Ray Waletzko

Accounting & Benefits Specialist: Tina Cox

Administrative Secretary: Allison Nelson

Clerk-Receptionist: Marta McCord

Laboratory

Scientific Program Manager: Steve Schutz, Ph.D.

Vector Ecologist II/GIS Map Coordinator:
Eric Ghilarducci

Vector Ecologist: Damien Clauson

Biologist/Fish Program: Chris Miller

Public Affairs

Public Affairs Manager: Deborah Bass

Community Affairs Representatives:
Andrew Pierce
Nola Woods

Shop & Facility Maintenance

Mechanic II: Tom Fishe

Information Technology

IT Systems Administrator: Wayne Shieh

Operations

Mosquito Control Operations: West
Program Supervisor: Sheila Currier

Inspectors:
Lawrence Brown
Felipe Carrillo
Jeremy Tamargo
Patrick Vicencio
David Wexler

Technicians:
Brandon French

Mosquito Control Operations: East
Program Supervisor: Greg Howard

Inspectors:
Reed Black
Josefa Cabada
Tim Mann
Ceaser Gutierrez
Joe Hummel

Technicians:
Christopher Doll

Vertebrate Vector Control Operations
Program Supervisor: Jonathan Rehana

Inspectors:
Joe Cleope
Jason Descans
Steve Fisher
Dave Obrochta
Danielle Wisniewski

Independent Special District Classification

The Contra Costa Mosquito & Vector Control District is classified as an independent special district and is *not* part of Contra Costa County's governmental system. Contra Costa County encompasses the District's physical jurisdiction for mosquito and vector control. Special districts are:

- Formed by local residents to provide local services
- Sanctioned by the State of California Government Codes
- Often the most economical means of providing public service
- Independent, self-governed agencies governed by a board of trustees
- Operated as non-profit organizations
- Responsible directly to the people
- Accountable - Accessible - Efficient

Board of Trustees



Standing Left to Right: Richard Means, Pleasant Hill; Warren Clayton, Pinole; Daniel Pellegrini, Martinez; Michael Krieg, Oakley; Jim Fitzsimmons, Lafayette; Randall Diamond, Danville; and H. Richard Mank, Secretary, El Cerrito

Kneeling/Seated: Chris Cowen, Contra Costa County; Jeff Bennett, President, Hercules; Diane Wolcott, Orinda; Sharyn Rossi, San Ramon; Peggie Howell, Clayton; and Perry Carlston, Concord

Not pictured: Jose Saavedra, Antioch; Rolando Villareal, Brentwood; Myrto Petreas, Ph.D., Moraga; Sohelia Bana, Ph.D., Richmond; Richard Ainsley, Pittsburg; Morris Jones, Walnut Creek; James Pinckney, Vice President, Contra Costa County; and Darryl Young, Contra Costa County



Administrative Staff

Standing: Tina Cox, Accounting/Benefits Specialist; Ray Waletzko, Assistant Manager; Wayne Shieh, IT Systems Administrator; Steve Schutz, Ph.D., Scientific Program Manager; Marta McCord, Clerk/Receptionist; Eric Ghilarducci, Vector Ecologist II; Jonathan Rehana, Program Supervisor; Craig Downs, General Manager; Allison Nelson, Administrative Secretary; Chris Miller, Biologist; Damien Clauson, Vector Ecologist; Sheila Currier, Program Supervisor; Andrew Pierce, Community Affairs Representative; and Deborah Bass, Public Affairs Manager *Not pictured:* Nola Woods, Community Affairs Representative and Greg Howard, Program Supervisor



Inspectors & Technicians

Standing: Jason Descans, VCI; Steve Fisher, VCI; Christopher Doll, VCT; Tom Fishe, Mechanic II; Felipe Carrillo, VCI; Jeremy Tamargo, VCI; Josefa Cabada, VCI; Dave Obrochta, VCI; Joe Cleope, VCI; Joe Hummel, VCI; Brandon French, VCT; Lawrence Brown, VCI; Tim Mann, VCI; Ceasar Gutierrez, VCI; and Patrick Vicencio, VCI *Not pictured:* David Wexler, VCI; Danielle Wisniewski, VCI; and Reed Black, VCI

Integrated Vector Management

Mosquito and vector control is based on scientifically planned management tactics and control strategies that reduce the abundance of target pests in a timely manner. Integrated vector management is a comprehensive program that incorporates several coordinated activities:

VECTOR SURVEILLANCE
BIOLOGICAL CONTROL
PHYSICAL CONTROL (HABITAT MODIFICATION)
CHEMICAL CONTROL (PESTICIDE APPLICATION)
VEGETATION MANAGEMENT
PUBLIC INFORMATION & EDUCATION
TRAPPING

Service Area

Our service area encompasses Contra Costa County, California, and the islands pertaining to the Concord Naval Weapons Station that are in Solano County. In addition, the District can take action in bordering areas of Solano County, Sacramento County, San Joaquin County, or Alameda County if needed to provide control of mosquitoes or other vectors for residents of Contra Costa County [California Health & Safety Code Section 2270]. Areas covered by the program include:

1. The incorporated cities of Antioch, Brentwood, Clayton, Concord, Danville, El Cerrito, Hercules, Lafayette, Martinez, Moraga, Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, and Walnut Creek
2. The unincorporated areas of Contra Costa County
3. Those portions of the Concord Naval Weapons Stations that lie outside Contra Costa County (Roe and Ryer Islands and three small unnamed islands)
4. Other bordering areas in Solano, Sacramento, San Joaquin, or Alameda Counties

Surrounding Land Uses

The service area, which is essentially within the borders of Contra Costa County, has a diverse set of land uses and environmental settings. The District divides the service area into four regions, corresponding roughly to the pattern of vector production found in each. East County is generally hot and dry, with land use dominated by agriculture and new residential communities. North County includes both the coastal marshlands and the established port and industrial cities from Martinez through Pittsburg to Antioch. West County, like the north, includes coastal areas, older cities, and parklands, but is generally cooler and wetter. South Central Contra Costa, on the other hand, is generally warm and dry, with land use dominated by moderate to low-density housing mixed with open space, including some grazing areas, woodlands, and intermittent creeks.

Mosquito production is associated with standing water of all types and sizes. This includes marshes, ponds, creeks, seasonal wetlands, wastewater ponds, storm-water detention basins, irrigated pastures, duck clubs, etc., as well as individual homes or commercial buildings. Other vectors, especially rats, inhabit an even wider range of natural settings, as well as virtually all types of structures. Because of the diversity of mosquito and other vector habitat, almost all land use categories in the District's service areas may be affected by our efforts.

Other Public Agencies Whose Review/Approval is Required

The District's integrated vector management program as a whole, including the certification and continuing education of state-certified field personnel, is reviewed and approved by the California Department of Public Health through a formal cooperative agreement that is renewed annually.

For work on state lands and riparian zones, wetlands or other sensitive habitats, the District coordinates and reviews activities with the California Department of Fish and Wildlife and the California State Lands Commission as Trustee Agencies.

For minor physical control activities, the District obtains five-year regional permits from the U.S. Army Corps of Engineers (with review by the San Francisco or Central Valley Regional Water Quality Control Boards and/or the U.S. Fish & Wildlife Service, as appropriate), and from the San Francisco Bay Conservation & Development Commission.

For chemical control activities, the District reports to and is reviewed, at least annually, by the Contra Costa County Agricultural Commissioner.

Description of Services

The integrated vector management program of the Contra Costa Mosquito & Vector Control District is an ongoing program of surveillance and control of mosquitoes and other vectors of human disease and discomfort. The program essentially consists of eight types of activities:

- **Surveillance** for vector populations, vector habitats, disease pathogens, and public distress including trapping and laboratory analysis of vectors to evaluate populations and disease threats, direct visual inspection of known or suspected vector habitats, the use of all-terrain vehicles, maintenance of paths, and public surveys.
- **Public Education**— Encouraging and assisting reduction or prevention of vector habitats on private and public property.
- **Physical Control**— Managing vector habitat, especially through water control and maintenance or improvement of channels, tide gates, levees, and other water control facilities.
- **Vegetation Management**—Applying herbicides and other forms of vegetation management to improve surveillance or reduce vector populations.
- **Biological Control**—Rearing, stocking, and provision to the public of the “mosquitofish” *Gambusia affinis*; and possible use of other predators or pathogens of vectors.
- **Chemical Control**—Applying bacterial products *Bacillus thuringiensis israelensis* (Bti), *Bacillus sphaericus* (Bs), and Spinosad. Applying non-persistent selective insecticides to reduce populations of larval or adult mosquitoes and other invertebrate threats to public health, and rodenticides to control rats and other rodent threats to public health.
- **Trapping**—Trapping and euthanizing skunks and rodents that pose a threat to public health and welfare.

Descriptions of these activities, including their typical annual frequency and intensity, and general District policies and procedures to ensure that they result in no significant environmental impact are provided in the following pages.

Purpose and Need

The District exists to reduce the risk of vector-borne disease or discomfort to the residents of our service area. Besides being nuisances by disrupting human activities and the use and enjoyment of public and private areas, certain insects and animals may transmit a number of diseases. The diseases of most concern in the service area are West Nile virus, western equine encephalomyelitis, St. Louis encephalitis, dog heartworm, and malaria, which are transmitted by mosquitoes; rabies transmitted by skunks; plague and murine typhus transmitted by fleas; leptospirosis and hantavirus pulmonary syndrome associated with rats and other rodents; and Lyme disease, babesiosis, and ehrlichiosis transmitted by ticks.

The California Health and Safety Code defines a vector as “any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, other insects, ticks, mites, and rats, but not including any domesticated animal”. The District undertakes activities through its integrated vector management program to control the following vectors of disease and/or discomfort in the service area:

MOSQUITOES

Certain species of mosquitoes found in Contra Costa County can transmit malaria, West Nile virus, St. Louis encephalitis, western equine encephalomyelitis, and potentially other encephalitis viruses. Another species of mosquitoes is also capable of transmitting dog heartworm. Although some of the 23 species of mosquitoes found in our County have not been shown to transmit disease, most species can cause human discomfort when the female mosquito bites to obtain blood. Reactions range from irritation in the area of the bite to severe allergic reactions or secondary infections resulting from scratching the irritated area. Additionally, an abundance of mosquitoes can cause economic losses, and loss of use or enjoyment of recreational, agricultural, or industrial areas.

Upon request for service, technicians will inspect residential property for mosquito problems and provide recommendations to control their populations. With so many varieties of mosquitoes that inhabit a variety of water sources, it's important that the homeowner or caller provides a mosquito sample to the technician. The technician is then able to determine what type of mosquito is present and where the mosquito may be originating. Mosquito sources located outside the residential property are treated appropriately.

MOSQUITOFISH

Mosquitofish (*Gambusia affinis*) are used throughout the world for effective mosquito control. They are capable of eating enormous amounts of mosquito larvae daily. Mosquitofish are an important, natural mosquito control tool.

Mosquitofish are available to the public free of charge at the District's Concord office for private ponds, horse troughs, non-maintained swimming pools and spas, rain barrels and more.

GROUND-NESTING YELLOWJACKETS

Ground-nesting yellowjackets can bite, have a painful sting, can fly moderate distances, and are found throughout Contra Costa County. A single nest can lead to loss of use of public recreational areas, and loss of the enjoyment of property. More significantly, yellowjacket stings can result in anaphylactic shock and rapid death for the approximately 0.5 percent of the public with severe allergies.

The District provides extermination of ground-nesting yellowjackets since these species are aggressive toward people. The District does not provide a service for other species of yellowjackets, nor those that make their nest on or in structures. For ground-nesting yellowjackets, simply locate the nest and call the District for service. The nest's location must be identified and the location shared with the technician.

AFRICANIZED HONEY BEES

Africanized honey bees (AHB) were first detected in California on October 24, 1994 and were detected and successfully intercepted in Contra Costa County (Crockett) in 1997 and 2008. AHB are not known to transmit disease and are no more venomous than European honey bees (EHB); however, AHB respond to threats more rapidly than EHB and will defend their hive with greater numbers of bees which could result in a massive number of stings to an individual. Although persons have died as a result of 100 - 300 stings, it is estimated that the average lethal dose of venom for an adult human is 1,100 bee stings; for a child it can be substantially less. Normal reaction to a bee or wasp sting includes redness, itching, swelling, and pain at the site of the sting. Some individuals are allergic to all bee and wasp stings. Allergic reactions may include swelling of an entire extremity, abdominal cramps, vomiting, diarrhea, upper respiratory distress, and constriction of the throat and chest. Bee stings, like yellowjacket stings, can result in anaphylactic shock and death within 15 to 30 minutes for the approximately 0.5 percent of the public with severe allergies.

RATS AND MICE

Two introduced species of rats, the Norway rat and the roof rat, and the house mouse are present in the service area and are subjects of District action. In addition to being unsanitary, rats and mice can transmit a variety of organisms that infect humans. Rats are hosts to the worm that causes trichinosis in humans. Humans may become infected when they eat poorly cooked meat from a pig that has eaten an infected rat. Rat and mouse urine may contain the bacteria that cause leptospirosis, and their feces may contain Salmonella bacteria. Bubonic plague and murine typhus may be transmitted by infected rat fleas. Rat bites may cause bacterial rat-bite fever or infection. Gnawing by rats and mice causes damage to woodwork and electrical wiring, resulting in shorted circuits and potential fires. Additionally, an abundance of rats and mice can cause economic losses, loss of use of public recreational areas, and loss of the enjoyment of property.

Homeowners, business owners or any group in Contra Costa County can request a site visit to assist them with rat and mouse issues. District services include rat and mouse identification (rat or mouse need not be present) and advice for prevention and control. District employees do not bait nor set traps, but provide valuable, detailed information, guidance and recommendations. They also issue a formal, detailed report.

SKUNKS

The two primary reservoirs and vectors of rabies in California are skunks and some species of bats. Because of extensive residential development near natural areas and their ability to live in close proximity to people, skunks pose a potential health risk.

In an effort to reduce the incidence of rabies by suppressing skunk populations, the District works with homeowners to discourage skunks from visiting their property. District employees survey properties, provide guidance and recommendations and may loan live catch skunk traps if specific criteria are met.

TICKS

There are three species of common human-biting ticks in the District's service area. Of these three, only the western black-legged tick (*Ixodes pacificus*) is known to transmit Lyme disease in California.

The District periodically surveys public parks and other areas for the ticks that transmit Lyme disease to monitor the risk to people. The District also provides tick identification services to the public and medical personnel.

OTHER ANIMALS OF IMPORTANCE

Although certain animal species such as bats, ground squirrels, fleas, and opossums will not be regularly controlled, these animals play important roles in the transmission of rabies, plague, murine typhus, hantavirus, or Lyme disease and may be surveyed for diseases. The District may provide education and consulting services to the public about disease risk associated with these vectors and appropriate measures to protect human health. In extreme cases where the transmission of disease is likely, as with the other District integrated vector management activities, control efforts may be employed. Control of these animals is done in consultation with the California Department of Public Health, Contra Costa County Department of Health Services, Contra Costa County Animal Control Department, Contra Costa County Agricultural Commissioner's Office and other state and local agencies.

Most of the vectors mentioned above are extremely mobile and cause the greatest hazard or discomfort away from their breeding site. Each of these potential vectors has a unique life cycle and most of them occupy different habitats. In order to effectively control these vectors, an integrated vector management program must be employed. District policy is to identify those species that are currently vectors, to recommend techniques for their prevention and control, and to anticipate and minimize any new interactions between vectors and humans.

General Vector Management Strategy

The District's activities address two basic types of vectors—mosquitoes and other insects; and rats, mice, and skunks— but both share general principles and policies including identification of vector problems; responsive actions to control existing populations of vectors, prevent new sources of vectors from developing, and manage habitat to minimize vector production; education of land-owners and others on measures to minimize vector production or interaction with vectors; and provision and administration of funding and institutional support necessary to accomplish these goals. In order to accomplish effective and environmentally sound vector management, the manipulation and control of vectors must be based on careful surveillance of their abundance, habitat (potential abundance), pathogen load, and/or potential contact with people; the establishment of treatment criteria (thresholds); and appropriate selection from a wide range of control methods. This dynamic combination of surveillance, treatment criteria, and selection between multiple control activities in coordinated programs is generally known as integrated pest management. Due to the specific nature of our programs, we refer to this as integrated *vector* management.

The District's integrated vector management program, like any other integrated pest management program, by definition involves procedures for minimizing potential environmental impacts. The District's program employs integrated pest management principles by first determining the species and abundance of vectors through evaluation of public service requests and field surveys of immature and adult pest populations; and then, if the populations exceed predetermined criteria, using the most efficient, effective, and environmentally sensitive means of control. For all vector species, public education is an important control strategy, and for some vectors (rats, mice, ticks) it is the District's primary control method. In certain situations, water management or other physical control activities (historically known as "source reduction" or "permanent control") can be instituted to reduce vector breeding sites. The District also uses biological control such as the placing of mosquitofish in some settings. When these approaches are not effective or are otherwise inappropriate, then microbial or chemical pesticides are used to treat specific vector-producing or vector-harboring areas or vector populations.

In order to maximize familiarity by the operational staff with specific vector sources in the service area, the District is divided into mosquito and other arthropod zones (currently 11) and also into vertebrate vector zones (currently five). Each mosquito and other arthropod zone is assigned a full-time vector control technician, and sometimes an aide, whose responsibilities include minor physical control, inspection and treatment of known vector sources, finding and controlling new sources, and responding to service requests from the public. Each vertebrate vector zone is also assigned one or more vector control technicians and sometimes aides; responsibilities in these zones include control of skunks, rats, mice, and potentially other vertebrate vectors.

Vector control activities are conducted at a wide variety of sites throughout the District's service area. These sites can be roughly divided into those where activities may have an effect on the natural environment either directly or indirectly (through drainage), and sites where the potential environmental impacts are negligible. Examples of "Environmental Sites" in the service area include tidal marshes, duck clubs, other diked marshes, lakes and ponds, rivers and streams, vernal pools and other seasonal wetlands, stormwater detention basins, flood control channels, spreading grounds, street drains and gutters, wash drains, irrigated pastures, or agricultural ditches. Examples of "non-environmental sites" include animal troughs, artificial containers, tire piles, fountains, ornamental fish ponds, swimming pools, animal waste detention ponds, and non-natural harborage, such as wood piles, residential and commercial landscape, trash receptacles, etc.

The intensity of chemical, biological, or physical control activities in the District service area in general, or in any particular vector source, varies seasonally and from year to year because of weather conditions, size and distribution of vector populations, disease patterns, prevention of pesticide resistance, and other variables. Therefore, the scope of work discussed in the sections below is illustrative of typical District activity levels, but in the future these activities are expected to show continuing variation.

VECTOR SURVEILLANCE

The District's responsibility to protect public health and welfare involves monitoring the abundance of vectors, vector habitat, vector-borne pathogens, and interactions between vectors and people over time and space. Collectively, these monitoring activities are termed vector surveillance. Vector surveillance provides the District with valuable information on what vector species are present or likely to occur, when they occur, where they occur, how many there are, and if they are carrying disease or otherwise affecting humans. Vector surveillance is critical to an integrated vector management program because the information it provides is evaluated against treatment criteria to decide when and where to institute vector control measures. Equally important is the use of vector surveillance in evaluating the efficacy, cost effectiveness, and environmental impacts of specific vector control actions.

The District routinely uses a variety of tools and methods to conduct vector surveillance including specialized traps to collect adult mosquitoes, regular field investigation of known vector sources, flocks of sentinel chickens to detect arboviruses, public service requests for vertebrate pests, adult mosquitoes, and other insect pests; and low ground pressure all-terrain vehicles to access these potential vector sites.

The District's vector and disease surveillance activities are conducted in compliance with accepted federal and state guidelines. These guidelines recognize that local conditions vary, and are thus flexible in the selection of specific application methods. Therefore, the District's specific activities and their potential environmental impacts are described herein.

PHYSICAL CONTROL (HABITAT MODIFICATION)

Dredging, installation of culverts or alternative engineering works, as well as other physical changes to the land can reduce mosquito production directly by improving water circulation or drainage. Mosquito production can also be reduced indirectly by improving habitat values for predators of larval mosquitoes, including fish and many invertebrates, or by otherwise reducing a site's habitat value for mosquito larvae. The District performs these physical control activities in accordance with all appropriate environmental regulations (wetland fill and dredge permits, endangered species review, water quality review, etc.), and in a manner that generally maintains or improves habitat values for desirable species. Major physical control activities or projects (beyond the scope of the District's five-year regional wetlands permits with the U.S. Army Corps of Engineers and the San Francisco Bay Conservation and Development Commission) receive individual California Environmental Quality Act reviews. Minor physical control activities are covered by the regional wetlands permits. These vary substantially from year to year, but typically consist of up to 2,000 feet of ditch maintenance.

VEGETATION MANAGEMENT

The District periodically applies herbicides to reduce the mosquito habitat value of sites by improving water circulation or access by fish and other predators, or to allow access to standing water for inspections and treatment. Herbicides used by the District include Roundup® and Rodeo®, which are both based on the active ingredient glyphosate. Herbicides are applied in strict conformance with label requirements.

The District did not apply any herbicides during 2013. Some vegetation management was done using hand tools ("brushing") to improve access to inspection and treatment areas.

BIOLOGICAL CONTROL

The District uses the mosquitofish *Gambusia affinis* in some types of mosquito larval habitat to provide biological control of mosquitoes through direct predation of larvae. Fish stocking conducted by District personnel complies with strict guidelines designed to ensure that no significant impacts can occur to native species. District staff are also conducting research on several California native fish species as alternative biological control agents.

CHEMICAL CONTROL

MOSQUITO LARVICIDES

Depending on time of year, water temperature, organic content, mosquito species present, larval density, proximity to human settlements, presence of predators, and other factors, pesticide applications may be repeated at any site at recurrence intervals ranging from weekly to annually. District staff apply public health pesticides to the site in strict accordance with the pesticide label instructions.

The District uses several natural bacterial products for control of larval mosquitoes. These include Bti (*Bacillus thuringiensis israelensis*), a bacterium that is ingested by larval mosquitoes and disrupts their gut lining, leading to death before pupation. Bti is applied by the District as a liquid or bonded to inert substrate (sand, corn cob granules) to assist penetration of vegetation. Persistence is low in the environment and efficacy depends on careful timing of application relative to the larval growth stage. Therefore, use of Bti requires frequent inspections of larval sources during periods of larval production, and may require frequent applications of material. Application can be by hand, All-terrain vehicle (ATV), or helicopter. Bs (*Bacillus sphaericus*) is similar to Bti but has the additional capability of natural re-cycling, providing a longer duration of control. Bti and Bs have very low toxicity to non-target organisms. Spinosad ("Natar") is a bacterial fermentation product which acts on the nervous system of mosquito larvae and is available in several liquid and solid formulations.

Chemical larvicides routinely used by the District include Methoprene (Altosid), larvicidal oils, and Agnique. Methoprene, or Altosid, is a synthetic insect hormone designed to disrupt the transformation of a larval mosquito into an adult. It is applied either in response to observed high populations of mosquito larvae at a site, or as a sustained-release product that can persist for up to about four months. Application can be by hand, ATV, or helicopter. While highly effective against mosquitoes, it has very low toxicity to non-target organisms. Larvicidal oil is a petroleum distillate (mineral oil) with low toxicity to plants and fast environmental breakdown that forms a thin film on water and kills larvae through suffocation and/or direct toxicity. It is typically applied by hand, ATV, or truck. Unlike most other larvicides, this material is also effective against mosquito pupae. Agnique is the trade name for a monomolecular (one molecule thick) surface film larvicide, comprised of ethoxylated alcohol. It works by disrupting the surface tension of water, preventing mosquito larvae and pupae from being able to remain at the surface to breathe air. Sustained winds tend to disrupt the film, so this material is most useful in enclosed areas like swimming pools and other artificial containers.

MOSQUITO ADULTICIDES

In addition to chemical control of mosquito larvae, the District also makes aerosol applications of pesticides for control of adult mosquitoes if specific criteria are met, including species composition, population density (as measured by landing count or other quantitative method), proximity to human populations, and/or human disease risk. As with larvicides, adulticides are applied in strict conformance with label requirements. Adulticides currently used by the District include natural Pyrethrins (derived from chrysanthemum flowers) and the synthetic pyrethroid Resmethrin (Scourge). Both contain the synergist PBO (piperonyl butoxide) which improves their effectiveness against adult mosquitoes while reducing the amount of active ingredient needed. Both materials are applied as ultra-low-volume (ULV) fogs by truck or potentially by aircraft. In addition to having low toxicity to humans, these materials are applied in very small amounts (approximately 1 oz. to 2 oz. of active ingredient per acre) and are non-persistent (break down rapidly in sunlight). Applications are generally conducted at night or before dawn, when the target mosquitoes are most active, but bees and other nontarget organisms would not be exposed.

Malathion is an organophosphate material which the District may use for direct control of adult mosquitoes. This is not a routine operational material for the District, and its use is only contemplated in emergency circumstances or in the event that mosquito populations in our area develop significant resistance to other adulticides.

OTHER INSECTICIDES

In addition to direct chemical control of mosquito populations, the District also applies insecticides to control bees and ground-nesting wasps that pose an imminent threat to humans or pets. This activity is triggered by a public request for assistance, rather than in response to direct population monitoring. The District does not control any bees that are located inside a structure or wasps that are on or inside a structure, so if a technician finds that a bee or wasp nest is located inside a structure or a wasp nest is above ground, the resident will be given a copy of a referral list which contains the names of all companies in Contra Costa County that are certified for structural control of bees and wasps. If a district technician elects to treat stinging insects, he or she will apply an insecticide directly to the insect or insect nest in accordance with District policies to avoid any drift and harm to other organisms.

Pesticides that contain the active ingredient potassium salts of fatty acids (insecticidal soaps), such as M-Pede®, are used to control feral bees. Potassium salts of fatty acids are extremely low in toxicity. Drione® is used by the District against ground-nesting yellowjackets. This is an insecticidal dust containing pyrethrins, PBO and silica. The potential environmental impact of this material is very small because the active ingredients include Pyrethrins, and Piperonyl Butoxide (discussed above), and the mode of application, deep into underground nests, further limits the potential for environmental exposure.

RODENTICIDES

The District uses the rodenticides (rodent poisons) bromadiolone, diphacinone and difethialone. Most of the material is used in sewer systems, or is deployed in locked, tamper-resistant bait stations along creeks and in other natural habitats with no potential for direct human or pet exposure. Used bait is disposed of in accordance with the labels.

OTHER VERTEBRATE PEST MANAGEMENT

In addition to the use of rodenticides for the control of rats and potentially other rodents of public health significance, the District also traps and humanely euthanizes skunks that have established dens on residential or commercial properties. Property owners are educated by inspectors or technicians on how to limit contact with skunks. Skunks can be a reservoir of rabies. The District has approximately 175 live traps which can be distributed to residents and local business owners in the service area. Prior to delivering a trap, our technicians will conduct an inspection of the property to determine what existing conditions might be attracting skunks and provide recommendations for habitat modification. If the problem persists in spite of these efforts, a trap may be provided. Members of the public with District traps on their property are instructed to check the trap daily and to call the District promptly if an animal is captured. If a skunk is trapped, it is humanely euthanized with carbon dioxide gas and transported to the District for storage before being transported to a landfill. Animals other than skunks in the traps are promptly released on site; however, our trap design makes capture of other animals unlikely. Public requests for routine assistance with trapping or removal of other vertebrate animals such as raccoons or opossums are referred to Contra Costa County Animal Control or to local private pest control companies.

Under some circumstances, the District might trap rodents of public health significance, or, in an emergency, other vertebrate vectors for disease surveillance and control.

PUBLIC INFORMATION & EDUCATION

The District's outreach program educates and informs the public about mosquitoes and other vectors along with their associated diseases. Emphasis is placed on prevention methods and reducing the risk of illness. The District utilizes the media, various advertising outlets and the [District's website](#). Staff provide presentations to a plethora of groups and community organizations and disseminate health messages through events, health fairs, community newsletters, social media, city and county partnerships, and local groups.

Mosquito & Vector Surveillance

The District's entomology laboratory staff collect and analyze the following types of information to help guide and plan effective and environmentally sound control of vectors and vector-borne diseases in Contra Costa County:

- Mosquito population surveillance
- Encephalitis virus surveillance
- Surveillance for other mosquito-borne diseases
- Tick and Lyme disease surveillance
- Identification of ticks and other biting arthropods
- Quality control for pesticide applications
- Research and special projects

Mosquito Population Surveillance

Mosquito surveillance is a key component of our integrated vector management program. **Twenty-three different species of mosquitoes** are found in our county, and each one is different in terms of its habitat, biting habits, ability to transmit disease, flight range and appropriate control methods. The District's surveillance program monitors larval and adult mosquito populations countywide to track changes over time and identify potential risk areas for nuisance or disease issues. This information is used by our operations team to plan and carry out efficient, effective and environmentally sound mosquito control strategies.

Larval Mosquito Surveillance

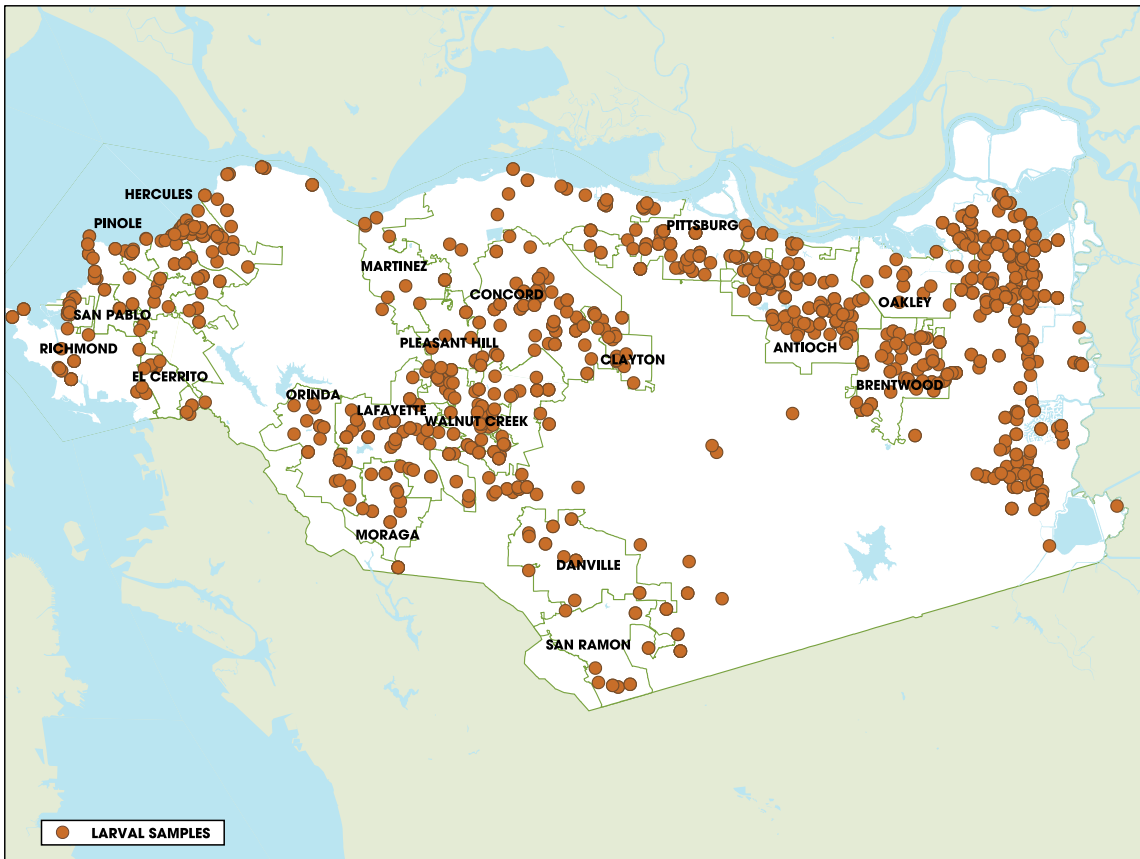
Vector control technicians and inspectors collect samples of mosquito larvae in the field daily and return them to our laboratory for counting and identification. Treatment decisions can then be made based on species and density information in addition to other factors like habitat type, proximity to populated areas and presence or absence of natural predators. The data are stored in a database which enables us to make comparisons with historical averages and to map larval populations by species. In 2013, our laboratory staff counted and identified 40,327 mosquito larvae and pupae.

SPECIES	COUNT
<i>Pupae</i>	2,343
<i>Cx tarsalis</i>	14,962
<i>Cs incidens</i>	11,624
<i>Cx pipiens</i>	9,254
<i>Cs inornata</i>	1,430
<i>Ae washinoi</i>	725
<i>Ae nigromaculis</i>	591
<i>Ae melanimon</i>	450
<i>Ae sierrensis</i>	357
<i>Cx stigmatosoma</i>	341
<i>Ae squamiger</i>	321
<i>Cx erythrothorax</i>	83
<i>Ae dorsalis</i>	78
<i>Ae vexans</i>	41
<i>An punctipennis</i>	38
<i>Cx apicalis</i>	19
<i>An franciscanus</i>	9
<i>Cs particeps</i>	2
<i>Cx boharti</i>	2
Total	40,327

Mosquito larvae identified in 2013 by species.



A batch of larvae and pupae collected in the field await counting and identification.



Locations of mosquito larval samples collected by the District in 2013.

Adult Mosquito Surveillance

The District utilizes two types of traps to monitor adult mosquito populations throughout the county—New Jersey light traps and carbon dioxide traps (CO₂ traps)—at representative locations throughout the county.

New Jersey light traps use light from a 5-watt fluorescent bulb to attract night-flying mosquito species. The traps have light sensors which automatically turn them on at dusk and off at dawn, and are operated year-round at 23 locations, some of which have been in use for 20 years or more. Samples are collected once a week by District technicians and returned to our lab for counting and species identification. Each week, current trap counts are compared with historical averages for different regions of the county to identify population trends that might require additional scrutiny.

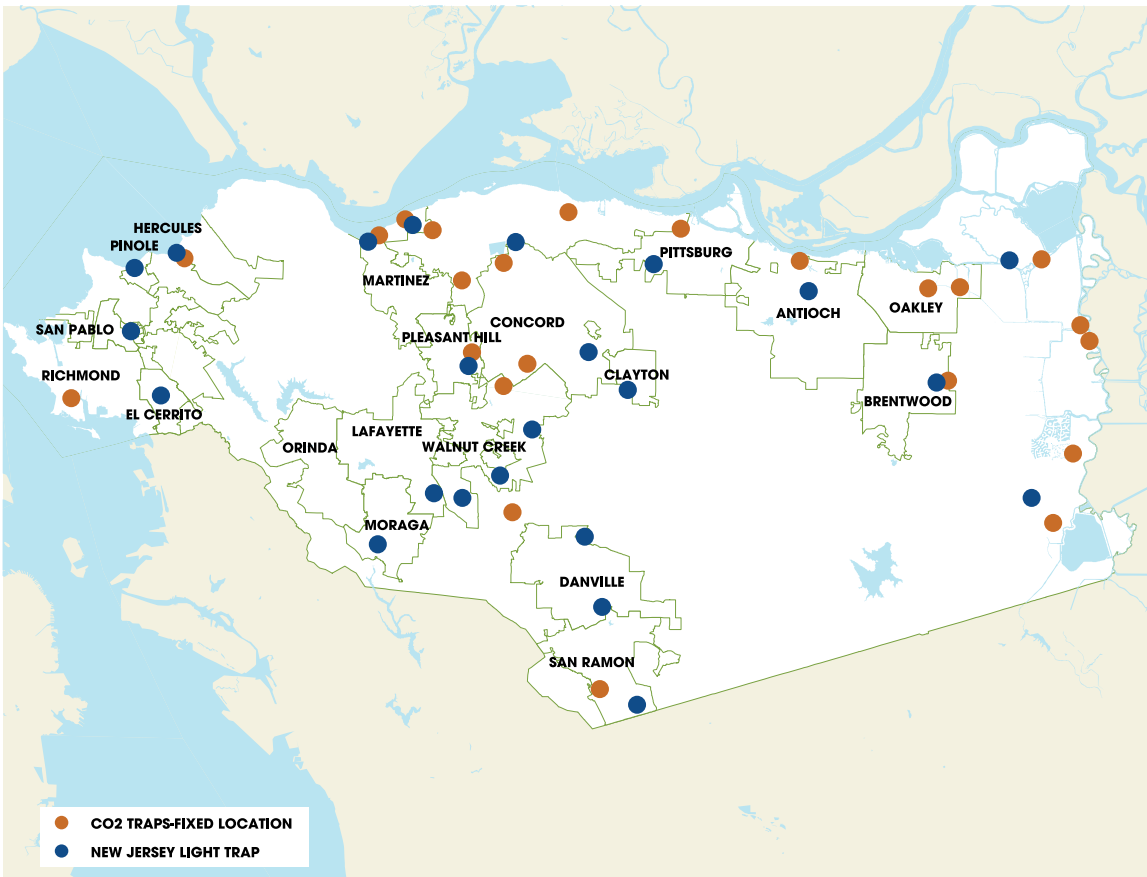


A New Jersey Mosquito light trap used to collect adult mosquitoes.

CO₂ traps are portable, battery powered, and use a small LED light and dry ice to produce carbon dioxide, which is a powerful attractant for mosquitoes. Traps are set overnight once per week at 24 'fixed' locations throughout the county and as many as 12-30 variable locations which are chosen based on other surveillance information (dead bird reports, mosquito complaints, field observations by technicians, etc.). In addition to collecting both day and night flying mosquitoes, these traps also allow the District to return the mosquitoes to our lab while still alive so they can also be tested for West Nile virus and other viruses. Counts can also be compared with regional averages to track population changes and target control activities.

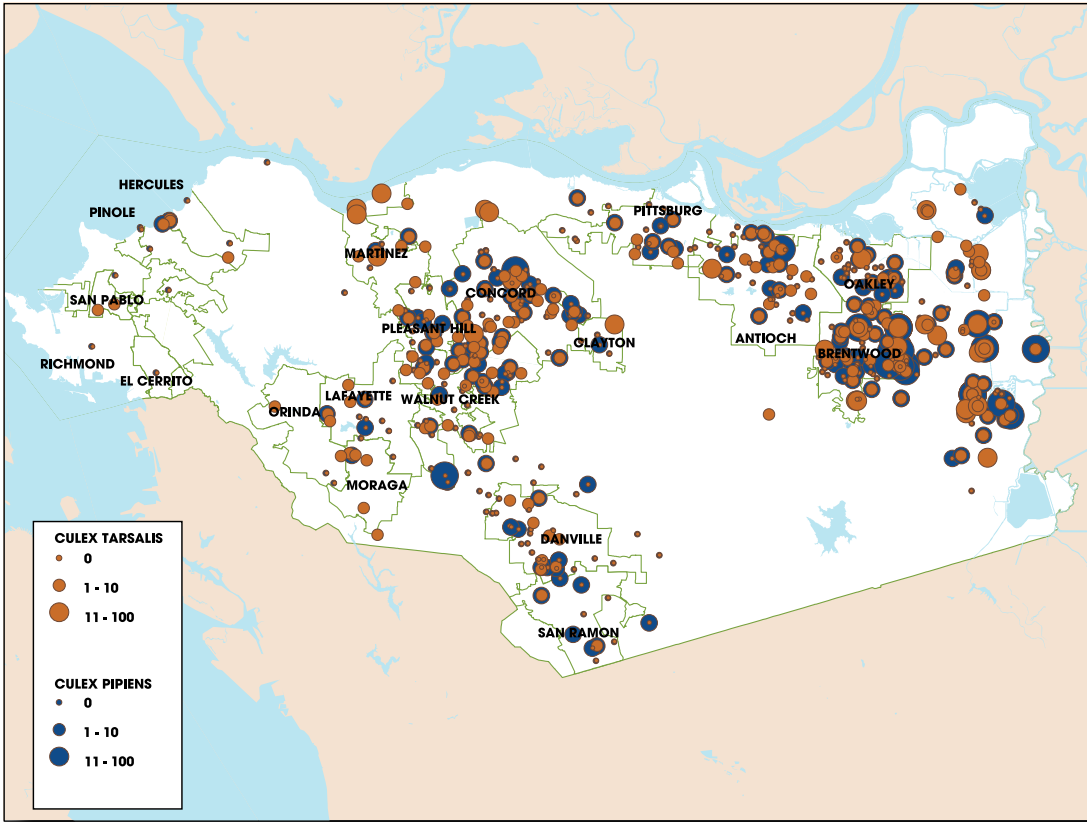


A carbon dioxide trap that collects adult mosquitoes hangs in a tree.



FIXED ADULT MOSQUITO TRAP LOCATIONS IN 2013

Both carbon dioxide, which simulates the breath of a person or animal, and light attract mosquitoes to the trap. Mosquitoes are then counted and identified per species to determine the risk of disease or nuisance to people.



RANDOM ADULT MOSQUITO TRAP LOCATIONS IN 2013

Random traps set throughout Contra Costa County capture mosquitoes for surveillance and control applications. *Culex tarsalis* and *Culex pipiens* are primary vectors of West Nile virus and other diseases.

In this figure, the size of the circles illustrate how many mosquitoes were collected.

Adult Mosquito Abundance Trends

Although the District is able to monitor the abundance of most of the mosquito species present in Contra Costa County, two species—the western encephalitis mosquito, *Culex tarsalis*, and the northern house mosquito, *Culex pipiens*, are considered the most significant since they are the primary vectors of West Nile virus and other encephalitis viruses including St. Louis encephalitis. Both species are widespread and abundant throughout the county. *Culex tarsalis* prefers clear water and used to be more common in rural agricultural areas; however, in recent years it has become the most abundant species in abandoned or unmaintained swimming pools in residential neighborhoods. This mosquito may fly as far as five miles or more from its larval habitat so a single ‘bad’ pool can affect a large area. *Culex pipiens* prefers water high in organic material and is most common in sewer plants, dairy farm ponds and underground storm drains. This mosquito usually doesn’t travel more than a few blocks from its larval ‘source’, but may be extremely widespread in residential neighborhoods during the summer due to overwatering of lawns and other urban water runoff that keeps the storm drains constantly wet.

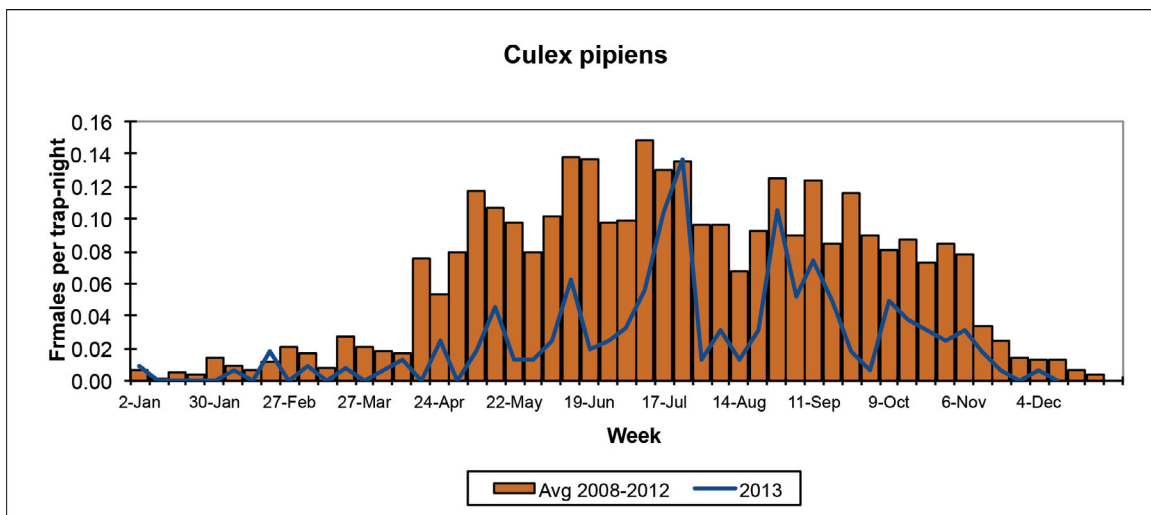
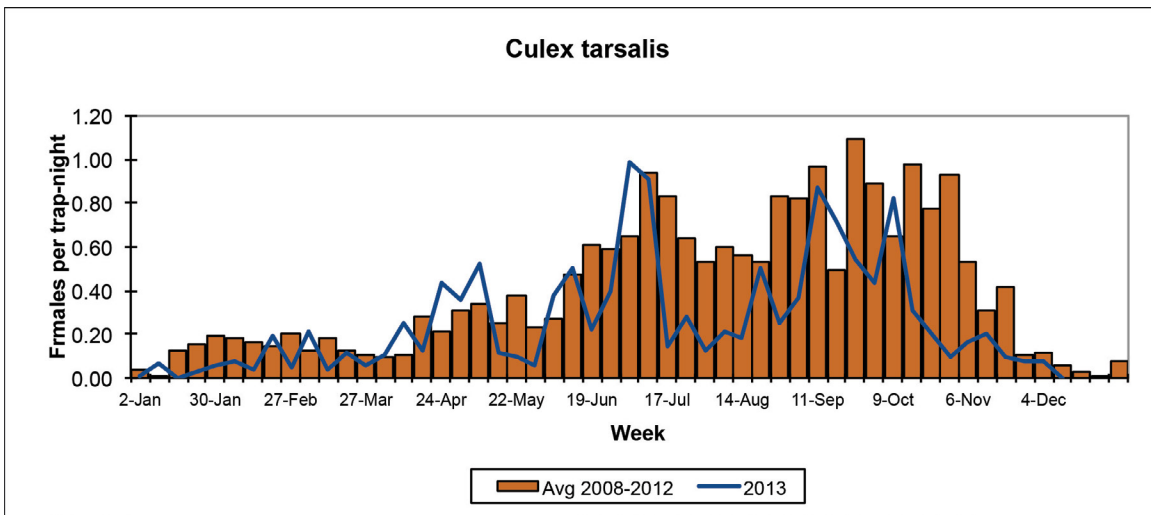
Rainfall and summer temperatures were both below average in 2013, and countywide populations of *Culex tarsalis* were average or below throughout most of the season, with a few brief exceptions early in the season. The seasonal peak occurred in mid-June and the fall peak was lower than average. *Culex pipiens* counts were below average countywide throughout most of the mosquito season. Despite these overall below-average counts,

there were several locations in East County and the Martinez waterfront area where trap counts and/or virus risk levels exceeded the District’s adult mosquito treatment thresholds, necessitating a few fogging operations to protect public health. More than 30,000 adult mosquitoes were collected and identified in fixed-location traps in 2013.

SPECIES	COUNT
<i>Cx tarsalis</i>	25,605
<i>Cx pipiens</i>	1,769
<i>Cs inornata</i>	1,496
<i>Ae dorsalis</i>	613
<i>Cx erythrothorax</i>	374
<i>Ae melanimon</i>	354
<i>Cs incidens</i>	265
<i>Ae squamiger</i>	120
<i>An franciscanus</i>	71
<i>Ae nigromaculis</i>	61
<i>Ae vexans</i>	51
<i>Ae washinoi</i>	39
<i>Ae sierrensis</i>	28
<i>Cs particeps</i>	10
<i>An punctipennis</i>	8
<i>An freeborni</i>	1
Total	30,865

Adult mosquitoes collected in fixed traps in 2013, by species

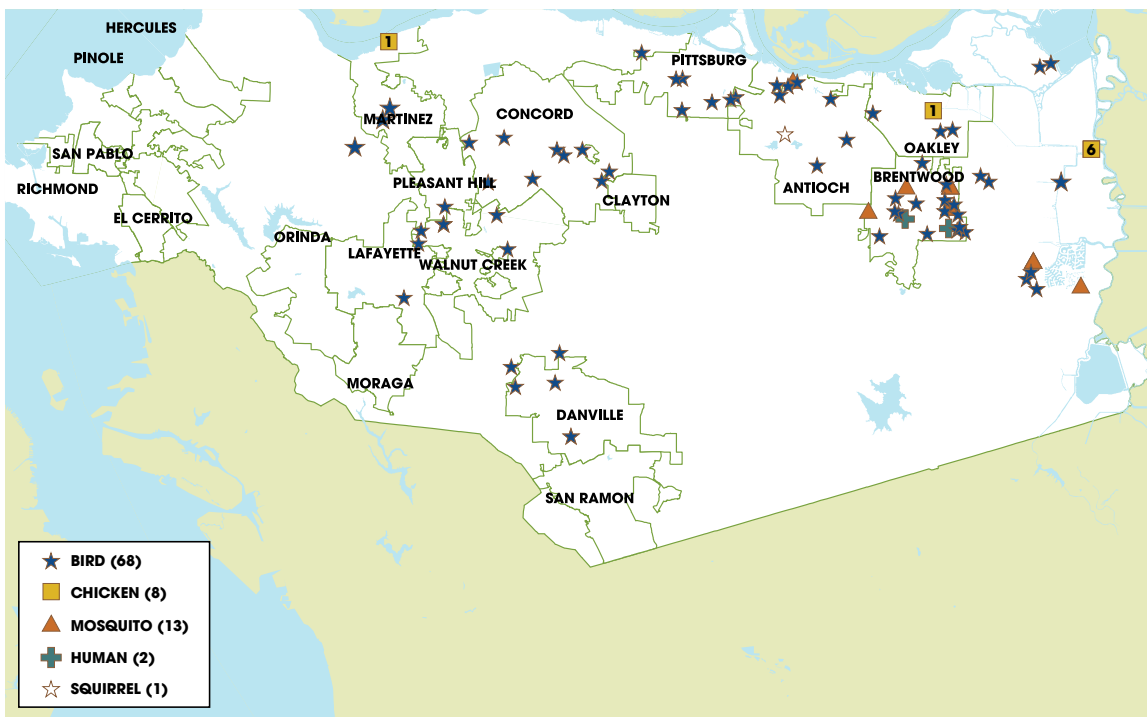
Abundance of Vector Mosquito Species in Contra Costa County in 2013



Mosquito-Borne Disease Surveillance

Our laboratory conducts a comprehensive surveillance program for diseases transmitted by mosquitoes, including West Nile virus, western equine encephalomyelitis and Saint Louis encephalitis as part of California's statewide surveillance effort. We also collaborate with the California Department of Public Health, the University of California and other state and federal agencies on studies intended to detect or predict new mosquito-borne diseases which might be introduced to our area in the future. West Nile virus, which is native to Africa, first appeared in the United States in 1999. It has been the most prominent mosquito-borne disease here in California since its arrival in 2003, with more than 4,000 reported cases and 145 deaths. (The actual number of cases is probably much higher since only patients with the most severe form of the illness tend to be tested and diagnosed.) Serious outbreaks of western equine encephalomyelitis and St. Louis encephalitis occurred in California as recently as the 1950s and 1960s, and could reoccur at any time. The District last detected western equine encephalomyelitis activity in 1997, when two chickens at our flock in the Martinez waterfront area tested positive for antibodies.

The San Francisco Bay Area also had a **history of severe malaria outbreaks** in the early part of the 20th century. Pioneering mosquito control efforts by Stanley Freeborn, Ph.D., Sc.D. and others led to the eradication of malaria in California. However, international travel still occasionally brings people infected with malaria to our area. *Anopheles* mosquitoes, which are also capable of transmitting the disease to humans, still occur here as well. District employees work with the Contra Costa Department of Public Health to investigate and treat, if necessary, *Anopheles* mosquito breeding sites in the vicinity of reported human cases in order to prevent local disease transmission.



Positive West Nile Virus Activity in Contra Costa County in 2013

Mosquito Samples

Between 30 and 50 dry ice-baited mosquito traps are set every week, some at fixed locations and others at variable locations, based on dead bird reports, mosquito complaints, or other indicators of possible virus or nuisance risk. Mosquitoes from these traps are tested for mosquito-borne viruses in batches or 'pools' of between 10 and 50 individuals of a particular species. Some testing (for West Nile virus only) can be done in the District's laboratory, but the majority of samples are sent to the University of California Center for Vector-borne Disease Research where they are tested for West Nile virus, western equine encephalomyelitis and St. Louis encephalitis. Results of this testing enable us to determine areas of the county at risk for disease transmission and target our control resources efficiently.

In 2013, 454 samples of more than 12,730 mosquitoes were tested; 13 samples were positive for West Nile virus (six *Culex pipiens*, seven *Culex tarsalis*). Seven of these samples came from areas in Brentwood where we had an ongoing issue with inadequately maintained storm water detention basins, which had become overgrown with vegetation and hence were difficult to inspect or larvicide effectively. Working with other local agencies, projects were initiated by late in the season which will hopefully prevent similar problems in the future. The remainder of the positive mosquito samples came from other areas of East County, including Brentwood, Antioch and Discovery Bay. Limited adulticiding was conducted in Brentwood and Discovery Bay to reduce the immediate risk of human cases.

Dead Birds

The District's dead bird surveillance program represents a very successful collaboration between the California Department of Public Health, the District and the residents of Contra Costa County. Dead birds are reported by members of the public to the statewide West Nile virus Hotline (1-877-WNV-BIRD) or online at <http://westnile.ca.gov>.



		2005 – 2013 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE								
		2005	2006	2007	2008	2009	2010	2011	2012	2013
Mosquito Samples	Samples Tested	425	523	721	729	814	536	484	468	454
	Total No. Mosquitoes	20,309	24,358	28,290	23,502	27,436	16,820	14,321	11,571	12,730
	West Nile Virus Positive	4	20	28	31	17	4	7	19	13
Chickens	Blood Samples Tested	800	904	669	851	717	773	600	590	631
	Total No. Chickens	50	50	50	50	50	50	50	50	50
	Seropositive	18	24	5	15	13	4	0	7	8^
Dead Birds	Total Reported	5,589	3,472	2,042	2,227	1,221	923	1,057	1,816	1,377
	Total Tested	518	388	158	115	80	32*	74*	106*	123*
	West Nile Virus Positive	94	92	29	88	45	8	43+	66	68
Dead Squirrels	Total Tested	45	41	29	39	19	0**	0**	0**	1
	West Nile Virus Positive	25	19	5	9	2	--	--	--	1

*testing restricted to crows/jays only **squirrels not tested + includes five 'chronic positive' birds ^Includes 1 RAMP positive

Hotline operators screen the calls to determine whether the birds are suitable candidates for testing; if so, they are referred to the District to be collected. Although not all birds are candidates for testing, all reports are important since they are mapped and used to identify potential risk areas and to target additional surveillance which can include mosquito trapping and larval source inspections.

Testing in 2013 was restricted to corvid (crow family) birds only (crows, ravens, jays, and magpies). Although we have occasionally found West Nile virus infected birds of other species, corvids are the highly susceptible and therefore represent the most sensitive indicators. Also, corvids tend to develop higher virus levels in their bodies than other birds which means that the virus can often be detected by using a rapid screening test in our own laboratory the same day the bird was collected. Birds testing negative for West Nile virus on our initial screening may be sent to the University of California for further testing. Results typically take 10 days to two weeks.

During 2013, the West Nile virus Hotline received 1,377 dead bird reports from Contra Costa County residents. Of those, 123 birds were collected for testing and 68 (55 percent) tested positive. The majority of infected birds were found in East County, although we saw sporadic clusters of positive birds in parts of Central County as well.

Sentinel Chickens

Chickens are naturally resistant to mosquito-borne viruses and do not become ill, nor can they pass the virus back to mosquitoes, but they do develop antibodies that can be detected in laboratory tests. This makes them ideal 'sentinels' for detection of virus transmission. The District maintains a total of 50 chickens (10 at each of five flock sites) within the county. New young chickens are obtained from a commercial chicken farm each spring to insure that they have not been previously infected. Blood samples are collected twice a month from April through October and submitted to the California Department of Public Health's Viral and Rickettsial Disease Lab in Richmond to be tested for antibodies to West Nile virus, western equine encephalomyelitis and Saint Louis encephalitis. In 2013, seven of our chickens (five on Holland Tract, one in Oakley and one in Martinez) tested positive for West Nile virus antibodies. Since chickens cannot pass the virus on to others, they are donated to charitable organizations for egg production or adopted by owners of the host properties at the end of each season.

Human Disease Cases

Two locally acquired and three non-locally acquired human West Nile virus cases were reported by the Contra Costa County Department of Public Health in 2013. Both locally acquired cases occurred in east county. Four out of the five patients, including both with locally acquired illness, experienced the severe, neuroinvasive form of the disease. Since the Centers for Disease Control and Prevention statistics show that neuroinvasive disease represents approximately one in 150 West Nile virus cases, it can be estimated that more than 300 county residents may have been infected locally in 2013. The vast majority of milder cases go un-tested and unreported since they may be asymptomatic (no symptoms) or mistaken for the flu. Statewide, there were 366 human cases, 13 of which were fatal.

Equine Disease Cases

A single equine (horse) case was reported in Contra Costa County in 2013. Due to cutbacks in the statewide veterinary diseases surveillance program, details were not available to determine whether it was locally acquired. An effective vaccine for horses has been available for several years; human vaccines have so far not gone beyond clinical trials. Statewide, 13 equine cases were reported.

Invasive Mosquito Species

Through the District's ongoing surveillance program, District employees work to detect any new mosquito species that enters the county. In 2013, monitoring for new mosquito species proved to be an important task because the number of mosquito species increased in California.

In addition to the non-native Asian tiger mosquito (*Aedes albopictus*), which is now established in parts of the Los Angeles basin, vector control districts in Fresno, Madera, and San Mateo counties reported finding populations of the yellow fever mosquito (*Aedes aegypti*) in 2013. Both species are similar in behavior in that they are adapted to living around humans and lay their eggs in a wide variety of natural and artificial water containers. Both are potential vectors of human disease, including dengue virus, which has been on the increase worldwide, and chikungunya virus, which has recently been detected for the first time in the Caribbean. Both viruses use humans as reservoir hosts and the concern is that these mosquitoes may pick up the viruses while feeding on people who have returned from trips to endemic areas and spread the viruses to other people here at home.

In 2013, the District's comprehensive surveillance program did not detect either species in Contra Costa County. The District plans to enhance the program in 2014 to proactively search for these invasive species with the goal of preventing them from becoming established. Since these are primarily considered 'backyard' mosquitoes, it is essential for the public to be vigilant in eliminating any potential mosquito breeding sites on their property and to report mosquito problems (especially mosquitoes biting during the day) to the District.

Research, Special Projects and Presentations

Scientific Programs Manager Steve Schutz, Ph.D. gave a presentation at the 81st Mosquito & Vector Control Association of California's (MVCAC) Annual Conference and Exhibitor Showcase held in Burlingame, CA in 2013. The presentation was entitled "The Law of Unintended Consequences: Stormwater Detention Basins as Suburban Foci of WNV Activity." It was co-authored by mosquito program supervisors Greg Howard and Sheila Currier. Schutz also presented a lecture entitled "Mosquitoes by the Bay: Biology of Bay Area Species" at a seminar at the MVCAC Coastal Region Continuing Education Workshop that was held in San Leandro later in the year.

Mosquito Control Operations

New Mosquito Species in Nearby Counties Increase Risk of Mosquito-borne Illness

California has long been home to more than four dozen species of mosquitoes, but in 2013 that number grew with the discovery of the yellow fever mosquito (*Aedes aegypti*) in Fresno, Madera, and San Mateo Counties. The Northern California discovery came on the heels of the Southern California investigation into an established population of the Asian tiger mosquito (*Aedes albopictus*) which began two years ago. The detection of new mosquito species in California is testament to the importance of mosquito surveillance and control because with each new mosquito species comes the risk of new and potentially dangerous mosquito-borne illness.

The District's trained and state-certified public health employees are on the lookout for both new mosquito species and the existing species that have already been identified within the county. With 23 mosquito species currently in Contra Costa County, that task requires daily attention. In 2013, District employees received 2859 requests for mosquito service from members of the public, nearly identical to the 2872 requests the District received in 2012. A possible reason for the similar numbers is that 2013 and 2012 experienced related climate phenomena. 2012 was one of the hottest years on record in California and 2013 was the driest year on record in the Golden State. During hot weather, water easily evaporates and during dry weather, water just isn't present. In both cases, there are limited sources of water where both mosquitoes and birds congregate creating hotspots for West Nile virus transmission. Therefore, disease transmission is often increased in drought years.

East Contra Costa County Retains West Nile Virus Dominance

Of the mosquitoes, birds and chickens that tested positive for West Nile virus in 2013, all of the mosquito samples, 41 of the birds and six of the seven chickens were collected from the eastern portion of Contra Costa County. West Nile virus is a disease that reproduces rapidly in hot temperatures. That is why traditionally, eastern Contra Costa County has been the primary location of West Nile virus in the county because it maintains warmer temperatures where the virus is able to replicate more efficiently.

In response to the virus and when evidence and testing suggests people are at greater risk of becoming infected with the virus, the District may use public health pesticides distributed through ultra low volume truck-mounted sprayers. In 2013, the District conducted truck mounted spraying six times, five in the eastern section of the county; however, that was fewer than the 14 times the District fogged in 2012. The reduction in truck-mounted fogging was due in part to a change in approach when possible to favor smaller scale hand held applications. The District also focused on identifying the specific people responsible for properties where mosquito production occurred and educated them as to what they could do to reduce the mosquito population.

Detention Basins

Detention basins are supposed to be designed to accept residential excess water along with rain water and slowly release it into storm drains so as not to create a flood risk. Obstructions, including plant life that are allowed to grow in basins, impede water flow. Instead of flowing, the water remains still, a perfect habitat for mosquitoes. In 2013, drainage detention basins continued to be an unforgiving source of mosquito production in Contra Costa County. For three years, the District has worked with Contra Costa Flood Control and other groups responsible for the basins in an effort to curb mosquito production that frequently comes from water trapped beneath overgrown vegetation.

In 2012, Flood Control contracted with Orinda-based Goats R Us to control the vegetation in two ponds located in Brentwood so that District employees could access the water for monitoring and treatment. In 2013, additional vegetation removal and new infrastructure work was required to reduce the mosquito production. Flood Control employees removed the foliage and installed low flow channels that allowed District employees to access the water. As they suspected, they found the water was producing large numbers of mosquitoes. The ability to reach the water in these basins is critical in reducing mosquito production in an area of the county that is predisposed by climate and other factors to possess measurable risk for West Nile virus.

At another privately owned detention basin known as Garin Pond, the District was able to make contact with the land developer responsible for the flood prevention feature. In accordance with the District's request, the developer worked actively to maintain the basin to allow for mosquito control, which not only benefits the adjacent residential area, but helps to break the cycle of West Nile virus in the area.

In Concord, District employees worked to find the source of mosquitoes that prompted nearby residents to request mosquito services on several occasions. It turned out to be yet another detention basin, and yet again, overgrown vegetation and infrastructure issues created numerous challenges in gaining control over the mosquito population. The District partnered with City of Concord Public Works officials who used resources and equipment at their disposal to clear the basin and allow District employees to access the area using an all terrain amphibious vehicle. Following the application of public health pesticides on the area to combat the numerous adult mosquitoes, the number of mosquitoes caught in traps decreased by 91 percent. Once the initial treatment was complete, District employees were able to place mosquito-eating fish in the water to prevent young mosquitoes from developing into adults that have the potential of transmitting disease. Throughout the rest of 2013, the City of Concord maintained the basin, allowing the District to attain success in reducing the risk of mosquito-borne illness in that particular location.



Goats clear vegetation from detention basins in Brentwood.

Mosquitoes Aren't Picky – They Come From Residential and Agricultural Areas

For many years, agricultural land has been a large source of mosquitoes in the most eastern portion of Contra Costa County. In some cases, the parties responsible for the land purposefully flood fields to attract specific animals or promote specific crops. In other situations, livestock on pastures create divots that when filled with water become thousands of potential mosquito sources. There are also squatters, people who settle on a property without right, who create places for mosquitoes to lay eggs in artificial containers or agricultural blockages that hold water and produce mosquitoes. In 2013, District employees met with the parties responsible for these parcels of land and the results appear promising for reducing mosquito production in the future. In one case, the owners of a cattle ranch agreed to change their operation from raising cattle to farming crops. Where squatters created mosquito sources, the District worked with the appropriate agencies to monitor the locations and enforce existing ordinances to prevent activities that contribute to mosquito production.

In densely populated residential areas, particularly retirement communities, flower pot saucers and other containers left on balconies or outside can often produce mosquitoes. At Walnut Creek's Rossmoor community in 2013, the District's inspectors had to look high and low for the source of mosquitoes. After going door to door and talking with residents about potential mosquito sources, District employees were led to sources below the homes with elevated foundations where water had accumulated resulting in mosquito production. Once the source of mosquitoes was located, the District worked with Rossmoor's maintenance team who facilitated a solution that successfully eliminated the mosquitoes and diminished the risk of mosquito-borne illness.

Swimming Pools Still Produce Mosquitoes

Five years after the heart of the nationwide housing crisis when abandoned swimming pools became a public health catastrophe, neglected swimming pools continue to dot the landscape of Contra Costa County. With them comes the risk of mosquitoes and their associated illnesses because neglected swimming pools are the perfect place for mosquitoes to lay more than 1 million eggs. Even partially filled neglected swimming pools can produce more than a million mosquitoes and affect people up to five miles away. The District still receives requests for mosquito service for swimming pools. In 2012, the District received 2037 of these requests countywide, and in 2013 that number increased to 2172. In response to the growing number of requests pertaining to neglected swimming pools, in 2013 District employees visited property owners and renters as often as possible to educate them about ways to avoid mosquito activity by maintaining a swimming pool. District employees have treated many of the swimming pools for many years. Often, District employees stock the pools with mosquito-eating fish. The District's goal is to have homeowners and residents maintain or remove the pools, so that District employees can focus more time on locating mosquitoes in natural sources throughout the county.

Mosquito Zones

The District divides the county into 10 mosquito zones to allow for more efficient mosquito surveillance and control. In 2013, inspectors responsible for zones in the western areas of Contra Costa County reported concerns over unmaintained properties that provide limited access to control efforts, but can be major sources of mosquito activity. District employees communicated with city and county officials when possible in the ongoing effort to reach a solution in these situations.

Marshland and coastal industrial areas can also pose a challenge for mosquito control. Wetland areas can produce a mosquito species with a flight range of up to 20 miles, so control efforts in these areas are important to protect coastal residents from these mosquitoes that at this time are primarily a biting nuisance rather than a vector of disease.

At industrial areas, the District's inspectors work with company supervisors to advise them on ways to reduce mosquito production, and thus protect the health of employees at each facility. Large industrial operations, particularly along the county's waterfront areas, can produce mosquitoes in a number of places including equipment that holds water and in specialized ponds and storage tanks. When warranted, the District can provide mosquito control.

In several public parks in 2013, District employees worked with parks employees in various cities to post information about the risk of western treehole mosquitoes (*Aedes sierrensis*) and to provide control efforts to prevent them. These mosquitoes are capable of spreading canine heartworm and are found frequently in wooded areas. These mosquitoes prefer to lay eggs in the holes and crevasses that often develop in older trees or trees that have lost a branch or a branch has split. When it rains, these holes fill with water which activates the eggs and within days, produces new adult mosquitoes. By providing information to members of the public who frequent areas with a robust tree population, they can better protect themselves from mosquito bites as well as their four-legged friends from the potentially deadly heartworm.

Looking to the Future

Among the areas that will require District follow up in 2014 will be the 8th Street drainage location in Antioch because overgrown vegetation and a number of discarded tires have contributed to the West Nile virus risk there. Toward the end of 2013, the District reached an agreement with officials in Antioch who agreed to clear the area to reduce the mosquito source. The District is optimistic this work will indeed take place in the near future.

In 2013, the District also made strides in pursuing partnerships with other agencies and officials that have the power to reduce the number of mosquito sources in the county. In 2014, time will tell if the fruits of the labor bloom and produce partnerships that help the District protect public health.

Rats & Mice

Opportunities Lead to Vector-borne Illness Risk

Rats and mice pose a risk to public health because they can spread bacterial and viral diseases through their nesting material and waste products. The District provides free inspections and advice to county residents and business owners on what they can do to prevent these animals from taking up residence in or near a home or company.

A common misconception is that rats and mice are a sign that a home or yard is dirty or unkempt; however, the fact is, rats and mice are opportunistic. They are constantly on the lookout for food and shelter. A manicured yard can still provide a rat or mouse food if fallen fruit is not picked up promptly, pet food is left outside, or displaced bird seed is not swept and removed. Rats and mice can also find shelter in overgrown vegetation, debris or wood piles that rest upon the ground or against a building. Any structure that has doors that do not fit snugly to the ground or vents that are ripped or missing provide rats and mice an invitation to enter. Once rats or mice are present, they can bring with them the **risk of bacteria and virus** that can be transmitted to humans who clean up the animals' waste products or nesting material. When a county resident or business owner finds signs that a rat or mouse might be present, he or she can **contact the District** to request a free public health inspection. The District's state-certified employee will inspect the location to determine what is attracting the rat or mouse and how it is gaining access to the property. The inspector will then explain to the person who requested the inspection what steps need to be taken to make the property less attractive to rats and mice.



Vector Control Inspector Steve Fisher consults with a resident about how rats and mice are entering his home.

Inspections and Abatement

In 2013, the Contra Costa Mosquito & Vector Control District responded to 633 requests for service for rats and mice, up from the 598 requests in 2012 and the first increase in requests since 2011. District employees provided more service to locations in Concord with 88 inspections, Walnut Creek with 81 and Danville with 50, than any other city in Contra Costa County. In Danville in particular, one property required abatement after the city of Danville red-tagged the property due in part to excessive rat activity. This was only the second rat and mouse abatement operation provided by the District within the past seven years. The necessary effort was precipitated by a situation at a home where hundreds of rats had taken up residence and flourished because of lack of control. As the population expanded, the rats traveled to neighboring homes in search of food and shelter. District employees had recommended solutions to the resident at the primary location, to no avail. Seeking a remedy to this public health risk, the City of Danville partnered with the District which provided the abatement process that took more than one month to completely rid the location of rats and mice. In addition to the physical work at the specific property, District employees also conducted outreach in the surrounding neighborhood by educating individual neighbors about how to prevent rats and mice.

Keeping Pace In Spite of Staffing Reductions

Following the 2012 retirement of one of the District's four rat and mouse program inspectors, the District redistributed assignments so that the three remaining inspectors would be able to provide service for all of Contra Costa County. Despite the staffing reduction, the District employees were able to keep up with the greater demand for service in 2013 and were also able to assist the mosquito program as needed on a limited basis.

Sewer Baiting

Rats and mice are attracted to the dark, humid environment in sewers because they are a water source. To prevent rats from invading homes and businesses through plumbing, the Contra Costa Mosquito & Vector Control District conducts sewer baiting using rodenticide. 2013's historically dry year made water a highly sought after commodity. To reduce the number of rats in the sewers, the District's rat and mouse inspectors baited 54 sewers in 15 cities, nearly the same as the 55 sewers in 10 cities that the District's inspectors baited in 2012.

Reversal of Requirement and Clarification

In 2013, the U.S. Environmental Protection Agency (EPA) reversed an earlier decision that limited the use of above ground rat bait to no more than 50 feet from a structure. That limitation allowed rats and mice to come closer to homes and businesses before any control efforts could be initiated, thus increasing the possibility rats or mice could enter the structure. However, in 2013, the EPA changed the requirement in favor of allowing rodenticide to be located within 100 feet of a structure. The revision allows control efforts to be conducted where rats and mice are frequently found including parks, creeks, and canals. Rats travel up to 300 feet each day in search of food, so the change allows for a larger buffer zone to protect locations from rats and mice. The EPA also clarified how bait is to be used to control specific rats and mice including the Norway rat, Roof rat and house mouse which are commonly found in Contra Costa County. Previous instructions for the use of such rodenticides did not specify usage based on a specific species.

Special Inspections and Projects

Since 2011, the San Francisco Bay Area Rapid Transit District (BART) has been completing an earthquake retrofit project along the Ohlone Greenway in El Cerrito. During the multi-year project, the District has worked to mitigate rat issues that have resulted from removal of vegetation the rats used for habitat. In 2013, the District also worked with residents of the nearby neighborhood to provide inspections and advice on control methods as needed.

Control methods along the waterways of Contra Costa County are an important way to minimize the risk of rats that are commonly found along the waterfront. In Richmond, one District inspector initiated an integrated vector plan at two waterfront areas to study the mouse migration that takes place from the water to the adjacent waterfront parks. The District employee used a non-toxic product to locate and trace the mice and their travel habits. This project will continue through 2014.

Landlord/Tenant disputes can often involve rat or mouse infestations. District employees provide inspections and reports when requested. As needed, the District provides Spanish-speaking employees who can discuss rat and mouse related problems and solutions with residents.

In addition, vacant homes throughout Contra Costa County continue to be a source of rat and mouse activity when people break into the homes, and then leave food or garbage available to rats and mice that can enter through the same newly forged openings. The District's inspectors work with various city code enforcement officers and public safety officers when necessary to control rats and mice and reduce the public health risk that these animals can become for neighboring residents.

In the Future

At the end of 2013, California meteorologists were in agreement that the historically dry conditions California experienced all year seemed unlikely to dissipate soon. If 2014 continues the trend, the District's rat and mouse program inspectors may see a spike in service requests as rats and mice invade residential properties in desperate search for food, water and harborage. Without rain, natural sources will be harder to find in natural settings.

Ticks & Lyme Disease

Lyme disease is a bacterial infection transmitted by the western black-legged tick (*Ixodes pacificus*) which is commonly called a deer tick. While Lyme disease is rare in Contra Costa County (on average there are two to four human cases reported per year), it can cause serious complications if not treated promptly. The Contra Costa Mosquito & Vector Control District has monitored the risk of Lyme disease by collecting and testing black-legged ticks from several locations in the county for more than 15 years. On average, only one or two in one hundred black-legged ticks test positive; although we have found a few locations where the rate is higher, and these tend to change over time.

District staff continue to identify ticks brought in by members of the public and medical personnel. This is important because there are three species of ticks that commonly bite people and only one (western black-legged tick) that transmits Lyme disease. However, after careful consideration in 2013, the District entomologist and vector ecologist along with biologists from the California Department of Public Health concluded that individual tick testing does not significantly reduce the risk of Lyme disease for patients since the data cannot confirm human disease. For that reason, the District has ceased to conduct tick testing at this time. People who are concerned about possible Lyme disease should contact their physician.

Tick related service requests in 2013 continued a decline that began in 2010. Of the 42 ticks identified by our staff, 20 were western black-legged ticks, the vector of Lyme disease. This trend may be a result of the extended drought conditions experienced throughout the California.



Vector Ecologist Eric Ghilarducci identifies a tick in the District's laboratory.

Ticks of Contra Costa County

There are three species of common human-biting ticks in Contra Costa County.

- Western black-legged tick (*Ixodes pacificus*)
- Pacific Coast tick (*Dermacentor occidentalis*)
- American dog tick (*Dermacentor variabilis*)

Of these three, only the western black-legged tick (*Ixodes pacificus*) is known to transmit Lyme disease in California. Adult females of the species are about 1/8" long and reddish-brown in color. Males are slightly smaller and brownish-black.

Protect Yourself from Tick Bites

Know where to expect ticks. Western black-legged ticks live in moist and humid environments, particularly in or near wooded or grassy areas. You may come into contact with ticks during outdoor activities around your home or when walking through vegetation such as leaf litter or shrubs. To avoid ticks, walk in the center of trails.

Use a repellent with DEET on skin or clothing or permethrin on clothing and gear. Products containing permethrin can be used to treat boots, clothing and camping gear, and the permethrin can remain protective through several washings. Repellents containing 20 percent or more DEET (N, N-diethyl-m-toluamide) can be applied to the skin, and they can protect up to several hours. Always follow product instructions. Parents should apply repellents to their children, taking care to avoid application to hands, eyes, and mouth.

Perform Daily Tick Checks

Check your body for ticks after being outdoors, even in your own yard. Conduct a body check upon return from potentially tick-infested areas by searching your entire body for ticks. Use a hand-held or full-length mirror to view all parts of your body and remove any tick you find. Take special care to check these parts of your body and your child's body for ticks:

- Under the arms
- In and around the ears
- Inside belly button
- Back of the knees
- In and around all head and body hair
- Between the legs
- Around the waist

Ticks may be carried into the house on clothing and pets. Both should be examined carefully and any ticks that are found should be removed. Placing clothes into a dryer on high heat effectively kills ticks.

What to Do If You Are Bitten by a Tick

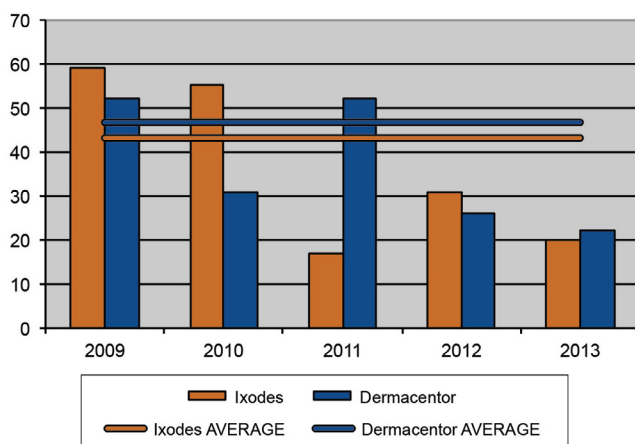
Remove an attached tick using fine-tipped tweezers as soon as you notice it. If a tick is attached to your skin for less than 24 hours, your chance of getting Lyme disease is extremely small. To be safe, watch for signs or symptoms of Lyme disease such as rash or fever, and see a health care provider if these develop.

Your risk of acquiring a tick-borne illness depends on many factors, including where you live, what type of tick bit you, and how long the tick was attached. If you become ill after a tick bite, see a health care provider.

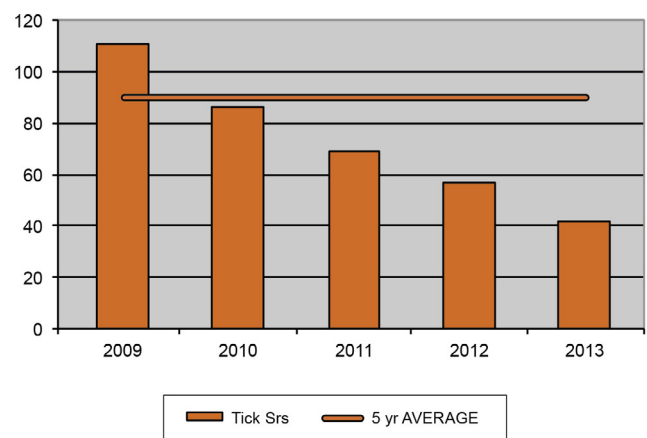
Prevent Ticks on Animals

Prevent family pets from bringing ticks into the home. Maintain your family pet under a veterinarian's care. Two of the ways to prevent ticks on dogs and cats are to apply a veterinarian approved tick medication or by placing a tick collar on the animal. Be sure to use these products according to the package instructions.

Tick Service Requests by Type



Tick Service Requests



Skunks and Rabies Risk Reduction

Skunks are the second most frequent mammal to test positive for rabies in California. Bats are the most common, but because skunks often make their homes near or under the homes of Contra Costa County residents, the risk of rabies transmission from a skunk is more localized. This is why the Contra Costa Mosquito & Vector Control District provides free inspections and advice on what to do to reduce the risk of rabies from skunks on private property. The program is known as the District's Rabies Risk Reduction program.

Through this program, the District's state-certified inspectors personally inspect the properties of residents who believe a skunk may be present. The inspector provides the resident with detailed information and advice on what to do to prevent skunks from being attracted to the property. If needed, the inspector may provide the resident with a humane, live catch trap and instructions on proper operation. If the resident successfully catches a skunk in the District trap, the inspector will remove the skunk from the property. In 2013, District employees removed 490 skunks compared to 448 in 2012. By law and due to the risk of spreading rabies, the District is prohibited from relocating skunks. The District humanely euthanizes all skunks that are caught and removed.

Skunk Mating Season

Contra Costa County is home to two species of skunks: the spotted skunk (*Silogale putorius*) and the more common striped skunk (*Mephitis mephitis*). **Early each year skunks mate**, which can cause male skunks to fight over the females. During the mating season, county residents often describe a strong skunk odor in neighborhoods that is largely due to the skunks' interaction. The odor is a sure sign that skunks are active in the neighborhood as they search for dens and that increases their contact with people, thus the risk of rabies increases. Dens are locations where the females can gestate and rear young offspring. The availability of shelter and ample food supply is what attracts skunks to many residential areas. District public health inspectors spend the majority of their time identifying locations that attract skunks and recommending changes that can deter them from using a crawl space under a house, a deck or shed, or a wood pile as their new home.

Less Rain, More Skunks

In 2013, District inspectors responded to 900 requests from county residents and business owners for skunk services, which was an increase compared to the 727 requests the District received in 2012. Mother Nature didn't help at all. The mild temperatures and unseasonably dry climate experienced all across California in 2013 likely created two scenarios that could have resulted in an increased number of requests for skunk service. The mild temperatures may have allowed more skunk offspring to survive unabated by extreme temperatures, while the lack of rain may have prompted wildlife, including skunks, to come closer to established homes and businesses in search of water. In that case, when they also found food and shelter, they stayed.

Keep Me Wild

Residents who leave pet food outside, actively feed wildlife, and fail to remove fallen and unharvested fruit and vegetables are providing skunks plenty of culinary choices. While that seems like a humane thing to do, the problem is leaving food or water out for wild animals encourages them to adapt their skills and natural habits to an environment that works against them. The California Fish and Wildlife Department has a program called **Keep Me Wild**. While it recognizes Californians' well meaning intentions, it clearly explains why the effort to help wildlife is actually hurting wildlife. The same can be said for skunks because encouraging them to come into backyards where they can find food or water takes them out of their natural environment where they are best suited to forage for food on their own.

Requests for Service Increase

The largest number of requests for service in 2013 came from the cities of Walnut Creek with 113, Martinez and Danville with 96 each, and Concord with 91. The same cities led the county in requests for skunk service in 2012 with Concord at 94, Martinez and Walnut Creek at 92, and Danville at 82. District inspectors communicated with residents, property managers, homeowners associations and landscaping professionals to encourage practices that would control skunks. In cases where the skunk activity was widespread, District inspectors used door tags, letters, and booklets to educate residents in entire neighborhoods about the importance of reducing the risk of rabies through denying skunks a place to eat and sleep. The efforts proved effective in a number of neighborhoods including Moraga where residents took the recommendations seriously and worked together to eliminate food and habitat sources for skunks in their area. In areas where the recommendations were not heeded, District inspectors often had to revisit properties in order to remove subsequent skunks. This happened at 101 properties in 2013, up from 53 in 2012.



A family of skunks explore a backyard.

Looking to the Future

As the members of the District's Rabies Risk Reduction program look to the future, they look to the skies. If mild temperatures and dry conditions continue into 2014, it's possible skunks and other wildlife will not only continue to improve offspring survival rates, they may also be attracted to neighborhoods in larger numbers as they look for water sources that no longer exist in agricultural areas.

Yellowjackets

Yellowjackets have quite the reputation as unwanted guests at warm weather picnics. They hover around the meat and beverages and often ruin outdoor dining experiences. Why do they find our food so appealing? Yellowjackets need protein to feed their young so they are attracted to red meat, chicken, and fish. They are also attracted to sweet treats like candy, fruit and soda; all typical ingredients of the common picnic. If these insects were docile, their culinary habits would be a mere nuisance, but because they can repeatedly sting and bite anyone who threatens their home or well-being, yellowjackets pose a risk to public health. That is why the Contra Costa Mosquito & Vector Control District provides free inspections and treatment services for this notorious arthropod.

Contra Costa County is home to four species of yellowjackets. Two species build their nests above ground and are known as aerial nesting yellowjackets. This common yellowjacket (*Vespula vulgaris*) is less likely to engage in confrontation, while the other two species are more aggressive. The western yellowjacket (*Vespula pensylvanica*) builds nests underground in abandoned animal holes or voids. The underground location amplifies vibrations caused by landscaping equipment being used nearby or humans or animals walking on the ground above the nest. Those vibrations can prompt yellowjackets to exit the nest in defense of their home. With populations ranging from an average of 5,000 to a large nest of 25,000, yellowjackets can pose a significant risk to the unsuspecting person or animal passing by. Unlike their distant cousin the honey bee, the yellowjacket's stings and bites are more painful. And due to a yellowjacket's multiple attempts to induce pain, the assault can be dangerous for anyone allergic to the aggressive insect's venom.



A yellowjacket forages in a flower.

The challenges for the District's yellowjacket program staff in 2013 were in part a continuation of what inspectors found in 2012. Many of the nests were quite large and located deep underground. District employees theorize that 2012's extreme heat followed by 2013's extremely dry weather may have allowed yellowjacket colonies to survive long past the usual arrival of rain or winter cold. Longer survival appears to have translated into more colony growth and changing nest design. In 2013, inspectors found yellowjackets effectively moved the entrance of many nests. Yellowjacket nests are typically located within six to 12 inches of the surface of the ground, but in 2013, technicians discovered a number of nests where yellowjackets appeared to have created an underground tunnel leading to the nest. This meant the actual nest could be two or three feet to the left or right of the ground's surface. At one location, the tunnel was four feet long, which made treatment difficult.

This evolution of the basic nest design required District technicians and inspectors to excavate the tunnels to reach the nests. The extra effort added to the time required to treat each nest and in a number of cases, the situation required two District employees to work together to achieve effective treatment. In cases where the yellowjacket activity resumed in spite of the technicians' first efforts, District employees had to return to the nests for further treatment. District employees found one such nest **on the District's own property** in 2013. The nest required follow up treatments to finally stop the yellowjacket activity. In an effort to reduce repeat visits to the same nest, the District tested a **synthetic product** to treat yellowjacket nests, but the results did not meet District expectations, so inspectors and technicians returned to the **natural product** they previously used.



Vector Control Aide Heidi Budge treats a nest below a debris pile.

The majority of the requests for yellowjacket service in 2013 came from residents and businesses in Orinda, Walnut Creek, and Lafayette; the same cities that requested the majority of service in 2012. These cities accounted for 54 percent of the District's yellowjacket inspections. The remaining 46 percent of inspections came from multiple locations across the county.

In the most western part of Contra Costa County, District inspectors encountered nests that appeared as if they had gone undetected for many years because each one was quite large and deep into the ground. Properties in El Cerrito, El Sobrante, Kensington, and San Pablo had multiple nests underground. On one property, a debris pile obscured two large yellowjacket nests underground. On other properties, heavy groundcover including ivy and **periwinkle** obscured nest openings allowing colonies to flourish underground and making effective treatment very challenging. In these cases, homeowners had to remove vegetation before the District could provide effective treatment of ground nests.

In addition to ground nesting yellowjackets, District employees also found a bumblebee nest underground in 2013. Bumblebees typically nest underground in old rodent burrows.

Africanized Honey Bees

Contra Costa County's first detection of Africanized honey bees (also known as "killer bees") was in July of 1997. The second was in December 2008. Both incidents involved imported bees that hitched a ride on cargo ships. The bees were intercepted before they could escape and establish new colonies. As the lead agency for these aggressive bees, the Contra Costa Mosquito & Vector Control District responds to public complaints of honey bee swarms and new hives in potentially hazardous locations.

The District receives approximately 30 service requests related to honey bees every year. In 2013, the District received eight calls about honey bees compared to 16 calls in 2012, 23 calls in 2011 and 29 in 2010. Most calls are due to the presence of a honey bee swarm passing through or resting in a neighborhood. These swarms are generally not a threat as the bees are simply in search of a new hive location, but they can look dangerous and may sting, but only if provoked.

Initial screening for Africanized honey bees is made by District scientists measuring the wing span of the bees and comparing them to those of European honey bees, but they can only be positively identified through DNA testing.

Since Africanized honey bees have not colonized in Contra Costa County to date, the District advises homeowners who observe a swarm in their neighborhood to leave the bees alone if they do not pose an immediate risk to health and safety. To discourage bees from making their new home out of a resident's current home, homeowners should ensure the structure has no deficiencies that will allow bees to colonize, such as gaps or holes in the exterior of the house or missing screens that might allow the bees to find harborage in the walls.

District personnel work to educate individuals about the value of bees as pollinators and the difficulties that bee colonies have as they try to survive in our county. District staff provides homeowners with contact information for local beekeepers who have agreed to retrieve and relocate feral bee swarms or hives. District employees always strive to leave the hive intact and only treat swarms or hives if they pose an imminent threat to public safety.

Currently, Africanized honey bees are established as far north as Fresno, California; however, the bees can be unwittingly transported into Contra Costa County as evidenced by the previous incidents, or they may continue to move north into the county on their own. Either way, the District remains poised to respond and protect public health from this sometimes fatal vector.



www.DesertUSA.com

Africanized Honey bees ("killer bees") are slightly smaller than European honey bees, but only experts can tell them apart by measuring their wingspan.

Fisheries

The Contra Costa Mosquito & Vector Control District produced approximately 973,000 mosquitofish (*Gambusia affinis*) and distributed 101,755 mosquitofish in Contra Costa County in 2013.

In efforts to continue to evaluate native fish species for use in mosquito control, the District initiated spawning trials with a native delta species, the Sacramento hitch (*Lavinia exilicauda exilicauda*). The Sacramento hitch is a cyprinid (minnow family) and is found in the Central Valley. It can grow up to 14 inches long and feeds on zooplankton and aquatic, as well as terrestrial, insects.

The District obtained approximately 100 juvenile Sacramento hitch in November of 2011 from the California Department of Fish and Wildlife. These fish were reared in 200 gallon tanks and fed salmon starter. In January 2013, the hitch were moved to a 2,000 gallon tank on a recirculating system. On March 1st, 2013, the hitch were engaged in typical spawning behavior (chasing a single fish as a school). The temperature was 20 degrees Celsius. Upon observing this behavior, the fish biologist placed three types of spawning substrate materials in the tank: a gravel egg trap, a spawning station with garland attached, and a garland bundle. Hitch preferred the garland bundle and were **videotaped spawning in garland**.

This spawning behavior was observed intermittently until the end of April. District personnel were unable to see any eggs on or around the substrates provided. The eggs are nonadhesive and the preferred spawning substrate had no way of collecting the eggs. Staff found seven juvenile hitch in the tank when it was drained for maintenance. Poor egg production is most likely due to the immaturity of our brood fish (females typically mature by three years of age) and the inability of the preferred substrate to protect or hold eggs. In March 2014, District personnel will be using a new design to capture hitch eggs.

Staff will continue to maintain a population of California roach (*Lavinia symmetricus*) at the District, spawning this species as needed and monitoring approximately 22 swimming pools that were stocked with roach in 2011 and 2012. Roach continue to control mosquito production in these pools.



Sacramento hitch reared at the District.



Sacramento hitch spawn for the first time in District tanks.



This substrate proved ineffective in 2013 and will be redesigned for 2014.

Public Affairs & Community Outreach

Key Messages

The unprecedented 2012 West Nile virus outbreak in the United States, declared the worst year on record for the amount of deaths due to the virus in the United States and the second worst year for the number of people infected, was a firm reminder that we must not let our efforts wane on the war against mosquitoes. The virus outbreak was a wake-up call to many about the hazards of mosquitoes and their associated diseases. The Contra Costa Mosquito & Vector Control District's key messages in 2013 continued to reflect the record-breaking statistics that so clearly illustrate the importance of mosquito control and taking proper personal precautions. The District's public affairs staff also continued to illustrate the Centers for Disease Control's data that helped to estimate that in Contra Costa County in 2013, as many as 280 people were affected by West Nile virus, they just didn't know it. This data allowed staff to quantify what was already known, that West Nile virus is grossly underreported by citizens and members of the medical community for a variety of reasons.

New Mosquito Species

The unexpected discovery of the yellow fever mosquito (*Aedes aegypti*) in San Mateo County last summer dominated vector-related news in the San Francisco Bay Area. District staff were invited to appear on the television show Bay Area People to discuss the newly discovered mosquito, along with the previously discovered Asian tiger (*Aedes albopictus*) and yellow fever mosquitoes in other parts of California. Both of these *Aedes* mosquitoes represent a looming threat in California as they are the mechanism for transmitting dengue and yellow fevers, as well as chikungunya disease to humans. No recent local transmissions of the diseases have been documented.

Website

The District's award-winning website remains the No. 1 communication tool for constituents and is an important reference tool for a worldwide audience. Staff revamped the site in 2013 to include a better experience for mobile phone users while keeping the extensive resources available. The one-stop site allows anyone to easily report a dead bird or neglected swimming pool, learn which vectors are prone to activity during different times of the year, or view fascinating videos from everything from the historical spread of West Nile virus to the District's entomologist feeding his mosquito colony his own blood every week, and of course, so much more.



Rosy Chu of Bay Area People points out mosquito larvae as Public Affairs Manager Deborah Bass illustrates the amount of water needed for mosquito larvae to thrive (just a couple of tablespoons).

Paid Advertising

The District's paid advertising program not only complements other outreach in the county, it's an effective tactic to empower constituents to contribute to their own, as well as the overall health of the public by controlling vectors and taking proper health precautions. To ensure effectiveness, unique phone numbers and Quick Response codes allow District staff to track the efficacy of all advertisements. Overall, the District's paid advertisement program resulted in 11,212,388 million impressions within our community in 2013.

Large outreach advertisements at all BART stations in Contra Costa County, some displayed directly on the platform, proved effective. Tail signs on the back of buses throughout the county also proved effective with a surprising number of calls originating from these ads. While staff don't advocate using cell phones while driving and assume that passengers or people in parked vehicles are placing the calls, proof that the advertisements are useful is encouraging.

Advertisements inside the Penny Saver and large front or back page ads on the Penny Saver and mail wraps continue to top advertising efforts and are a mainstay of the District's outreach program. These printed pieces are mailed to each household, more than 420,000 total in the county, three times during mosquito season and generate nearly five million impressions.

Vehicle Branding

One of the most exciting marketing events in 2013 was the re-branding of District vehicles with the District's updated logo and fresh you-can't-mistake-us look. Larger and comprehensive graphics enable our constituents to recognize our workforce in the community much easier and create awareness for our District services for which they pay taxes.



The newly branded fleet of trucks at the District sit ready for action.

Social Media

Social media, specifically Twitter, is a critical communication tool for the District. It's a crucial tool that enables information to be distributed immediately to both constituents and the media. Often, media respond within one minute of posting, which allows District news to be distributed efficiently and effectively on a mass scale. Public affairs staff work closely with and rely on the media to engage and inform residents.

While Twitter allows for only 140 characters of text in each message, it forces succinct and specific messages. The District enhances the messages with links, pictures, videos and other engagement tools, most often directing followers to the District website where visitors can find everything they need to know about the topic.

As a small public health agency, the District must ensure that staff time and resources are well spent. The public affairs team is currently evaluating Facebook as another social media communication tool.

Service Request Surveys: Gauging Quality

Service request surveys are a mainstay of the District's public affairs department because they enable staff to understand the quality of service delivered. The whopping 48 percent return rate far surpasses the return rate of two to five percent, which is considered the normal successful return rate for surveys by experts in the industry.

The District utilizes both online and mailed surveys. Of the mailed surveys in 2013, 62 percent of constituents wrote comments on them with the majority offering praise for District employees and services. Staff respond to complaints swiftly and personally.

Due to the effectiveness of the survey, in 2014, the District will increase the amount of surveys sent out each year to ultimately survey six out of 10 constituents who used our services. In addition to surveys, the **District welcomes feedback** at any time.

Electronic Communication

The District's Mosquito Bytes newsletter continues to be a favorite communication of constituents. Mosquito Bytes is delivered electronically by Constant Contact® through a free subscription. To sign up for the monthly publication or any or all of our electronic communication, simply **opt in using your email address**. This monthly newsletter delivers relevant, researched stories that range from issues such as, why drought years can increase the risk of mosquito-borne illness to when it's time to hang yellowjacket traps in your yard and how the **spots on cars are almost sure to be bee poop**. The latter story proved to be one of the most popular to date.

Media releases and notifications of adult mosquito spraying are also delivered by email and are available through free subscription.

Presentations & Events

Greeting constituents in person is an important part of the public affairs program. Whether at a formal presentation or large community events, connecting with constituents is a win-win all around. District staff answer questions, educate, and impart useful and important information. Each year, all outreach efforts are evaluated to ensure the most efficient and effective reach to the greatest number of people. In 2013, District staff participated in a variety of small and large venues from boy scout camps to art and wine festivals. Surprisingly, one of the most popular venues remains farmer's markets. For all events, District staff personally reached more than 150,000 constituents through interactive engagement in the community.

Environmental

In addition to protecting public health, the Contra Costa Mosquito & Vector Control District is also dedicated to protecting the natural environment. Healthy wetlands support populations of natural predators which produces fewer mosquitoes than habitats modified or damaged by human activity. The District plays a leadership role in the conservation and restoration of Bay Area wetlands, protection of endangered and threatened species, and promotion of biorational (environmentally compatible) control methods in order to protect both human and environmental health.

No deed is too small when it comes to protecting the environment. The District has made many small changes that have added up to big differences. The District is a past recipient of an award for the water recycling program that ensures water from trucks using pesticide products is diverted from catch basins that carry water to creeks and waterways. Solar panels were installed to capture the sun's energy and support District operations. The District also installed a water filtering station for employees, eliminating disposable plastic water bottles from daily use.

Continuing Education

The District employs vector control technicians and inspectors certified by the California Department of Public Health. In order to become certified, they are required to pass an exam in pesticide use and safety, in addition to at least one of the following: Mosquito Biology and Control; Terrestrial Invertebrate (insect) Biology and Control; Vertebrate (animal) Biology and Control. Certificates are renewed every two years provided the following continuing education requirements have been met during that period: 12 hours of Pesticide Use and Safety, 8 hours of Mosquito Control, 8 hours of Terrestrial Invertebrates, and 8 hours of Vertebrate Vectors. In addition to these basic requirements, the District conducts annual in-house training and frequent reviews and updates of policies and procedures at weekly and monthly staff meetings.

Shop & Facility Maintenance

The District employs one mechanic responsible for all automotive and facility repair and maintenance. He maintains 39 field vehicles, four staff vehicles, 18 vehicle sprayers, two boats and their trailers, five 8-wheel ARGOs, four 4-wheel All Terrain Vehicles, 11 trailers, six Ultra Low Volume sprayers, one catch basin mister, and 1 forklift. The mechanic designs and fabricates specialized equipment, provides most needed repairs and maintenance of grounds and equipment, such as electrical upgrades, plumbing repairs, solar panel maintenance, flooring and miscellaneous projects.

Information Technology

The information technology systems administrator is responsible for all communication technology at the District including maintaining all aspects of the administration phone system, cell phones, computers, and internet services. The systems administrator maintains multiple virtual servers and approximately 40 workstations with associated software. The administrator also programs and maintains the District's specialized database known as VXS which is used to record data for vector control surveillance, monitoring pesticide usage, workload management and more.

In 2013, the systems administrator developed a new system feature that was designed to integrate the in-house electronic time sheet system with county retirement electronic data interchange process. This eliminates cumbersome manual tasks and provides a high level of data reliability.

Administration

Administrative staff serve the residents of Contra Costa County by responding to telephone inquiries, scheduling service requests, compiling mandated reports and maintaining public records. Staff responsibilities also include processing service requests, contract billing, payroll and accounts payable, as well as providing administrative support. Working closely with city and county personnel, staff also correspond and work extensively with city and county entities regarding compliance and enforcement on vector control issues.

Financial Statement

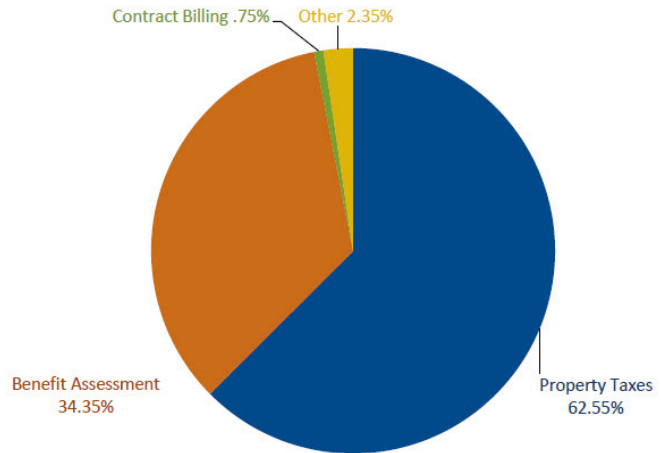
The Contra Costa Mosquito & Vector Control District depends on property tax revenues and benefit assessment charges in Contra Costa County to fund operations.

District property tax revenues were flat in fiscal year 2012/2013 as compared to fiscal year 2011/2012. This is in strong contrast to the dramatic drop the District saw in property tax revenue during the housing crisis. We are now seeing signs that Contra Costa County property tax assessed values are beginning to stabilize and we even expect to see a slight increase in fiscal year 2013/2014. It is important to note that the District shows a one time property tax spike of \$346,437 in fiscal year 2013/2014 due to reimbursement from the state of California for property taxes borrowed under Proposition 1A in 2010.

Additionally, local property taxes earmarked for the District are diverted annually to the State of California's Educational Revenue Augmentation Fund (ERAF). In 1996, the District implemented a countywide benefit assessment to replace these lost funds. This nominal annual charge varies among four zones in Contra Costa County according to benefit of our services, and generates revenues that are used to provide mosquito and vector surveillance and control projects to the properties in Contra Costa County.

The District's board of trustees created a trust and adopted a policy to begin funding Other Post Employment Benefits, "OPEB". Under Government Accounting Standards Board recommendations, public agencies need to start funding future retiree health benefits. Based on studies completed by an independent outside actuary, the District currently contributes \$200,000 from reserves to this trust fund. This contribution is the major reason for the necessary transfer from reserves noted in the District financial statements.

As mandated by government code, the District is annually audited by an outside firm. The firm audits the District's financial statements to obtain reasonable assurance that the financial statements are free of material misstatement, they review the accounting principles used, all financial disclosures, and the overall financial statement presentation. The District annually receives an *Unqualified Opinion*, which is the best opinion bestowed.



Revenues	2012/2013*	2013/2014**
Property Taxes	\$3,627,249	\$3,774,000
Proposition 1A Reimbursement		346,437
Benefit Assessment	1,991,766	1,994,227
Contracts	43,557	62,000
Interest	17,394	12,721
Miscellaneous	119,143	72,000
Total Revenues	\$5,799,109	\$6,261,385
Expenditures	2012/2013	2013/2014
Salaries & Wages	\$4,766,333	\$4,974,105
Operations	1,309,208	1,300,381
Capital	13,460	87,210
Total Expenditures	\$6,089,001	\$6,361,696
(transfer from reserves)	(289,892)	(100,311)
		*Audited **To be audited



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