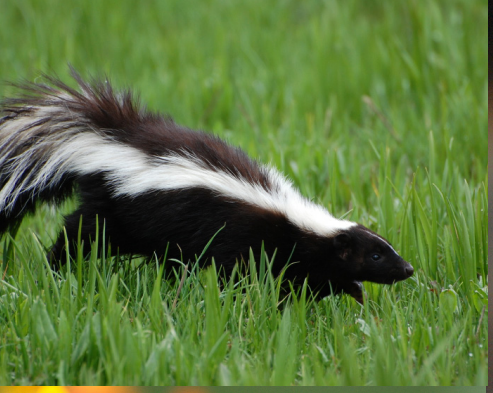
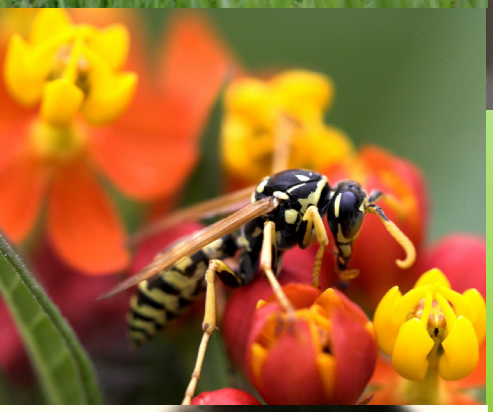
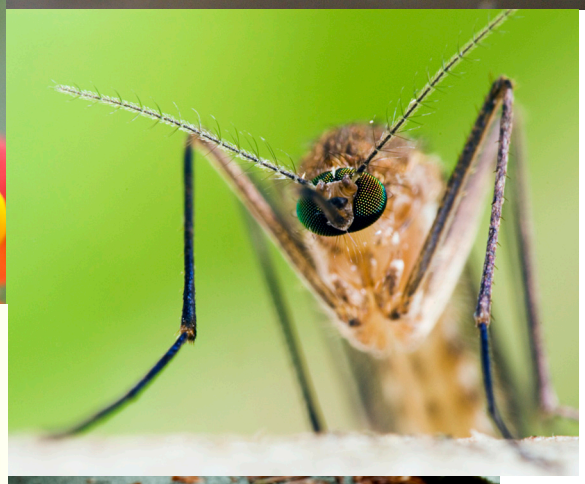
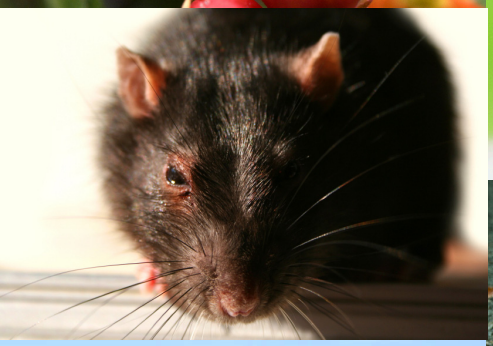



2010

annual report

CONTRA COSTA MOSQUITO & VECTOR CONTROL DISTRICT

protecting public health since 1927

Table of Contents

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 2010.

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 county, and numerous ponds, creeks, and residential sources county wide. 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, it's important that the homeowner or caller provide our District employee with a mosquito sample that can be identified to determine its possible source. 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 given 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. A detailed report is issued. 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 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.

Yellowjackets

The District provides extermination of ground-nesting yellowjackets only. Simply locate the nest and call us 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, 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

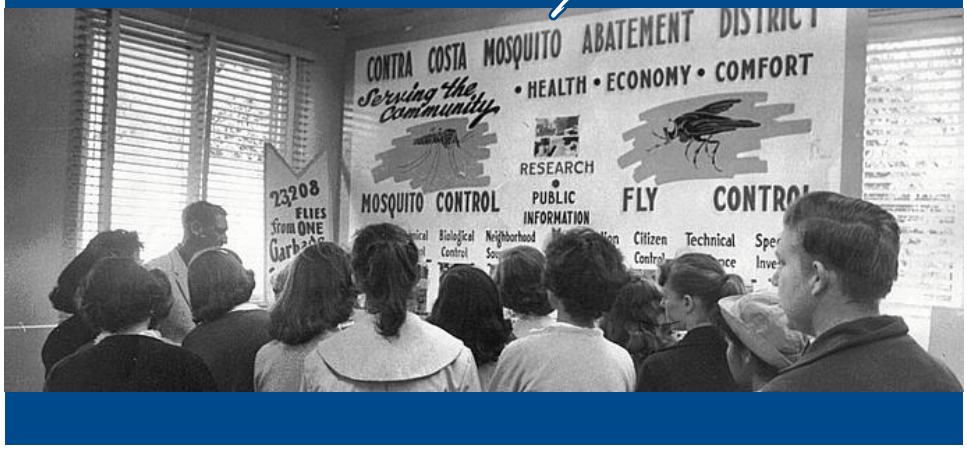
Investigating environmental concerns and developing and/or testing new materials, methods and technologies to ensure quality control oversight on all services and programs, while anticipating resurgent and/or newly introduced vectors or vector-borne diseases.

Interagency Relations

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

History

1926-2010 84 Years New!



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 and 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 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.

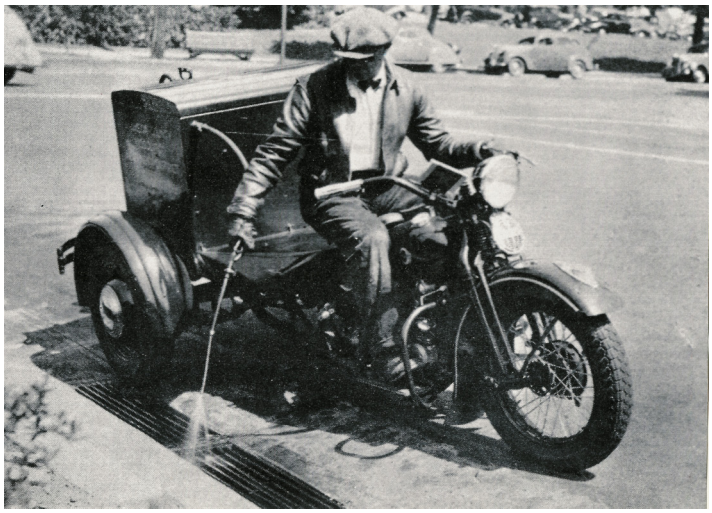
Quite often, schools in Contra Costa County had to be closed, waterfront industry was periodically shut down, and recreational areas were abandoned, all due to salt marsh mosquitoes, a severe nuisance mosquito. Periodically, citizens of Pittsburg lined the street curbs with smudge pots in an attempt 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, Noble Stover responded to requests from Contra Costa County and directed the first operations of Contra Costa Mosquito Abatement District #1 (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. Mr. 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. Noble 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 Noble 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 (WEE). This virus was isolated from the brain of a dead child in 1938. Human cases of another virus, St. Louis encephalitis (SLE), 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 December 19, 1941. In November 1943, CCMAD #1 annexed



Mosquito Spraying in Contra Costa County. Circa unknown.

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 WEE the State had experienced. In 1952, there were 375 human cases of WEE and 45 human cases of SLE in California. There were eight reported human cases of WEE 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. Circa unknown.

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 SLE in 1967 and WEE 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. Dr. Charles Beesley, 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.

Timeline

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 county-wide

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 and 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

2005 - First West Nile virus human case

2006 - Two residents die from West Nile virus

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

In 1986, CCMAD #1 and DVMAD merged to create one county-wide agency, Contra Costa Mosquito Abatement District. 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 and Vector Control District (District). In 1993, the District's mosquito arbovirus surveillance program detected WEE 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. By 2003, it 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, WNV 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. It's been nearly 85 years and the District is still steadfast in protecting public health from vector-borne diseases.

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

Contra Costa Mosquito & Vector Control District

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

Personnel

General Manager: Craig Downs

Administrative/Finance Manager: Ray Waletzko

Administrative Secretary: Allison Lewis

Accounting/Benefits Specialist: Tina Cox

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 Technician: Wayne Shieh

Operations

Operations Manager: Carlos Sanabria

Mosquito Control Operations: Inland
Program Supervisor: Sheila Currier

Inspectors:
Lawrence Brown
Felipe Carrillo
Patrick Vicencio

Technicians:
Josefa Cabada
Robert Stultz
Jeremy Tamargo

Mosquito Control Operations: Waterfront/East
Program Supervisor: Greg Howard

Inspectors:
Reed Black
David Wexler

Technicians:
Ceaser Gutierrez
Joe Hummel
Tim Mann

Vertebrate Vector Control Operations
Program Supervisor: Jonathan Rehana

Inspectors:
John Chase
Joe Cleope
Steve Fisher
Dave Obrochta
Danielle Wisniewski

Technician:
Jason Descans

Independent Special District Classification

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: Russ Belleci, Contra Costa County; Richard Mank, El Cerrito; Michael Cory, Danville; Richard Head, Oakley; Daniel Pellegrini, Martinez; Kristin Haegeland, Pinole; Richard Means, Pleasant Hill; Jose Saavedra, Antioch; and Jim Fitzsimmons, Lafayette **Seated:** Chris Cowen, Contra Costa County; Sharyn Rossi, San Ramon; Peggie Howell, Clayton; Diane Wolcott, Orinda; Angela Michaels, Concord; Nancy Brownfield, Walnut Creek; Soheila Bana, El Sobrante and Jeff Bennett, Hercules **Not pictured:** *Richard Ainsley, Pittsburg; Myrto Petreas, Moraga; James Pinkney, Alamo; Brian Smalley, San Pablo; and Kirk Thill, Brentwood*

Standing: Wayne Shieh, IT Technician; Ray Waletzko, Administrative/Finance Manager; Sheila Currier, Program Supervisor; Steve Schutz, Ph.D., Scientific Program Manager; Eric Ghilarducci, Vector Ecologist; Craig Downs, General Manager; Andrew Pierce, Community Affairs Representative; Carlos Sanabria, Operations Manager; Greg Howard, Program Supervisor; Jonathan Rehana, Program Supervisor; and Damien Clauson, Vector Ecologist **Seated:** Allison Lewis, Administrative Secretary; Tina Cox, Accounting/Benefits Specialist; Marta McCord, Clerk/Receptionist; Nola Woods, Community Affairs Representative; and Deborah Bass, Public Affairs Manager **Not pictured:** *Tom Fishe, Mechanic; and Chris Miller, Fish Biologist.*

Standing: Josefa Cabada, VCT; Reed Black, VCI; Steve Fisher, VCI; John Chase, VCI; Felipe Carrillo, VCI; Lawrence Brown, VCI; Tim Mann, VCT; Dave Obrochta, VCI; and Jason Descans, VCT
Seated: Joe Hummel, VCT; Robert Stultz, VCT; Joe Cleope, VCI; Ceasar Gutierrez, VCT; and Patrick Vicencio, VCI
Not pictured: Jeremy Tamargo, VCT; David Wexler, VCI; and Danielle Wisniewski, 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 (IVM) 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 those 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 [Cal. 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); and

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 service areas may be affected by our efforts.

Other Public Agencies Whose Review/Approval is Required

The District's IVM program as a whole, including the registration 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 & Game 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 associated with vectors - this includes 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 possibly 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 (WNV), Western equine encephalomyelitis (WEE), St. Louis encephalitis (SLE), 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 provide 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 for private ponds, horse troughs, non-maintained swimming pools and spas, rain barrels and more.

GROUND-NESTING YELLOWJACKETS

Ground-nesting yellow jackets 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. Africanized honey bees 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.

RODENTS

Two introduced species of rats, the Norway rat and the roof rat are present in the service area and are subjects of District action. In addition to being unsanitary, rats 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 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 causes damage to woodwork and electrical wiring, resulting in shorted circuits and potential fires. Additionally, an abundance of rats 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 rodent issues. District services include rodent identification (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. 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 service area. Of these three, only the Western black-legged tick (*Ixodes pacificus*) is known to transmit Lyme disease in California. The District surveys public parks and other areas for the ticks that transmit Lyme disease and monitor the risk to people. Staff collect and test Western black-legged ticks from several locations throughout the service area. 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, ticks, opossums, and mice 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 routinely provides 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 IVM 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 rodents 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 (IPM). Due to the specific nature of our programs, we refer to this as Integrated Vector Management (IVM).

The District's Integrated Vector Management program, like any other IPM program, by definition involves procedures for minimizing potential environmental impacts. The District's program employs IPM 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 (rodents, ticks) it is the District's primary control method. In some 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 six). 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, rodents, 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 scopes of work discussed in the sections below are illustrative of typical District activities levels, but they are expected to show continuing variation in the future.

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 traps for surveillance of adult mosquitoes, regular field investigation of known vector sources, flocks of sentinel chickens for arboviruses, public service requests for vertebrate pests, adult mosquitoes, and other insect pests; and low ground pressure all-terrain vehicles to access these 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 and specific application of methods. Therefore, the District's specific activities and their potential environmental impacts are described herein.

PHYSICAL CONTROL (HABITAT MODIFICATION)

Dredging, placement of culverts or other engineering works, and other physical changes to the land can reduce mosquito production directly by improving water circulation or drainage, 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 accord 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 S.F. Bay Conservation and Development Commission) receive individual CEQA review. 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 Round Up 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 2010. 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. Stocking 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.

MOSQUITO LARVICIDES

Depending on time of year, water temperature, organic content, mosquito species present, larval density, proximity to human settlements, water temperature, 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 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, ATV, or helicopter. Bs (*Bacillus sphaericus*) is similar to Bti but has the additional capability of natural re-cycling in certain habitats, providing a longer duration of control. Spinosad ("Natular") is a bacterial fermentation product which acts on the nervous system of mosquito larvae and is also available in several liquid and solid formulations. All three materials have very low toxicity to non-target organisms.

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, all-terrain vehicle (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 1-2 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, or place tamper-resistant traps or bait stations, selective for the target insect, in the vicinity of the problem animals.

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) Bromadialone and Diphacinone. 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 accord 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 200 live traps which are 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 is 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. Much emphasis is placed on prevention methods and reducing the risk of illness. The District utilizes the media, various advertising outlets extensively, 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

Our laboratory conducts a comprehensive surveillance program for diseases transmitted by mosquitoes, including West Nile virus (WNV), Western equine encephalomyelitis (WEE) and Saint Louis encephalitis (SLE) 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. WNV, a virus native to Africa which first appeared in the United States in 1999, has been the most prominent mosquito-borne disease here in California since its arrival in 2004, with almost 3,000 reported cases (the actual number of cases is probably much higher since patients with the most severe form of the illness tend to be tested and diagnosed) and 100 deaths. Serious outbreaks of WEE and SLE occurred in California as recently as the 1950s and 1960s, and could re-occur at any time. The District last detected WEE activity in 1997, when two chickens at our flock in the Martinez waterfront area tested positive for antibodies. The 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 and others led to the eradication of malaria in California; however, international travel still occasionally brings people infected with malaria to our area, and Anopheles mosquitoes capable of transmitting the disease to others still exist here. We 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.

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 (ten 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 Laboratory in Richmond to be tested for antibodies to WNV, WEE and SLE viruses. In 2010, four chickens (three in Knightsen and one in Oakley) tested positive for WNV 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.

A chicken's blood is sampled that will be tested to learn if the chicken has developed antibodies to the viruses WNV, WEE and SLE. Chickens do not die from the viruses. If the test is positive, then scientists know that those viruses are active in the area.

Dead birds

The 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 the public to the statewide WNV Hotline (1-877-WNV-BIRD) or online at http://westnile.ca.gov. 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 (mosquito trapping and larval source inspections, for example).

Due to surveillance staff reductions, testing in 2010 was restricted to corvid (crow family) birds only (crows, ravens, jays, magpies). Although we have occasionally found WNV positive individuals of other species, corvids are the most 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 in our own laboratory the same day the bird was collected using a rapid screening test. Birds testing negative on our initial screening are sent to the University of California for further testing. Results typically take ten days to two weeks.

During 2010, the WNV Hotline received 923 dead bird reports from Contra Costa County residents. Of those, 32 birds were suitable for testing and eight tested positive (five American Crows, three Western Scrub-jays). Seven were found in East County and one in Central County (three in Brentwood, three in Oakley, one in Antioch, one in Walnut Creek).

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 WNV only) can be done in our own laboratory, but the majority of samples are sent to the University of California Center for Vectorborne Disease Research where they are tested for WNV, WEE, and SLE. Results of this testing enable us to determine areas of the County at risk for disease transmission and target our control resources efficiently. In 2010, 536 samples, comprising almost 17,000 mosquitoes were tested; only four were positive for WNV, the lowest since 2005.

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: Field 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 2010, our laboratory counted and identified 66,000 mosquito larvae (Map 1, page 21).
- Adult mosquito surveillance: The District utilizes two types of traps to monitor adult mosquito populations—New Jersey light traps and Carbon dioxide (CO_2) traps—at representative locations throughout the county. Fixed and random traps are placed throughout the county (maps 2 and 3, page 22).

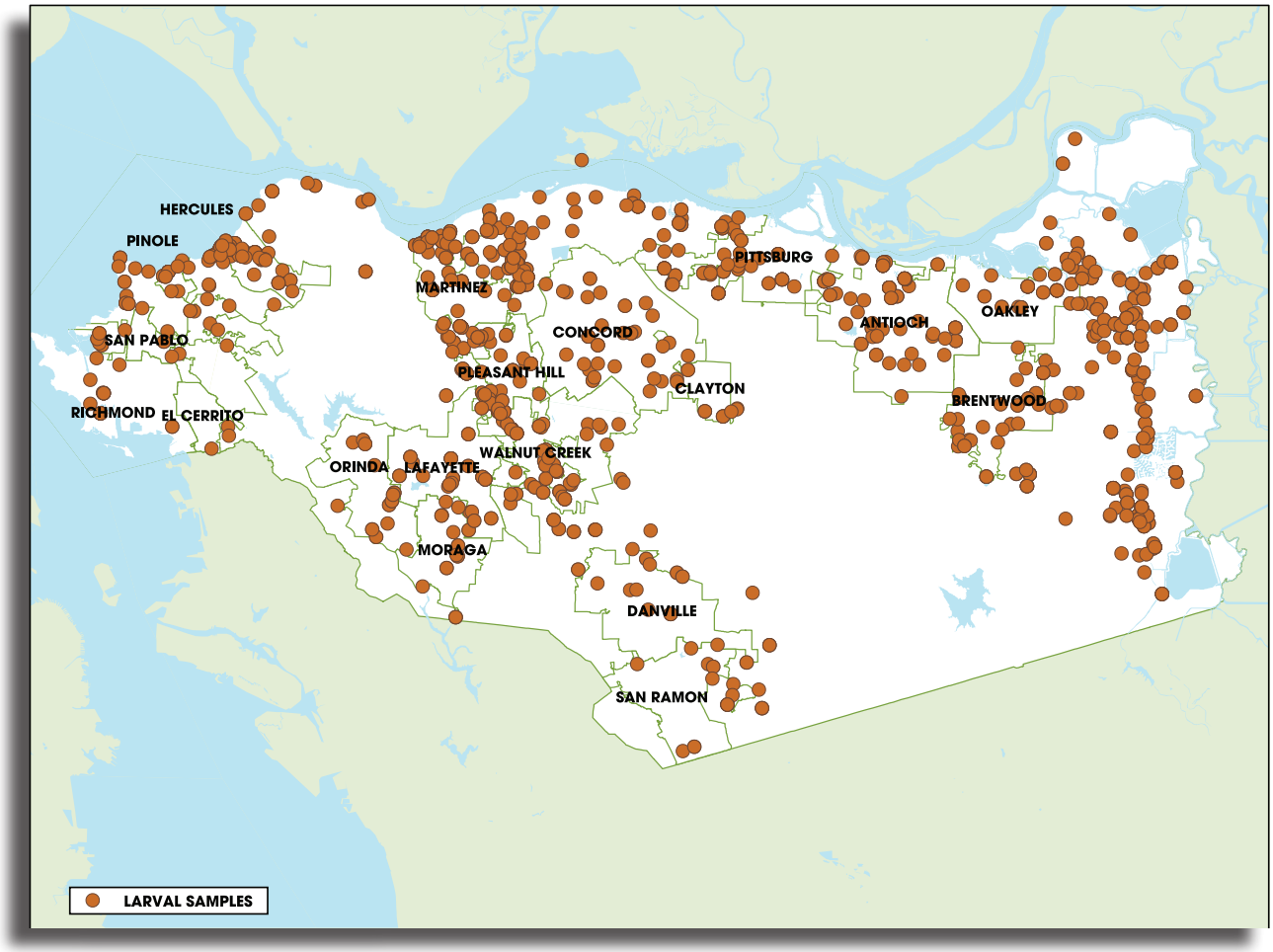
2005-2010 Summary of Encephalitis Virus Surveillance

		2005	2006	2007	2008	2009	2010
Mosquito Samples	Samples Tested	425	523	721	729	814	536
	Total # mosquitoes	20,309	24,358	28,290	23,502	27,436	16,820
	WNV Positive	4	20	28	31	17	4
Chickens	Blood samples tested	800	904	669	851	717	773
	Total # chickens	50	50	50	50	50	50
	Seropositive	18	24	5	15	13	4
Dead birds	Total reported	5,598	3,472	2,042	2,227	1,221	923
	Total tested	518	388	158	115	80	32*
	WNV positive	94	92	29	88	45	8
Dead squirrels	Total tested	45	41	29	39	19	0**
	WNV positive	25	19	5	9	2	**

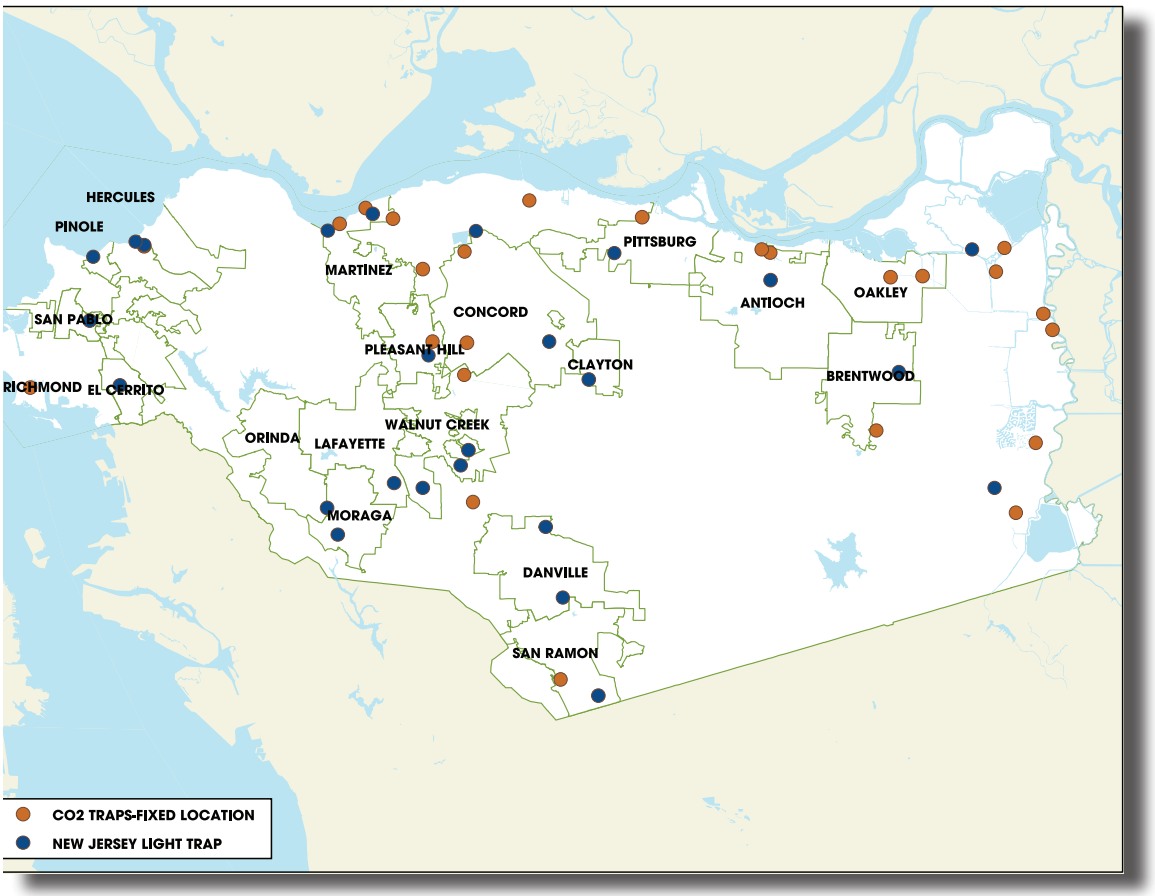
*testing restricted to crows/jays only
** squirrels not tested

- New Jersey light traps use light from a five-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 26 locations, some of which have been in use for 20 years or more. Samples are collected once a week by field technicians and returned to our laboratory 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.

- CO2 traps are portable, battery powered, and use dry ice to produce carbon dioxide, which is a powerful attractant for mosquitoes, as well as a small LED light. Traps are set overnight once per week at 25 'fixed' locations throughout the county and as many as 12-30 variable locations which are chosen based on other surveillance information, such as dead bird reports, mosquito complaints, field observations, and more. In addition to collecting both day and night flying mosquitoes, these traps also allow us to return the mosquitoes to our laboratory while still alive so they can also be tested for WNV and other viruses. Counts can also be compared with regional averages to track population changes and target control activities.

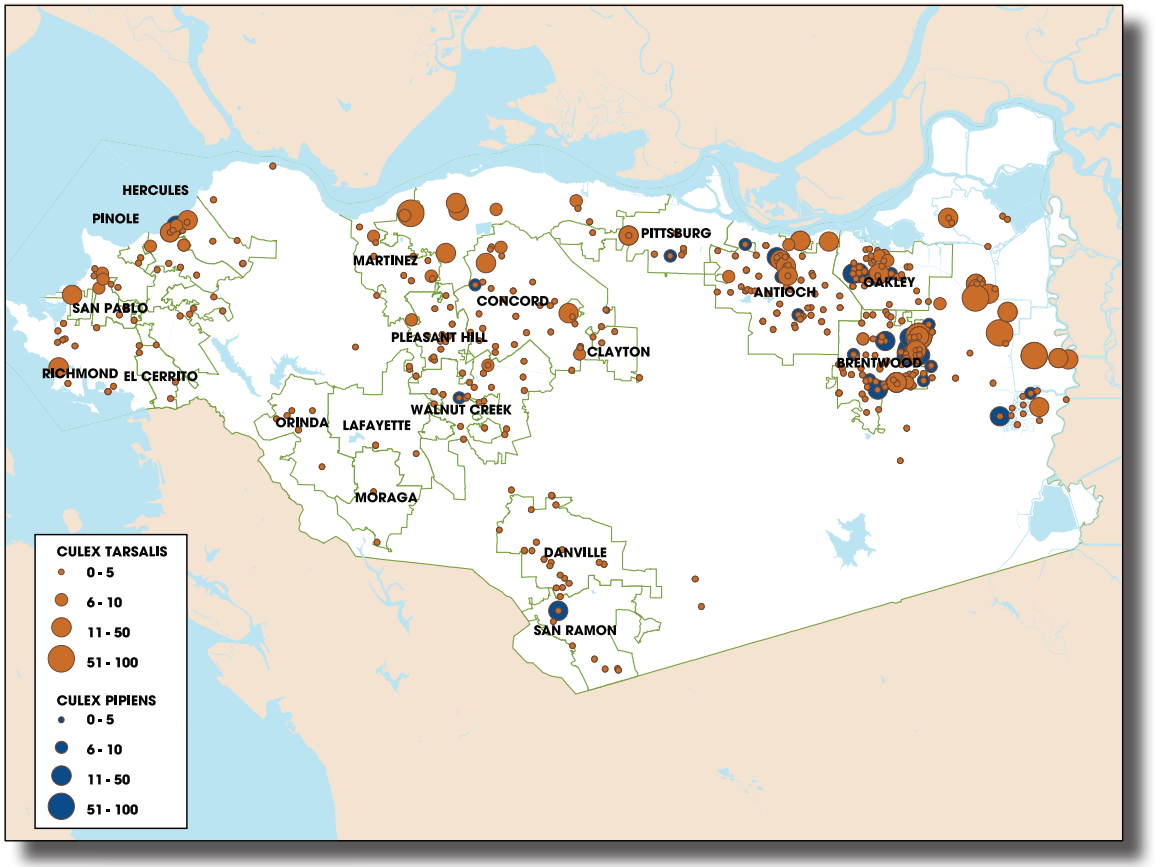


2010 LARVAL MOSQUITO SAMPLING LOCATIONS (Map 1)
Dots indicate where samples of mosquito larvae were collected in Contra Costa County. The majority of mosquito control is completed when mosquitoes are in their larval form in water.



2010 FIXED ADULT MOSQUITO TRAP LOCATIONS (Map 2)

Both Carbon Dioxide (CO2), 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.



2010 RANDOM ADULT MOSQUITO TRAP LOCATIONS (Map 3)

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.

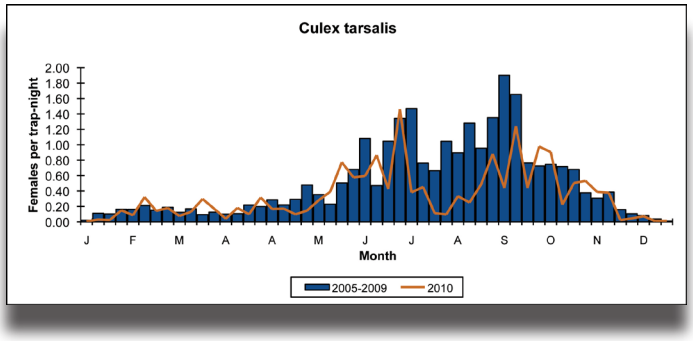
Adult Mosquito Abundance Trends

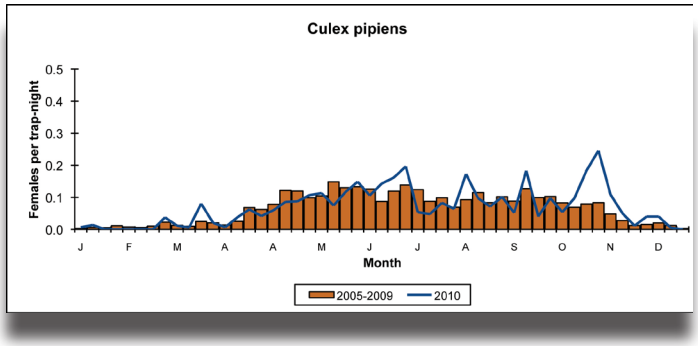
Although we are able to monitor abundance of most of the mosquito species present in Contra Costa County, two species—the Western Encephalitis Mosquito, *Culex tarsalis*, and the Northern house Mosquito, *Culex pipiens*, are considered the most significant since they are the primary vectors of WNV and other encephalitis SLE viruses. Both species are widespread 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 neglected swimming pool can affect a large area. *Culex pipiens* prefer water high in organic material and are 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.

During 2010, populations of *Culex tarsalis* were average or below for most of the year, probably due to unusually cool summer weather. We did see a significant increase in *Culex tarsalis* counts in late June which turned out to be due to a single previously unknown, very heavily breeding source along the Martinez waterfront. Once this source was located and treated, counts fell back below average for most of the remainder of the season. *Culex pipiens* counts showed occasional, above-average fluctuations throughout the year due mainly to high numbers of mosquitoes breeding in storm drains.

Adult Mosquito Abundance Trends Illustrated

The graphs below illustrate mosquito populations for the *Culex tarsalis* and *Culex pipiens* mosquito species.





Research & Special Projects

Our Laboratory conducted a field trial of a new reduced-risk bacterial larvicide, VectoMax™ CG for control of mixed species broods of mosquitoes in duck hunting club ponds.

Mosquitoes collected by our laboratory in 2008 were used by the US Army Medical Research Institute of Infectious Diseases (USAMRIID) in a study (published in 2010) to determine whether mosquito species found in the U.S. are capable of transmitting Rift Valley Fever virus.

Mosquitoes reared in our laboratory colony were provided to the University of California Mosquito Control Research Laboratory (Parlier, CA) to help replenish their reference colony of pesticide susceptible *Culex tarsalis*.

Ticks collected by our staff in 2010 were used by a researcher at Humboldt State University to determine the prevalence of different strains of Rickettsia (the group of bacteria that includes Rocky Mountain Spotted Fever).

Mosquito Control Operations

Foreclosure Crisis Challenges Vector Control

The financial challenges many Contra Costa County residents faced in recent years continued into 2010, leaving the Contra Costa Mosquito & Vector Control District to respond to hundreds of foreclosure properties that have become breeding grounds for vectors. A large percentage of these locations featured unmaintained swimming pools that served as ideal venues for mosquitoes.

At the same time, the financial difficulties that initiated the housing market collapse and subsequent reduction in county property taxes that serve as a funding source for the District's budget prompted the District to make the fiscally necessary decision not to hire additional seasonal personnel. Since 2007, seasonal employees have been instrumental in the District's efforts to curb mosquito-producing swimming pools, spas, and storm drains. Without these temporary employees, the District's full-time workforce absorbed the added responsibility of responding to these potential sources of vector-borne disease. For example, vertebrate inspectors assisted with service requests, conducted mosquito treatments, stocked sources with mosquitofish and performed surveillance for potential mosquito sources. Vertebrate inspectors responded to mosquito issues 123 times in 2009, and in 2010, that number skyrocketed to 1617 times as inspectors took on added responsibilites including delivering, installing and retrieving various mosquito traps to aid in detection of possible disease including West Nile virus.

Vector Control Technician Jeremy Tamargo sprays a neglected swimming pool to control mosquito larvae. Just one neglected swimming pool can produce more than 1 million mosquitoes and affect people up to five miles away.

Preemptive Strike against Neglected Swimming Pools

The staffing change, coupled with rainfall that exceeded the county's 10-year average, motivated the District to engage in a proactive approach to the swimming pools already in the District's database. This approach included stocking every still-unmaintained pool with mosquitofish in the first quarter of the year. The program's goal was to allow the fish to become established in the pools ahead of the start of mosquito season, so when the mosquitoes did begin to deposit eggs that developed into mosquito larva, the fish were already there to feed on them and prevent them from maturing into adulthood.

Following the preemptive strike against mosquitoes, the District's state-certified inspectors and technicians inspected swimming pools as needed, placing mosquitofish in the majority of them when possible, using adulticide when necessary and educating residents about the importance that proper maintenance of water features plays in protecting public health. The combined efforts appeared successful when paired with below-average summertime temperatures because 2010 surveillance numbers showed the *Culex tarsalis* population at average or below average levels compared to the five previous seasons. *Culex tarsalis* mosquitoes are the mosquito breed most commonly associated with swimming pools. They are one of the county's 23 types of mosquitoes and are a primary transmitter of West Nile Virus. The *tarsalis* are most active at night and have a flight range of three to 15 miles.

While mosquitofish are efficient consumers of mosquito larvae, they do not clean pools, spas, or change a water feature's appearance. This fact made public education a continuing challenge in 2010 to make sure neighbors, real estate agents, and others knew not to put chemicals in the pools or spas that would temporarily clean the water feature because those chemicals would also kill the fish. In cases where this happened, the chemicals dissipated in several days leaving neighbors at risk of mosquito-borne disease until fish could be restocked or someone was able to keep the pool or spa clean and filtered on a full-time basis. In 2010, District inspectors and technicians used brightly colored signs and door hangers to warn people against shocking the pools for temporary benefit. In addition, District employees began posting signs asking anyone who noticed dead fish in the pools or spas to contact the District immediately for mosquitofish replacement. Prior to this notification, District technicians and inspectors routinely returned to locations where they had stocked fish every four to eight weeks, with the belief the fish were still alive and functioning properly.

Interagency Cooperation

The frequency of pool and spa re-inspections was less in 2010 than in 2009 when the District employed seasonal employees to specifically respond to mosquito-producing swimming pools and spas. Without the seasonal employees serving as "additional eyes", the District worked more closely in 2010 with other agencies that had employees in the field who could report back to the District on incidences of vector-borne risk. In return, the District assisted other agencies in like kind because the economic climate that prevented the District from hiring seasonal workers had also prompted many other city and county agencies to cut staffing as well. Most effective in this arrangement was the exchange of information between the District and code enforcement offices across Contra Costa County because code enforcement inspectors often call upon the very same properties as the District.

Underground Sources

While *Culex tarsalis* mosquitoes are the chief vector associated with the neglected swimming pools and spas, *Culex pipiens* also transmit West Nile virus, but they prefer underground sources such as storm drains and sewer systems. In 2010, the District's mosquito surveillance and testing showed three out of four of the mosquito samples that tested positive for West Nile virus were *pipiens*. That evidence prompted the District to focus efforts on underground sources.

Prior to 2010, seasonal employees deposited larvacidal briquettes monthly in catch basins throughout Contra Costa County. Without these additional workers, the District's full-time inspectors and technicians responded to storm drains and catch basins as needed, using 120-day briquettes to prevent development of mosquito larvae for longer periods of time. The approach appeared effective as the number of West Nile virus positive *Culex pipiens* decreased from four samples in 2009 to three in 2010.

Catch basins are a popular source for Culex pipiens mosquitoes, a primary vector of West Nile virus. Often, water accumulates and stagnates in catch basins requiring regular and consistent treatments to control mosquitoes.

ULV Fogging

When the District's surveillance and testing detects West Nile virus in a community, the initial response is to intensify efforts to reduce mosquito breeding sites by focusing on mosquito larvae in areas where West Nile virus has been found. The District's aggressive campaign against mosquito larvae minimizes the need to use adulticides. In cases where the larval approach is not sufficient to prevent the risk of West Nile virus, the Contra Costa Mosquito & Vector Control District conducts fogging using Environmental Protection Agency approved public health pesticides when necessary to prevent human illness or to suppress a heavy nuisance infestation of mosquitoes. Fogging is concentrated in areas most at risk for disease occurrence and is conducted by certified and licensed applicators.

In 2010, the District fogged four areas of Contra Costa County at risk of West Nile virus using public health pesticides applied via a truck mounted ultra low volume sprayer. This number was far fewer than the 20 areas the District fogged due to West Nile virus risk in 2009. This reduction in fogging is attributed to the cooler temperatures of 2010 compared to the ten-year average. Warmer weather facilitates both mosquito larval development and West Nile virus viremic levels. When the weather is cooler, as was the case in 2010, larvae develop more slowly, giving the District's technicians and inspectors more time to find larval sources and complete larval treatment, thus reducing the need for fogging due to West Nile virus in this particular year.

In addition to ultra low volume fogging for West Nile virus, the District also fogs for relief of large populations of nuisance mosquitoes. These tend to be flood water mosquitoes that emerge all at once from recently flooded pastures or marshland where female mosquitoes leave eggs that will hatch when the area is flooded.

Looking to the Future

A major area of focus in the prevention of mosquito-borne illness remains the residential communities and neighborhoods of Contra Costa County. Requests from county citizens for mosquito inspections and service were up two percent in 2010 compared to 2009; 77 percent compared to the 25-year average. And in spite of several years of public education and outreach regarding the public health risk of neglected and abandoned swimming pools and spas, in 2010, District employees continued to find new pools and spas at risk of mosquito production, as well as water sources on occupied properties where homeowners or residents were not properly taking care of the pools or spas to prevent mosquitoes. As we look to the next mosquito season, the District will review practices and options to encourage homeowners and residents to take responsibility for the upkeep of their own pools and spas to reduce the demand for the District's resources.

In 2010, just as it has been in the District's 84-year history, we all play a role in protecting the health of our neighbors by reducing the risk of vectors in our own backyard.

> "The District's aggressive campaign against mosquito larvae minimizes the need to use adulticides."
>
> *Craig Downs*
> *General Manager*

Mosquito Zones

The Contra Costa Mosquito & Vector Control District divides the county into geographic zones and assigns the inspectors and technicians to individual zones in order to provide the most efficient and beneficial service to county residents. These zones are then grouped into two programs: Inland Mosquito Program and Waterfront Mosquito Program. In 2010, these dividing lines were redrawn to more evenly distribute the workload among District employees.

Inland Zones

The inland zones are comprised of very diverse geographic and economic conditions. Mosquito production sources here include residential locations, ponds, industrial areas, regional parks, and construction sites. Abandoned and neglected swimming pools were the primary source of mosquito production in these zones in 2010; however, residential storm drains and catch basins became a major source of mosquitoes as well, requiring regular attention from the Districts' six vector control technicians and inspectors assigned to the areas. On a daily basis, these District employees, with 52 combined years serving the citizens of Contra Costa County, visited properties and potential sources, talked with citizens, inspected properties for signs of vectors, used their expertise and state-certified training to determine the best potential treatment, and provided information and advice to residents and business owners on eliminating and preventing vectors from returning in the future.

Areas that required special attention in the inland zones in 2010: San Marcos stormwater detention basins, the Pittsburg water treatment plant, City of Orinda mitigation ponds, Central Contra Costa Sanitation District, Shell Oil refinery, and the area known to locals as the Hercules Property. District employees report, in cases where they responded to mosquito production sources on business properties, that the company employees involved were cooperative in receiving their recommendations for alleviating the risk to public health.

Waterfront Zones

The waterfront zones include East Contra Costa County's island communities, irrigation flooding fields, pastures, storm water ponds, marshlands, embarcaderos, regional parks, industrial sites, including five oil refineries and associated businesses, and waterfront residential areas. While the District inspectors and technicians in the inland zones spend the bulk of their time in residential areas, the inspectors and technicians in the waterfront zones spend much of their time in more rural areas.

The four district employees assigned to these zones divide their time between areas with a previous history of mosquito production and searching for new potential sources of mosquito production. But because a large percentage of the zones are agricultural or industrial, the search over hundreds of acres of fields or pastures or across a large refinery can often be quite challenging. This is why the inspectors and technicians' state certification is so important. The training involved provides them with the ability to zero in on potential sites through mosquito identification. While Contra Costa County has 23 different types of mosquitoes, to the trained eye, each one is distinct with specific habitat preferences. These traits give the zone inspectors and technicians important information to aid them in the search for sources.

To reach many of these areas, District employees used a boat, all-terrain vehicles specially created for marshes and wetlands, and helicopters when needed. When treatment was necessary in these zones, zone technicians and inspectors most commonly used mosquitofish in 2010 for natural mosquito control. But in cases where the fish could not be used, they often used bacterial larvicide or insect growth regulator to prevent mosquito larvae from developing into flying, biting adults.

The key to success throughout the zones was the technicians and inspectors' ability and willingness to assist in other areas as needed. While each District employee maintained expertise in his or her assigned zone, the ability to respond to situations as needed in other zones proved instrumental in 2010.

Rats & Mice

Rat & Mouse Inspections

The Vertebrate Program has four inspectors dedicated to rat and mice services. Under the 2010 arrangement to assist in mosquito service requests, the District's vertebrate inspectors managed their time to accommodate both rodent and mosquito inspections when needed. In 2010, the program's four rodent inspectors responded to 741 requests for service compared to 540 in 2009. The single year increase of 37 percent is surpassed by 2010's 56 percent increase compared to the 25-year average for rat and mouse requests for service. Primarily, inspectors provide exterior inspections for outdoor evidence of rats and or mice including chew marks, droppings, and rub marks. District employees also conduct interior inspections when evidence suggests the presence of a rat or mouse, or a homeowner makes a specific request. Interior inspections typically take place in garages or kitchens and are primarily under sinks and around hot water heaters.

When the vertebrate inspectors respond to service requests, they work with home and business owners to educate them on reducing the risk of rats and mice, while explaining how these rodents pose the risk of bacterial and viral diseases. The District employees explain that rodent prevention involves removing food items that attract rats and mice including pet food, water, fallen birdseed, fallen fruit or nuts from trees. They also inform homeowners and business owners about preventing rodents' access to potential harborage by removing or downsizing tall or dense vegetation, debris or wood piles that the rodents can live under, and closing openings that allow easy access to crawl spaces under homes, various buildings or sheds. The communities with the largest number of service requests for rat and mouse inspections in 2010 were Concord with 96, Walnut Creek with 86 and Lafayette with 59.

Residential and public areas along waterways present a special challenge to rodent control. District inspectors worked closely with harbor masters and regional park managers in 2010 to implement Integrated Vector Management protocols to reduce the risk of rats and mice. Integrated Vector Management is a four-part ecosystem-based strategy to reduce vector-borne risk using environmental, physical, educational and chemical methods. The focus of IVM involves habitat manipulation, modification of cultural practices and the use of resistant varieties.

Vector Control Inspector Steve Fisher educates a homeowner about rat entrance points to his home.

Vector Control Inspector Steve Fisher talks with a homeowner after a rodent inspection of his house. The District issues a report detailing inspection results and recommending exclusion activities.

Sewer Baiting

The two most common rats in the county are the Norway rat and the roof rat. The Norway rat is also known as the sewer rat for its penchant for living in the sewage systems in search of food flushed from garbage disposals. When they cannot find ample food in the sewer lines, they will search for sustenance often in urban areas connected by the sewers. This can lead to the unwelcome arrival of a rat in a toilet or sink. One of the ways the District works to prevent this occurrence is by reducing the rat population through the process of sewer baiting. During the process, District employees lift the manhole cover that can sometimes weigh as much as 200 pounds. They then secure rat bait to a ledge inside the sewer where a rat is most likely to find the material, and then they reinstall the manhole cover.

In 2010, the District's vertebrate inspectors underwent new Caltrans-inspired safety training to improve their protection while conducting sewer baiting. Often, the process takes place in the high traffic areas including major roads all over the county. With the improved technique, district inspectors were able to inspect, bait, and/or perform surveillance in sewers 496 times in 2010, down slightly from the 545 times in 2009 due to the time needed to respond to mosquito issues as well. But in spite of the divided time between vectors, overall the vertebrate inspectors accessed sewers in more areas of the county in 2010, reaching 15 cities in 2010 compared to 12 cities in 2009.

Vector Control Technician Bob Stultz and Vector Control Inspector John Chase place rodent bait for rats in a sewer in Richmond, CA.

Interagency Cooperation

While the mosquito program continues to see increasing risk of mosquitoes from foreclosure properties, these same properties also pose the risk of rat or mice infestation in part due to a phenomenon that gained popularity in 2010: illegal dumping on foreclosure properties. The illegal and unwanted dumping of random debris and garbage on foreclosure properties created additional attractants for rats and mice. The Contra Costa Mosquito & Vector Control District worked closely with area code enforcement, building inspection and environmental health agencies in 2010 to identify vectors present in these locations and assist in vector control activities as needed.

Vole Invasion

Above-average rainfall in the spring and early summer created a surge in vole (meadow mice) populations. More rain meant more green grass during more of the year, providing the voles with abundant food and habitat. Voles look similar to mice, but have shorter tails.

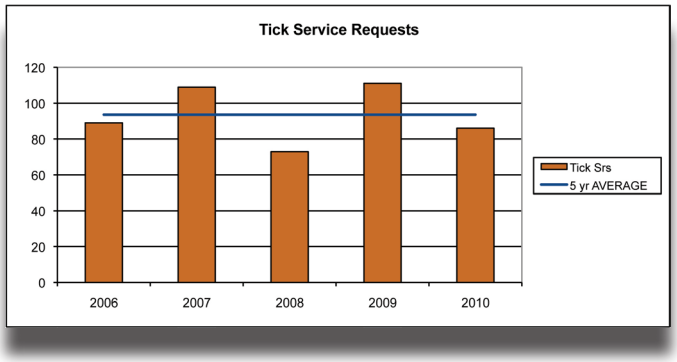
A large number of requests for rat and mouse inspections during this time turned out to be voles, so the District created a special publication for homeowners to distinguish between the voles, rats, and mice. The publication provided information and recommendations for dealing with these rodents that do not pose a risk to public health, but are a nuisance on many properties.

Looking to the Future

As the vacant properties and foreclosures of 2010, along with their associated problems involving rats and mice, do not appear to be dissipating anytime soon, the District plans to examine ways to further educate the citizens of Contra Costa County about rodent control and prevention. Of particular focus is the homeowners who remain in neighborhoods where foreclosure properties are numerous. In the future, the District will evaluate the best ways to provide information in key locations throughout the community, possibly where county residents work and play. The District hopes to illustrate that rats and mice are a community problem that require neighborhood cooperation in order to reduce the risk of the damage and diseases they can transmit.

Ticks & Lyme Disease

Lyme disease is a bacterial infection transmitted by the Western black-legged tick (also known as the 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 District monitors the risk of Lyme disease by collecting and testing Western black-legged ticks from several locations that have been monitored for as long as 15 years. On average, only one or two in one hundred Western black-legged ticks test positive, although we have found a few locations where the rate is higher, and these tend to change over time. In 2010, 175 ticks were collected and tested from two locations. One tick from the hills near Lafayette tested positive.

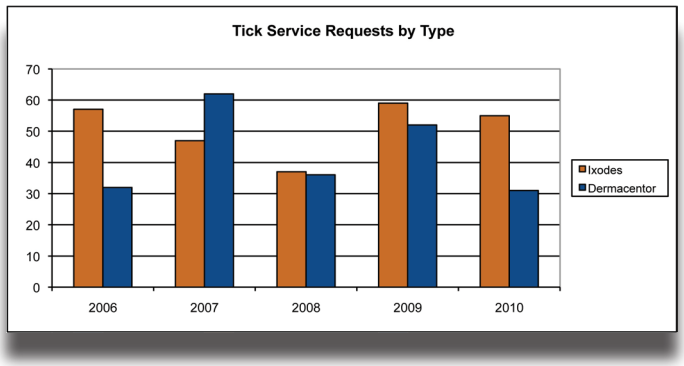


Ticks of Contra Costa County

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 viarabilis)*

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.



District staff continue to identify ticks brought in by members of the public; however, in April of 2010, the District discontinued Lyme disease testing on ticks. After careful consideration, 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. People who are concerned with possible Lyme disease should contact their physician.

In 2010, 86 ticks were identified by our staff of which 55 were Western black-legged ticks and 33 were dog ticks or Pacific Coast ticks. Tick identification requests for the year were slightly below the five-year average.

Skunks & Rabies Risk Reduction

The skunk is known to take up residence on many properties in Contra Costa County and is not only a nuisance, but a vector of disease. According to the California Department of Public Health, in 2010 the skunk was the state's most common four-legged animal to have rabies. As part of the Contra Costa Mosquito & Vector Control District's mission to protect public health, the District has a Rabies Risk Reduction Program that provides county residents with education, inspections and advice on reducing the risk of rabies by instructing property owners on how to make their properties less attractive to these unwelcome squatters. The Vertebrate Program has two inspectors who are dedicated to skunk services.

Contra Costa County is home to two types of skunks: the spotted and striped skunks. The striped skunk is most common, but both species are attracted to residential areas by the availability of food and shelter. In the winter months, skunks enter the mating stage, followed by the time when the female skunks seek den locations where they can have their young in the late spring and summer.

The key to skunk prevention is removing available food sources like exposed garbage, bird seed, fallen fruit from trees, grubs, and pet food from areas where skunks can access them. Removing these attractants makes a skunk less likely to visit a property and search for a place to create a den. In 2010, the District's state certified inspectors found skunk activity most common in residential areas that featured creeks, or were located near open spaces. In Contra Costa County, the largest number of requests for service came from the cities of Walnut Creek with 133, Antioch with 93 and Concord with 76. Total service requests for 2010 were 741 or up three percent compared to 719 requests in 2009, but down 15 percent compared to the 10-year average.

The striped skunk is the most common skunk found in Contra Costa County. Skunks can transmit rabies to people and other animals.

Yellowjackets

Contra Costa County is home to four species of yellowjackets. Though a relative of the bee, which typically stings as a last measure of defense, these stinging and biting cousins have a more aggressive temperament. They are known to sting and bite repeatedly when threatened, thus the yellowjacket's stings and bites are notorious for being more painful than those of its fellow arthropod.

There are four species of yellowjackets in Contra Costa County. Two species, the Western yellowjacket (*Vespula pennsylvanica*) and the common yellowjacket (*Vespula vulgaris)* are known as ground-nesting yellowjackets. These insects take over abandoned underground holes such as those left behind by rodents and burrowing animals. Because of their subterranean location, they can easily go unnoticed until accidentally discovered by an animal or person. When disturbed, up to 5,000 yellowjackets at home in the underground nest can exit the location to defend it. The mass exodus poses the threat of multiple stings and bites to the unwitting discoverer of the nest. The Contra Costa Mosquito & Vector Control District offers free nest treatment for these groundnesting yellowjackets because of their aggressive nature.

In 2010, the number of requests for service the District received grew by 54 percent compared to 2009, as well as 54 percent more than the 25-year average. This increase is somewhat misleading in that the number of requests received in 2010 is actually more typical of the number of requests in the last 10 years. In 2009, the cool, wet weather played a role in the decrease of service requests in 2009. The population in 2010 has resurged. In fact, the District received service requests as early as April when typically requests do not begin until May.

The District hired one seasonal employee to handle the majority of yellowjacket service requests. The District relied on the expertise and cross-training of all District inspectors and technicians to handle remaining yellowjacket service requests. This cross-training enables technicians to respond to any inquiry, regardless of the vector.

One of the key challenges of 2010 involved golf courses located in Contra Costa County. In previous years, inspection requests from golfing communities came from neighboring homes or areas of the course closest to surrounding residences. In 2010, that trend changed and an increasing number of ground-nest treatments had to be performed well within the golf courses. In many of these cases, the yellowjackets had established large nests and those defending the nest were particularly aggressive.

The District responds as quickly as possible to requests for service—usually within 24 hours.

Looking ahead to 2011, the District will continue to focus on providing timely service for every yellowjacket ground nest service request. The District will continue to utilize the cross-trained expertise of the District inspectors and technicians. With these preparations and procedures in place, the District will be ready to protect public health from ground-nesting yellowjackets, however many nature provides in the future.

A yellowjacket

A honey bee

Fisheries

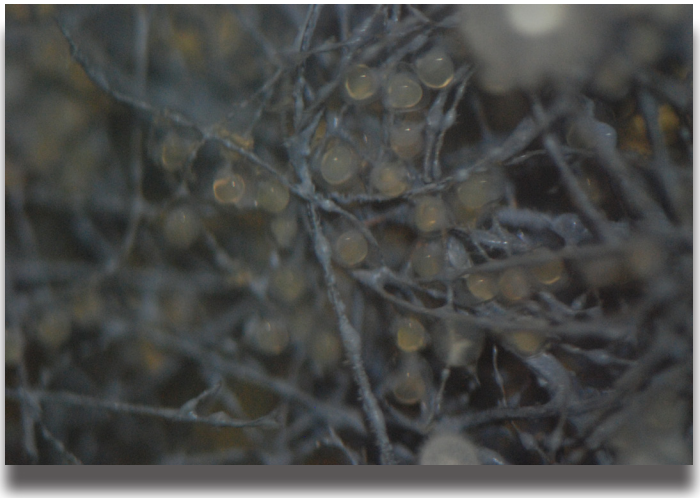
The District's mosquitofish program has been an important tool of the District's mosquito control efforts since nearly the beginning of the District's formation. In those early days, mosquitofish were commonly stored in outdoor ponds where, due to usual seasonal temperature fluctuations, the fish rarely survived the winter. Those that did also faced natural risk from predators, so the resulting supply was small. To provide a more cost effective and consistent supply of mosquitofish for mosquito prevention, in 1978, the District created a specific program to produce large numbers of mosquitofish in a controlled environment. This involved constructing a greenhouse and specialized raceways to allow the fish room to swim and reproduce. The creation of the greenhouse-based program has been beneficial on many levels including providing the fish with more reliable temperatures, and allowing for year-round production. The enclosure protects the fish from possible predators and allows the District to maintain a fish population free of diseases found in natural habitats.

In 1989, the District redesigned the greenhouse facility to promote production of the mosquitofish. Today, the program produces one million mosquitofish each year for District distribution in specific areas of water that produce mosquitoes, as well as for free distribution to the public for use in decorative ponds and water features and large containers including horse troughs. During the foreclosure crisis of the 2000s, the District placed the fish in neglected pools and spas for longer term control.

In 2010, the District distributed 94,790 mosquitofish (*Gambusia affinis*) in Contra Costa County. District personnel placed 68,670 mosquitofish of which 27,820 were in unmaintained swimming pools and 26,120 were distributed to residents. The District produced approximately 1.2 million mosquitofish in 2010.

California Roach over spawning trap

The District continues to conduct research on California Roach (*Lavinia symmetricus)* fish, a California native minnow found in creeks. This is a continuation of research aimed at finding California native fish species that can be used for mosquito control.



California Roach eggs

In April, the District was successful in aquarium spawning California roach. Refinements in spawning protocol and design of an egg trap resulted in ten spawning events between April and June. A total of 4,777 roach larvae (fry) were produced. This is the first record of California roach spawning in captivity. Rearing of the larval roach was not difficult as they readily fed on brine shrimp and commercial fish feed. This species is not cannibalistic and adapted well to culture conditions.

To evaluate their effectiveness in controlling mosquito larvae, 60 California roach (approximately 90 days of age) were stocked in each of three preselected unmaintained swimming pools. Pools were monitored every 14 days for presence of mosquito larvae. Roach controlled mosquito larvae for up to three months. Unfortunately, chlorine was later added to all three pools without our knowledge, killing the fish. In 2011, plans include producing more fish larvae and stocking them in approximately 15 non-maintained pools.

The District continues to assist East Bay Regional Parks District with their Mobile Fish Exhibit. We currently hold and maintain warm water game fish at the District until a permanent holding system is built. The District's cooperation in assisting another local public agency demonstrates interagency cooperation and responsible use of existing equipment and employee expertise.

Public Affairs & Community Outreach

A crucial aspect of protecting public health is providing residents with vital information on how to reduce the risk of vector-borne disease for themselves, their families, and friends. To this end, the District employs a multi-faceted education and outreach strategy that includes in-person presentations, informational booths at fairs and events, creating videos and articles for the Internet and social media, educational articles for newsletters, library displays, working with radio, television, newspapers in both news and advertising segments, and more.

In 2010, the District reached every household in Contra Costa County – twice – with important health information. In addition, the District once again opted to publish ads in the Penny Saver extensively since our evaluation illustrates this publication to be highly utilized by our constituents. We also advertised in the Contra Costa Times, mailed fliers to homes, and utilized advertising wraps that arrive in mailboxes. We sent direct mail postcards to only new home buyers whose properties included a swimming pool to illustrate the importance of pool maintenance against mosquito production and to call the District for mosquito control assistance. At movie theaters, we connected with our constituents with our "They're Here…..Mosquitoes!" public service announcement. This professional piece was created to be timeless and cost-effective, and will be used for years to come. It's currently and consistently aired on Contra Costa Television. We continue to evaluate our outreach program to ensure efficient and successful communication and outreach efforts.

Current research shows citizens prefer to receive information through multiple sources including the Internet and social media. The District posts timely messages on Twitter.com which reaches followers in all areas of the community, including many media outlets that often re-tweet our messages mere seconds later. Twitter helps us to reach our public through our own followers and through their followers as well, resulting in a much larger audience exponentially. With Twitter, the public has instant access to the most important health messages and fogging schedules, too. The information can be shared easily and effortlessly by anyone.

Community Affairs Representative Nola Woods discusses vectors with residents and visitors in Pleasant Hill in 2010 at the Pleasant Hill Public Works Day event.

Citizens can also access important public health materials and information on the District's award-winning website. The redesigned website launched in mid 2010 to an increasing amount of Internet traffic. Content is updated regularly with new videos, featured articles, surveys, and other interactive forms of communication. In January 2010, the District changed the website address to www.ContraCostaMosquito.com to make it even easier for the public to access important health information. The website features information about District services, residents may request services, as well as report vector issues.

The District received the 2010 Silver Davey Award for website design. This worldwide competition honors the "creative Davids who derive their strength from big ideas, not stratospheric budgets. The District regularly surveys residents to ensure connection between the District and the employees.

Combined with social media, traditional news outlets remain important to District efforts to reach the public. In 2010, the District was featured in 59 different stories or articles and appeared on television, radio, newspapers, or websites. The District also provides articles to various government and community newsletters. In 2010, the number of local newsletters publishing District articles increased by 360 percent over 2009. The total circulation of these newsletters is more than 100,000 people.

Africanized Honey Bees

Contra Costa County's first detection of Africanized honey bees (also known as "killer bees:) was in July of 1997 and the second was in December of 2008. Both incidents involved imported bees that hitched a ride on cargo ships and the bees were intercepted before they could escape and establish new colonies. As the lead agency for these aggressive bees, the 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 2010, the District received 29 calls about honey bees compared to 19 calls in 2009, 29 calls in 2008, and 38 in 2007. 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 rather alarming and may sting if provoked.

Initial screening for Africanized honey bees is made by 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 let the bees leave on their own, if they do not pose an immediate risk to health and safety. In any case, homeowners should ensure their home has no deficiencies that will allow bees to colonize, such as gaps or holes in the exterior of their homes 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 trying to survive in our county. District staff provides homeowners with contact information for local beekeepers who have agreed to retrieve 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 our county as evidenced by the previous incidents, or they may continue to move north into our county on their own. Either way, our District remains poised to respond and protect public health from this sometimes fatal vector.

Africanized Honey Bees have not colonized in Northern California to date. European Honey Bees, shown above, swarm when they are in search of a new hive location and are generally harmless at this time, unless provoked.

Environmental

In addition to protecting public health, the District is also dedicated to protecting the natural environment. Healthy wetlands support populations of natural predators, producing 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. We are a past recipient of an award for our 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. Finally, the District installed a water filtering station for employees, eliminating plastic water bottles from daily use.

Continuing Education

The District employs vector control technicians certified by the California Department of Public Health. In order to become certified, technicians 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: Pesticide Use and Safety, 12 hours; Mosquito Control, 8 hours; Terrestrial Invertebrates, 8 hours; Vertebrate Vectors, 8 hours. 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 41 field vehicles, 4 staff vehicles, 18 vehicles sprayers, 2 boats and their trailers, 7 8-wheel ARGOs, 3 4-wheel All Terrain Vehicles, 11 trailers, 3 Ultra Low Volume sprayers, 1 catch basin mister, 1 Africanized Honey Bee sprayer, 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. In 2010, the mechanic coordinated with the IT technician and installed new CAT6 cable for higher speed internet.

Information Technology

The IT technician is responsible for all communication technology at the District, maintaining all aspects of the administration phone system, cell phones, computers and internet services. The IT technician maintains 40 computers and their associated software, including programming and maintaining VXS, a specialized database the District developed and uses for vector control surveillance, monitoring pesticide usage, workload management and more.

In 2010, the IT technician and mechanic installed 3.5 miles of CAT6 cable for high speed internet saving the District $10,000 in installation charges. Outsourcing the District's email service and switching internet service providers resulted in significant savings as well.

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.

The Contra Costa Mosquito & Vector Control District is located in Concord, CA.

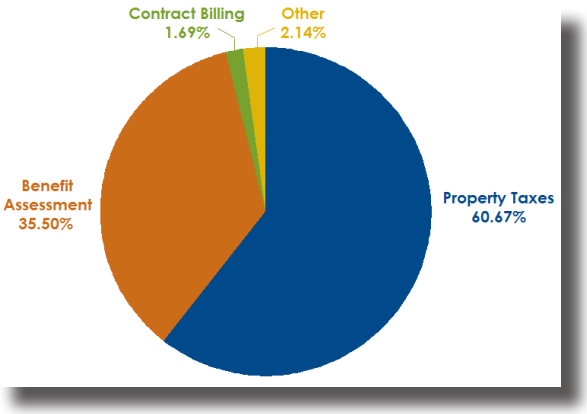
Financial Statement

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

Over the past several years, the real estate crisis in California has resulted in significantly lower property values and subsequently, District revenues. In 2007, among Bay Area counties, Contra Costa had the highest rate of increases in foreclosures. In one ZIP code in Antioch, one out of every 18 homes was in default. Contra Costa County continues to be adversely affected by the crisis and property values continue to decline.

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 county-wide 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.

As mandated by government code, the District is annually audited by an outside agency. The agency 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 available.



District revenues

Revenues	2009/2010*	2010/2011**
Property Taxes	$3,405,623	$3,630,023
Contracts	95,075	85,855
Interest Income	53,666	29,235
Benefit Assessment	1,992,635	1,984,921
Miscellaneous	66,446	148,960
Total Revenues	$5,613,445	$,5,868,994
Expenditures	2009/2010	2010/2011
Salaries & Wages	$4,311,649	$4,274,279
Operations	1,321,046	1,235,217
Capital	45,459	20,568
Total Expenditures	$5,678,154	$5,530,064

** Audited ** To be audited*

CONTRA COSTA
MOSQUITO & VECTOR CONTROL
DISTRICT

Protecting Public Health Since 1927

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