

# Mosquito & Vector Control matters.



2011

annual  
report



CONTRA COSTA  
**MOSQUITO  
& VECTOR  
CONTROL**  
DISTRICT

protecting public health since 1927

---

# *Table of Contents*

Programs & Services	•3
Principles	•4
History	•5
Personnel	•9
Board of Trustees	•10
Inspectors & Technicians	•11
Integrated Vector Management	•12
Mosquito Control Operations	•27
Rats & Mice	•31
Ticks & Lyme Disease	•32
Skunks and Rabies Risk Reduction	•34
Yellowjackets	•35
Fisheries	•36
Public Affairs & Community Outreach	•37
Africanized Honey Bees	•39
Environmental	•40
Continuing Education	•40
Shop/Facility Maintenance	•40
Information Technology	•40
Administration	•40
Financial Statement	•41

---

## *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 2011.

### **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, we can determine where to look if the homeowner or caller provides our District employee with a mosquito sample. Simply swat and kill a mosquito (try not to squish it too much) and save it or tape it to a piece of paper for the District employee. Mosquitoes can transmit a variety of diseases including West Nile virus.

#### **Mosquitofish**

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

#### **Rats & Mice**

Homeowners, business owners or any group in Contra Costa County can request a site visit to assist them with rodent issues. District services include identification of rodent problems (rodent need not be present) and advice for prevention and control. 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 the District for service. The nest's location must be identified and the location shared with District employees. This can be achieved by drawing a map, pointing a garden tool, or identifying the site with a marker (red sock, garden glove, etc.). Yellowjackets are beneficial insects that eat garden pests and pollinate crops through daily foraging; however, if aggravated, they can sting repeatedly and painfully and their stings can be dangerous for those people allergic to their venom.

#### **Ticks & Lyme Disease**

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

#### **Public Information & Education**

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

---

# Principles

## Vision

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

## Mission

To protect and promote public health and welfare through Integrated Vector Management services and programs utilizing best management practices and least toxic components by:

### Community Value

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

### Service Area

Serving all of Contra Costa County

### Public Confidence

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

### Public Relations

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

### Environmental Commitment

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

### Research

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

### Interagency Relations

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



1926-2010 84 Years New!

## History

Contra Costa County encompasses some of the most diverse environments found in one area. This wide range of environments makes our county one of the most desirable places to live in Northern California. The Contra Costa Mosquito 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.

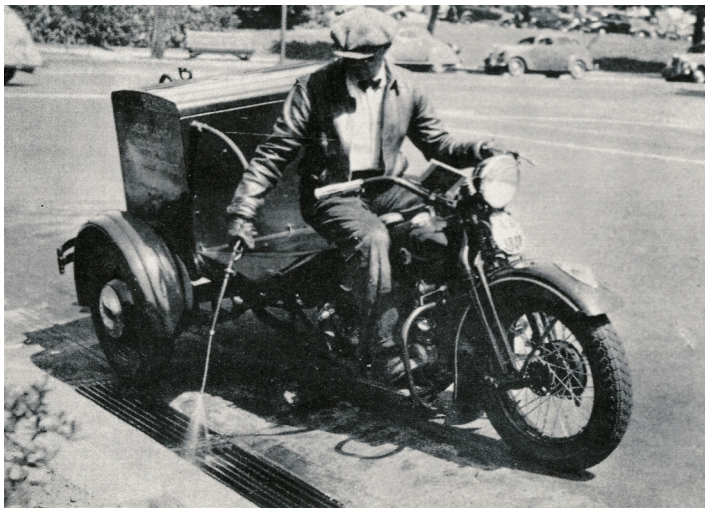


In 1926, Noble Stover responded to requests from Contra Costa County and directed the first operations of Contra Costa Mosquito Abatement District #1 (CCMAD #1), concurrently with his duties in Marin and San Mateo Counties. The purpose of the District was to control marsh mosquitoes in north central 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.*



## Timeline

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

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

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

Contra Costa County had its most recent reported human cases of 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.

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 in Contra Costa County

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

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

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

*In 1986,* CCMAD #1 and DVMAD merged to create one 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  
Robert Stultz  
Jeremy Tamargo  
Patrick Vicencio

Technicians:  
Josefa Cabada

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

Inspectors:  
Reed Black  
Tim Mann  
David Wexler

Technicians:  
Ceaser Gutierrez  
Joe Hummel

**Vertebrate Vector Control Operations**  
Program Supervisor: Jonathan Rehana

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



## *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 Left to Right:** Kristin Haegeland, Pinole; Nancy Brownfield, Walnut Creek; James Pinckney, Alamo; Diane Wolcott, Orinda; Soheila Bana, El Sobrante; Daniel Pellegrini, Martinez; Angela Micheals, Concord; Myrto Petreas, Moraga; Jim Fitzsimmons, Lafayette; Peggie Howell, Clayton and Sharyn Rossi, San Ramon

**Kneeling/Seated:** Jeff Bennett, Hercules; Randall Diamond, Danville; Russ Belleci, Contra Costa County; Jose Saavedra, Antioch; Richard Head, Oakley; Richard Mank, El Cerrito; Richard Means, Pleasant Hill; and Chris Cowen, Contra Costa County

**Not pictured:** *Richard Ainsley, Pittsburg; and Brian Smalley, San Pablo*



## *Administrative Staff*



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

## *Inspectors & Technicians*



**Standing:** Dave Obrochta, VCI; Lawrence Brown, VCI; Steve Fisher, VCI; David Wexler, VCI; Joe Hummel, VCT; Tim Mann, VCI; Josefa Cabada, VCT and Cesar Gutierrez, VCT **Kneeling/Seated:** Jason Descans, VCI; Felipe Carrillo, VCI; Robert Stultz, VCI; Joe Cleope, VCI; Danielle Wisniewski, VCI; and Reed Black, VCI **Not pictured:** John Chase, VCI; Jeremy Tamargo, VCI; and Patrick Vicencio, 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 [California Health & Safety Code Section 2270]. Areas covered by the program include:

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

---

## CHEMICAL CONTROL

### 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) Bromadiolone 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 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 IPM 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. Our 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.

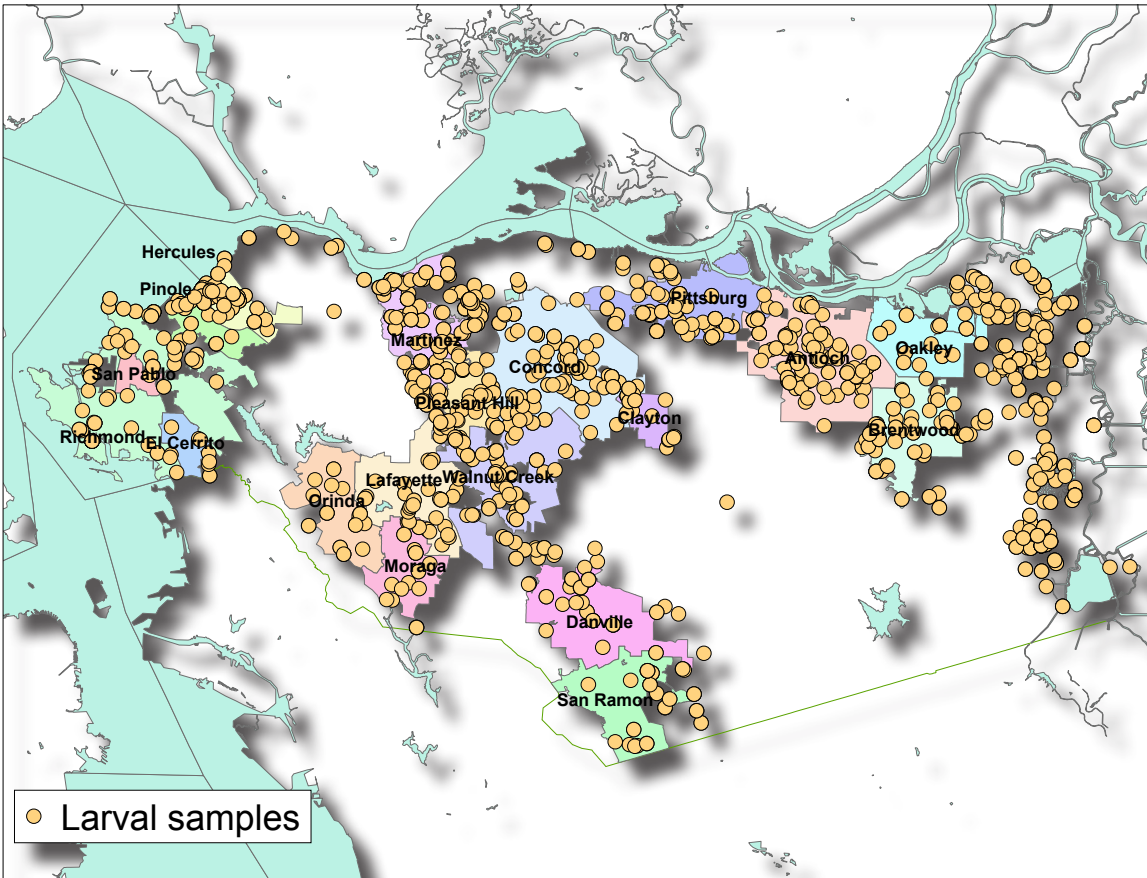
#### Larval Mosquito Surveillance

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 2011, our laboratory counted and identified 56,586 mosquito larvae and pupae.

Larval Samples By Species	
Cx tarsalis	27,476
Cs incidens	14,753
Cx pipiens	7,125
pupae*	2,489
Cs inornata	1,870
Ae washinoi	1,405
Ae sierrensis	388
Ae melanimon	358
Ae nigromaculis	252
Ae squamiger	125
Ae dorsalis	86
Cx erythrothorax	85
Cx stigmatosoma	83
Ae vexans	62
Cs particeps	10
An punctipennis	8
An franciscanus	5
Cx apicalis	4
An occidentalis	2
<b>TOTAL</b>	<b>56,586</b>
*pupae not identified to species	



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



2011 mosquito larval samples collected by the District

### Adult Mosquito Surveillance

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

**New Jersey light traps** use light from a 5-watt fluorescent bulb to attract night-flying mosquito species. The traps have light sensors which automatically turn them on at dusk and off at dawn, and are operated year-round at 25 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 lab for counting and species identification. Each week, current trap counts are compared with historical averages for different regions of the county to identify population trends that might require additional scrutiny.



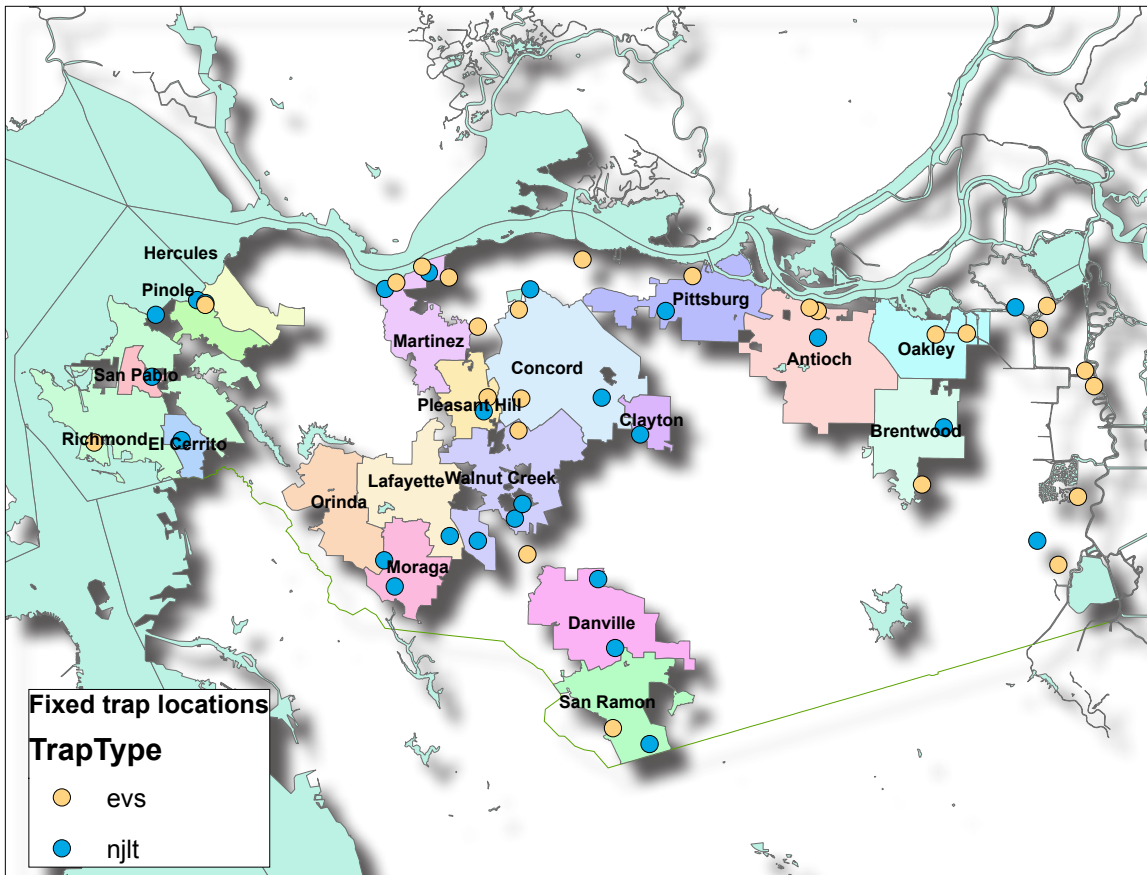
New Jersey Mosquito Light Trap



CO<sub>2</sub> 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 26 'fixed' locations throughout the county and as many as 12-30 variable locations which are chosen based on other surveillance information (dead bird reports, mosquito complaints, field observations by technicians, etc.). In addition to collecting both day and night flying mosquitoes, these traps also allow us to return the mosquitoes to our lab 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.

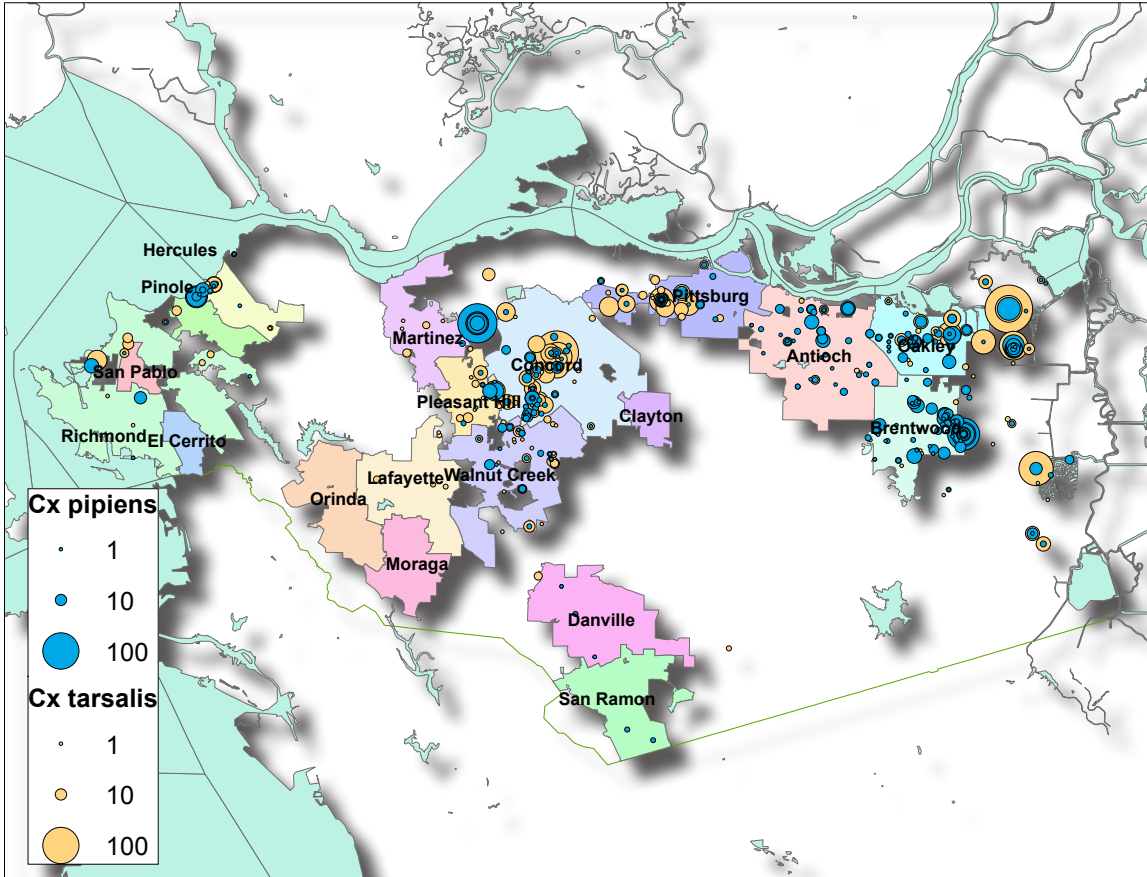


A carbon dioxide adult mosquito trap hangs in a tree.



**2011 FIXED ADULT MOSQUITO TRAP LOCATIONS**

Both carbon dioxide (CO<sub>2</sub>), 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.



### 2011 RANDOM ADULT MOSQUITO TRAP LOCATIONS

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

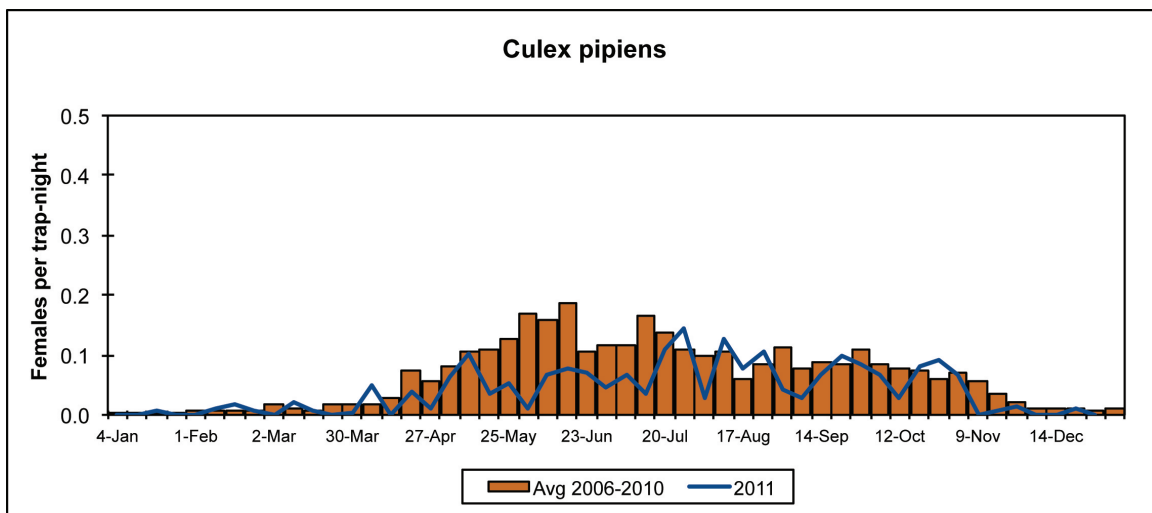
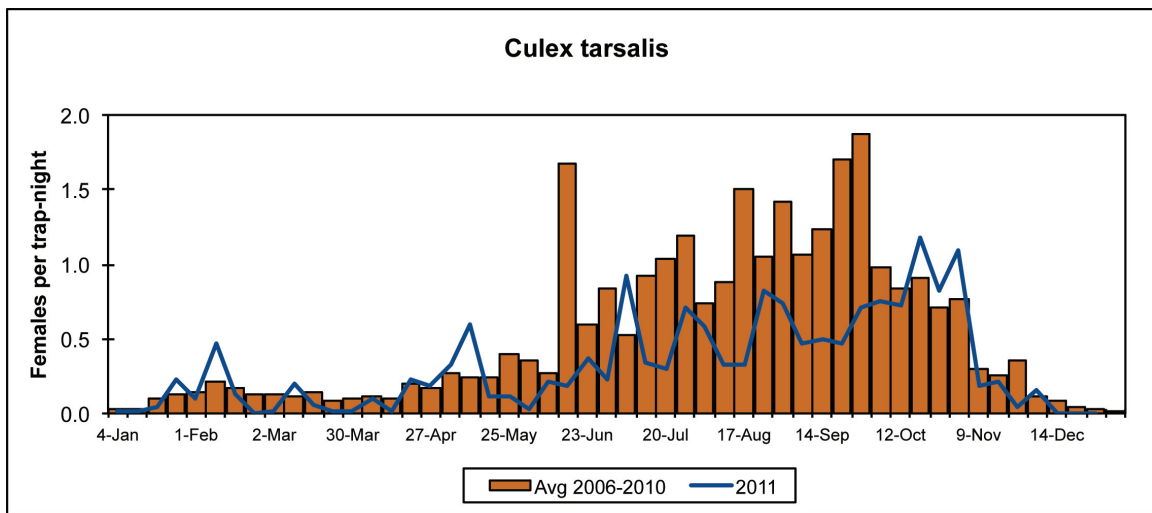
Although we are able to monitor abundance of most of the mosquito species present in Contra Costa County, two species—the Western Encephalitis Mosquito, *Culex tarsalis*, and the Northern house Mosquito, *Culex pipiens*,— are considered the most significant since they are the primary vectors of WNV and other encephalitis SLE viruses. Both species are widespread and abundant throughout the county. *Culex tarsalis* prefers clear water, and used to be more common in rural agricultural areas; however in recent years it has become the most abundant species in abandoned or unmaintained swimming pools in residential neighborhoods. This mosquito may fly as far as five miles or more from its larval habitat so a single ‘bad’ pool can affect a large area. *Culex pipiens* prefer water high in organic material and is most common in sewer plants, dairy farm ponds and underground storm drains. This mosquito usually doesn’t travel more than a few blocks from its larval ‘source’, but may be extremely widespread in

residential neighborhoods during the summer due to over watering of lawns and other urban water runoff that keeps the storm drains constantly wet.

Despite well above-average spring rainfall and a prolonged rainy season, county-wide populations of *Culex tarsalis* were below average for most of 2011 due to our second year in a row of below average summer temperatures. The seasonal peak did not occur until October in response to a brief late-season ‘heat wave’. Despite these overall below-average counts, investigation of a large number of WNV-infected birds in the Concord area led to the discovery of a variety of backyard, storm drain and industrial sites some producing unusually high numbers of adult *Culex tarsalis* for that part of the county.

*Culex pipiens* counts were similarly below average countywide throughout most of the mosquito season. A total of more than 41,000 adult mosquitoes were collected and identified in 2011.

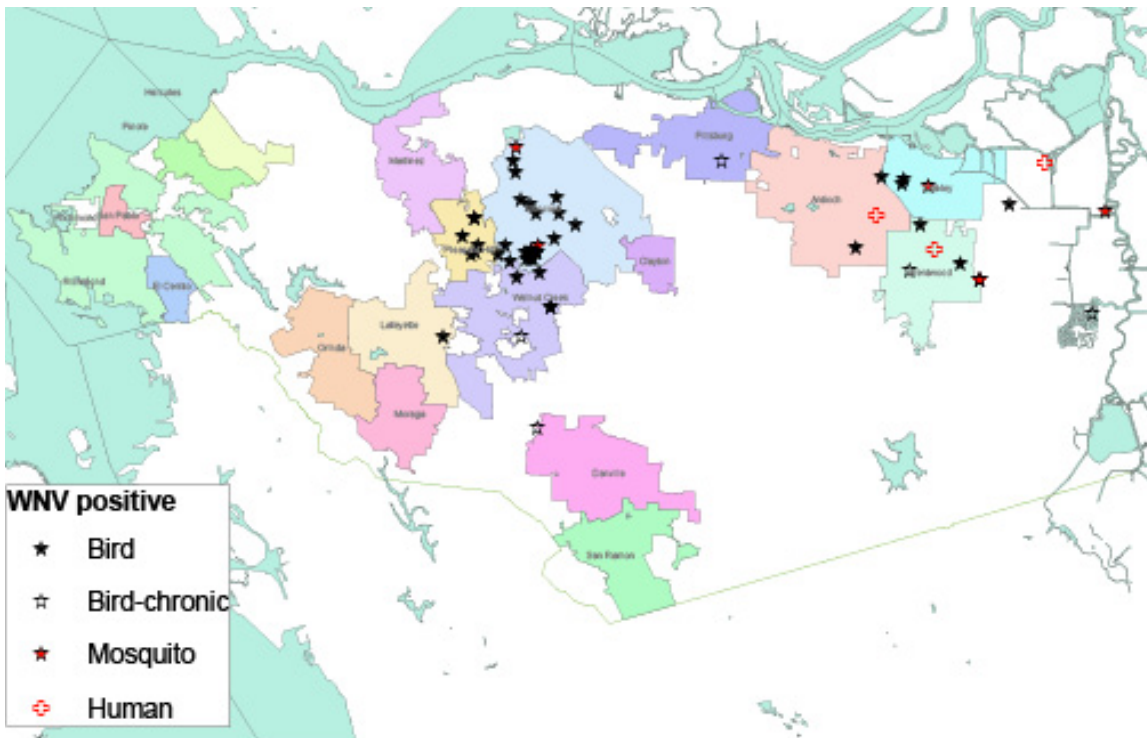
*Abundance of Vector Mosquito Species in Contra Costa County in 2011*



## Mosquito-Borne Disease

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 US in 1999, has been the most prominent mosquito-borne disease here in California since its arrival in 2004, with over 3,100 reported cases and 109 deaths (the actual number of cases is probably much higher since only patients with the most severe form of the illness tend to be tested and diagnosed). Serious outbreaks of WEE and SLE occurred in California as recently as the 1950s and 1960s, and could re-occur at any time. CCMVCD 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 occur 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.



2011 Positive West Nile Virus Activity in Contra Costa County



## 2005-2011 Summary of Encephalitis Virus Surveillance

		2005	2006	2007	2008	2009	2010	2011
Mosquito samples	Samples tested	425	523	721	729	814	536	484
	Total no. Mosquitoes	20,309	24,358	28,920	23,502	27,436	16,820	14,321
	WNV positive	4	20	28	31	17	4	7
Chickens	Blood samples tested	800	904	669	851	717	773	600
	Total no. chickens	50	50	50	50	50	50	50
	Seropositive	18	24	5	15	13	4	0
Dead Birds	Total reported	5,589	3,472	2,042	2,227	1,221	923	1,057
	Total tested	518	388	158	115	80	32*	74*
	WNV positive	94	92	29	88	45	8	43***
Dead squirrels	Total tested	45	41	29	39	19	0**	0**
	WNV positive	25	19	5	9	2	--	--

\*testing restricted to crows/jays only    \*\*squirrels not tested    \*\*\*includes five 'chronic' positive' birds

### 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 2011, 484 samples, comprising over 14,000 mosquitoes were tested; seven were positive for WNV (four *Culex pipiens*, three *Culex tarsalis*). Two of these samples (one *Culex tarsalis*, one *Culex pipiens*) came from areas in Concord where we saw an unusually high concentration of dead bird reports and WNV-positive dead birds. Investigation of these reports led to the discovery of a number of backyard, storm drain and industrial sources that were producing above-risk-threshold counts of these vector species. The remainder of the positive mosquito samples came from East County, including three samples of *Culex pipiens* collected from the same location, a water retention pond in Brentwood, between late August and October.

### 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 limited staff availability for bird pickups, testing in 2011 was again 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 2011, the WNV Hotline received 1,057 dead bird reports from Contra Costa County residents. Of those, 74 birds were suitable for testing and 43 tested positive, five of which were 'chronic positives', birds which were not currently infected, but showed evidence of past infections. In contrast with past seasons, the majority of positive birds came from Central County rather than East County, with a distinct focus in south Concord and adjacent areas of Walnut Creek and Pleasant Hill.

---

## 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 lab tests. This makes them ideal 'sentinels' for detection of virus transmission. The District maintains a total of 50 chickens (10 at each of five flock sites) within the county. New young chickens are obtained from a commercial chicken farm each spring to ensure that they have not been previously infected. Blood samples are collected twice a month from April through October and submitted to the California Department of Public Health's Viral and Rickettsial Disease Lab in Richmond to be tested for antibodies to WNV, WEE and SLE viruses. In 2011, none of our chickens 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.

## Human Disease Cases

Three human WNV cases were reported by the Contra Costa County Department of Public Health, all in east county. All three patients experienced the severe, neuroinvasive form of the disease, but fortunately were reported as 'recovering'. Since the Centers for Disease Control statistics show that neuroinvasive disease represents approximately one in 150 of WNV cases, it can be estimated that more than 400 county residents may have been infected in 2011. The vast majority of milder cases go untested and unreported since they may be asymptomatic (no symptoms) or mistaken for the 'flu'. Statewide, more than 150 human cases (eight fatal) were reported.

## Equine Disease Cases

No equine (horse) cases were reported in our county in 2011. Statewide, 15 equine cases were reported. Without vaccination, more than half of the horses infected with West Nile virus die.

## *Research & Special Projects*

The District laboratory participated in a nationwide study sponsored by the Centers for Disease Control to determine the accuracy and consistency of the RAMP rapid WNV test kit, and make recommendations for improvements if necessary. A series of mosquito samples containing known amounts of virus were sent to local agencies around the country to be subjected to RAMP testing, and the samples were then subsequently sent to the respective University or State laboratories for PCR confirmation of the results. RAMP consistently detected WNV at infectious levels, but, as expected, not at lower levels, and results were quite consistent among the different laboratories. Results of PCR confirmations of RAMP-tested samples were less consistent, and it became apparent that some of the reagents (chemicals) used in RAMP interfere with the ability for PCR to detect virus. Since RAMP is quite accurate at detecting higher virus levels, it was suggested that if the threshold for positive results was raised, PCR confirmation would be unnecessary. Samples testing below the threshold would simply be considered negative, and those testing above would almost certainly be 'true positives'.

---

## Mosquito Control Operations

### Central County Becomes West Nile Virus Hot Spot for First Time

Since the arrival of West Nile virus (WNV) into Contra Costa County in 2005, the eastern part of the county has consistently been the center of the WNV activity. But in 2011, the central area of the county became the main focus of WNV activity. Specifically, the cities of Concord and Pleasant Hill experienced 31 of the year's 43 WNV-positive birds and two of the seven samples of mosquitoes that also tested positive for WNV. The prevalence of WNV in such a densely populated area presented many challenges for Contra Costa Mosquito & Vector Control District personnel.

Due to the county's continued reduction in property tax revenue, the District received a smaller financial contribution for operations. This meant the District focused on improved efficiency while prioritizing the unusual situation in the Concord/Pleasant Hill area and still maintaining surveillance and treatment operations in the rest of the county. Success on both fronts required strategic planning.

The plan for Concord and Pleasant Hill focused on both underground and above-ground mosquito sources, because the District's state-certified inspectors found two species of mosquitoes capable of transmitting WNV in the area. *Culex tarsalis* prefer laying eggs in above-ground sources including containers and *Culex pipiens* prefer to lay their eggs underground, including the catch basins below street gutters. Both species will also lay eggs in neglected swimming pools and other artificial containers.

Two-thirds or 10 of the District's 17 state-certified inspectors and technicians blanketed the area, going door to door, trapping for mosquitoes and inspecting potential mosquito sources. They concentrated on treating the underground catch basins with long term larvicidal briquettes designed to slowly release a naturally occurring bacteria toxin lethal to mosquito larvae, as well as a larvicidal mist aimed at older larvae.

District inspectors targeted neglected swimming pools and worked with Realtors®, encouraging them to report neglected swimming pools and other mosquito sources. District employees also worked closely with code enforcement officers and public works employees. The partnership the District forged with neighbors was very important as they identified previously unknown mosquito sources. Engaging the public's assistance proved extremely valuable as citizens worked together to notify the District of sources, while spreading the word among homeowners of the need to dump or drain areas of standing water to avoid mosquito production.

### Communication Leads to Mutually Beneficial Mosquito Reduction

While the District worked strategically to address the mosquito situation in Concord and Pleasant Hill, communication was the foundation of the strategy to address mosquito issues elsewhere in the county. In addition to conducting surveillance and inspections across the county, the District also identified specific problem areas. After analyzing each situation, the District embarked on a long-term process to work with other agencies, organizations, and businesses to minimize mosquito habitat and encourage each entity to adhere to best management practices that allow for effective mosquito control.

In 2011, this process officially started when District representatives held a series of meetings with representatives of the agencies and organizations involved including government agencies, special districts, manufacturing plants and refineries, land managers and developers. The District experienced interagency progress while working with eight particular groups across the county.

In one example, the District worked with the California Department of Water Resources (DWR) to ensure mosquitoes would not be a by-product of the DWR's effort to reclaim 1,200 acres of pasture land for wetlands in an area of eastern Contra Costa County known as Dutch Slough. The District studied the targeted area and presented DWR with recommendations to reduce mosquito habitats prior to beginning construction. The DWR responded positively to the District's report; however, until the start of the construction project, the DWR is leasing the acreage to private land users. The District received a commitment from the DWR that it will monitor the private ranchers' irrigation practices to ensure a reduction in mosquito production during the interim.

In another example of the cooperative agreements the District forged in 2011, the lessee of a 300 acre parcel of land that had been a large source of mosquitoes due to over-irrigation that produced large amounts of standing water has agreed to work with the District to plan and improve infrastructure prior to irrigation. This change is designed to control irrigation to specific areas, thus greatly reducing the number of mosquitoes produced on this property. The tenant has also agreed to perform drainage improvements to the property to further reduce mosquito production.

---

## The Persistent Public Health Risk of Neglected Swimming Pools

Thousands of unmaintained swimming pools across the county associated with the nationwide housing crisis continue to be a major focus of the Contra Costa Mosquito & Vector Control District because of their ability to produce mosquitoes capable of spreading disease including West Nile virus. Just one swimming pool can produce more than 1 million mosquitoes and affect people up to five miles away.

During the first three years of this phenomenon, the District hired seasonal personnel to assist in the inspections and treatments of neglected swimming pools and spas. However, during the last two years the District's revenue decreased due to the sharp decline in property tax funding because of the housing market collapse. Thus, the District reduced seasonal hires.

This year, the District's state-certified inspectors and technicians have shared the responsibility for inspection and treatment of the popular water features. In 2011, District employees responded to 607 initial requests to provide service to neglected swimming pools and spas, almost identical to the 611 requests for service in 2010, suggesting the problem is neither growing nor waning.



*Vector Control Inspector Jeremy Tamargo treats a neglected swimming pool for mosquitoes. One neglected swimming pool can produce more than 1 million mosquitoes and affect people up to five miles away.*

Among the District employees assisting in the inspections of potential mosquito-producing swimming pools and spas were members of the District's vertebrate program. These employees provide inspections and services for rats, mice, and skunks, yet, in light of the lack of seasonal personnel in the last two years, the vertebrate members have stepped forward to assist in swimming pool treatments. In 2011, they responded to requests for service at 20 neglected swimming pools compared to 252 in 2010. The reason for the decrease in the number of swimming pools and spas inspected and or treated for mosquitoes by members of the vertebrate program is due to adjustments made by the mosquito program for handling swimming pools and spas within their own program. Additional assistance by the vertebrate technicians were therefore not needed to the extent they had in 2010.

With all of the current attention on neglected swimming pools as potential mosquito sources, it is hard to believe there was a time when the District did not need to treat them. 2011 marks the fifth year neglected swimming pools have been a major focus of mosquito operations in addition to other sources of mosquitoes in Contra Costa County.

## Residential Services

Across Contra Costa County, the 1,213 requests for mosquito services in 2011 kept pace with the 1,212 requests made by members of the public in 2009 and the 1,232 requests in 2010. The services provided on most residential properties can consist of identification of a mosquito sample provided by the resident, an exterior inspection of the property for potential mosquito sources, and recommendations on how to alleviate a current mosquito problem and prevent future mosquito problems from occurring.

The most effective form of prevention is to avoid having standing water on a property where mosquitoes can lay new eggs. A female mosquito is capable of laying up to 400 eggs in just a couple of tablespoons of still water. In warm weather the eggs quickly develop into mosquito larvae, followed by adult mosquitoes capable of transmitting disease. This is why the majority of the District's efforts to prevent mosquitoes focus on the larval mosquitoes because it is crucial to prevent them from becoming adults. The District's aggressive campaign against mosquito larvae minimizes the need to use adulticides.



---

## Ultra Low Volume Fogging for Adult Mosquitoes

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. In cases where the larval approach is not sufficient to reduce the risk of WNV, the Contra Costa Mosquito & Vector Control District uses public health pesticides when necessary to prevent human illness or to suppress a heavy nuisance infestation of mosquitoes. All public health pesticides used by the District are registered with the Environmental Protection Agency for use in mosquito control. Ultra low volume fogging for adult mosquitoes is generally concentrated in areas most at risk for disease occurrence and is conducted by certified and licensed applicators.

In 2011, the District used ultra low volume fog for adult mosquitoes seven times using truck-mounted ultra-low-volume sprayers. This is a slight increase over the four times the District fogged in 2010, but far less than the 20 times the District fogged in 2009. Two of the spray events in 2011 were attributed to the WNV presence in the Concord/Pleasant Hill Area while four of the spray events were in or adjacent to the areas where the District took an active role in working with specific groups to reduce mosquito production. Working with the agencies and organizations is an important step that not only reduces the number of mosquitoes, but could also result in a reduced need to fog for adult mosquitoes in the future.

## Looking to the Future

Due to a warmer, dryer transition from fall to winter in 2011, the mosquito season persisted later than past years. While District employees worked diligently to squelch the mosquito issues in Concord and Pleasant Hill, District employees are prepared to return to the highly populated area in 2012 if mosquitoes continue to be a problem in the area. Should that area be another West Nile virus "hot spot", the District plans to develop a comprehensive procedure for mitigating mosquito habitats and work with citizens in the vicinity to gain cooperation. Part of that plan will include pre-mosquito season activities designed to reduce mosquito sources prior to warmer weather when mosquito populations can flourish.

Mosquito mitigation on areas of large acreage will remain a priority in 2012, so the District looks forward to further cooperation with other agencies and businesses involved in managing potential sources of mosquitoes.

## Mosquito Zones

The Contra Costa Mosquito & Vector Control District conducts mosquito surveillance across the county's more than 700 square miles. To provide the most efficient and valuable services to meet the specific needs of the citizens, businesses, and vast

agricultural areas alike, the District divides the county into two mosquito programs: Inland Mosquito Program and Waterfront Mosquito Program. These two programs are then divided into geographic zones with specific inspectors or technicians assigned to each zone. The inspectors and technicians are responsible for providing public health services to their assigned zones. In 2011, supervisors conducted zone re-alignment on a limited scale, thus some zones changed in size as some inspectors and technicians gained responsibility for increased geographic areas.

## Waterfront Zones

The waterfront zones focus primarily on the coastal areas of Contra Costa County. The region includes both agricultural and residential areas, but the terrain is largely pastoral. Five inspectors and technicians are responsible for protecting public health in these zones. The all terrain vehicle known as an ARGO is a staple piece of equipment used to conduct service in locations including marshlands and flooded pastures. Members of the waterfront zones often take the lead in the District's annual ARGO training to ensure all technicians and inspectors are prepared to use one, should the need arise. For some District employees who do not belong to one of the mosquito programs, this is an example of cross-training which ensures District employees are prepared to protect public health regardless of the employee's primary vector responsibilities.

In addition to the agricultural areas in the waterfront zones, there are also a number of industrial facilities including oil refineries and power plants. District employees work directly with the appropriate supervisors at these facilities to reduce potential mosquito habitats and treat known sources to suppress mosquito production. In 2011, District employees worked successfully with representatives from Chevron, Tesoro, and Shell Refineries, Pacific Gas & Electric and GenOn power plants, Rhodia chemical plant, as well as waste water treatment plants in Richmond and Concord.

In areas farthest to the east in Contra Costa County, small island communities exist that are home to residents, farmers and duck clubs alike. District technicians and inspectors worked closely in 2011 with residents, city employees and representatives of the duck clubs to mitigate mosquito issues. In agricultural areas and duck club locations, mosquito production was reduced by encouraging land owners to work with the District prior to flooding or irrigation. With advance notice, District technicians and inspectors could pre-treat the areas to prevent mosquito production by using biological pesticides not harmful to wildlife or people, but intolerable to mosquitoes. In residential areas, District employees also worked with city representatives to encourage development when possible, adjustments when necessary to infrastructure to prevent mosquito production in areas with poor drainage. These areas, particularly those with underground storm drains can produce mosquitoes when water pools instead of

drains. The mosquitoes that prefer these underground locations are one of the two principal species that can transmit West Nile virus in Contra Costa County.

Ultimately, District employees must take a multi-faceted approach to mosquito prevention in the waterfront zones due to the diversity of industry, agriculture, and residential communities. It is a daily challenge to locate potential mosquito sources in these zones, but it is a challenge the technicians and inspectors accept enthusiastically as they strive to safeguard the health of citizens who live and work in the coastal communities of Contra Costa County.



*Vector Control Inspector Danielle Wisniewski maneuvers an all-terrain vehicle while applying products to kill immature mosquitoes in Contra Costa County.*

## Inland Zones

The area that the Contra Costa Mosquito & Vector Control District has designated as inland mosquito zones includes natural wetlands and low level areas that tend to flood with heavy rain or high tide in the west, as well as commercial businesses, numerous mitigation ponds, public parks, and densely populated residential locations throughout the county. Because of the large number of private residences, potential mosquito sources can be endless. Unknown backyard sources are the number one source of mosquitoes in residential areas. For the fifth year in a row, chief among the backyard mosquito habitats in 2011, were neglected swimming pools and spas associated with distressed or foreclosed properties. The large number of potential sources in the region created a number of challenges for the five inspectors and technicians assigned to the inland zones.

The primary area of concern among the inland zones was in the central part of the county in 2011; specifically areas of Concord, Walnut Creek, and Pleasant Hill. The majority of the birds and 29 percent of the mosquitoes that tested positive for West Nile virus in the county were from the vicinity. This created numerous challenges for the technicians and inspectors responsible for the zones in this area and resulted in a District-wide approach to tackling the problem. District employees from different zones worked together to inspect neglected swimming pools as well as other backyard sources, and worked with citizens and local officials to identify potential infrastructure issues that may have contributed to the increased propensity for WNV. Due to the WNV activity in 2011, the District will keep close tabs on the area again in 2012.

In addition to the mosquito issues in central Contra Costa County, mosquito production in neglected swimming pools, various ponds and other water features could be seen county-wide in 2011. In many cases, that provided District employees with opportunities to use mosquitofish to combat mosquitoes naturally. Since 2010, district employees assigned to the inland zones have worked closely with the District's fish biologist to assess the effectiveness of potential mosquito-eating fish that are native to California. Currently the popular mosquitofish, *Gambusia affinis*, is used world-wide, but is not native to California. In 2011, District employees stocked 950 California roach fish in 19 neglected swimming pools in both central and eastern Contra Costa County for observation and assessment.

If these fish do prove to be an efficient and appropriate natural mosquito predator, they will be a particularly useful tool in the eastern portion of the county, as it traditionally tends to offer a warmer climate that allows mosquitoes to thrive. In 2011, 24 percent of the birds and five of the year's seven mosquito samples that tested positive for WNV were from the eastern region. In response, the zone inspectors and technicians in the area focused on potential mosquito sources involving neglected swimming pools, mitigation ponds, golf courses, and catch basins below street gutters. District employees used a diverse approach to getting to the heart of the mosquito issues. Focusing on multiple potential sources using various natural and chemical methods of mosquito control is a hallmark of the integrated vector management the District has practiced for more than 40 years, in both the inland and waterfront zones of Contra Costa County.

---

## *Rats & Mice*

### Rat & Mouse Inspections

The Contra Costa Mosquito & Vector Control District provides free inspections and advice to county residents and business owners for rat and mouse issues because these rodents can contaminate food sources and spread disease, posing a threat to public health. The District also provides rat services to communities by working to suppress rats in sewer systems, commercial regions, and waterfront areas where rats can be found.

County citizens and business owners who suspect a rat or mouse problem may exist on their property can contact the District for a free inspection. The District's four state-certified inspectors who specialize in rat and mouse prevention respond to each request for service by doing a visual inspection of the exterior of a structure to look for signs of rat or mouse existence or entry. The District employee will also observe the vegetation, landscape and any items placed outdoors. Many times people do not realize the pet food left outside or the ivy in the yard will actually attract rats and mice.

If signs of entry are present or the resident or business owner has found evidence of rat or mouse activity indoors, the District employee will conduct an interior inspection most often limiting that inspection to areas surrounding sinks and hot water heaters in a garage or kitchen. At the conclusion of the inspection, the District employee will provide the citizen with written documentation and advice on how to get rid of the rats or mice and preventative measures to dissuade them from returning in the future.

In 2011, the District received 804 requests for rodent inspections compared to 741 requests in 2010. The rainy season that stretched well into the year likely played a role in the increase of rat and mouse activity in 2011. The rain produced more grass seed that served as food for the rats and mice. District technicians report that with plenty of food, the population grew until it consumed the available food and then moved into the neighborhoods.

Specifically, the cities of Antioch, Concord, Pittsburg, and Walnut Creek experienced the greatest increases in rodent activity. Pittsburg had the biggest boost with requests for service increasing by 147 percent compared to 2010.

### Sewer Baiting

For centuries, history teaches us that rats have liked the darkness and dampness provided by sewer lines. They provide ample food from garbage disposals as well as good shelter. These facts make efforts to suppress rat activity in Contra Costa County sewers a priority.

During a typical sewer inspection, 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, reinstalling the manhole cover when the action is complete. Long streets can have numerous sewer access points, so the process can be tedious and quite time consuming.

In 2011, the District's vector control employees inspected 74% more sewer lines in 17 cities compared to those inspected in 15 cities in 2010. One reason for the increase was the fact the inspectors who specialize in providing services for rats and mice had more time to focus on their specific vectors.

### Inter-Program Assistance

In 2010, the District did not hire additional seasonal workers to inspect and treat the abundance of neglected swimming pools that can produce more than 1 million mosquitoes capable of putting people up to five miles away at risk of mosquito-borne illness. As a result, vector control inspectors and technicians from the vertebrate program assisted in providing mosquito services to the swimming pools in 2010. But in 2011, District employees in the mosquito program were able to reorganize and prioritize responsibilities in such a way that they were able to respond to the large quantity of swimming pools and spas with very little assistance. Consequently, vertebrate program assistance with swimming pools dropped by 92 percent in 2011, allowing for more time to respond to rat and mouse issues.

Some of the time the vertebrate program regained however, had to be used to assist in yet another program. Rat and mouse inspectors assisted with yellowjacket inspections and treatments in both 2010 and 2011. In 2011, the number of times these employees provided yellowjacket service increased by 64 percent compared to 2010.

In both cases, the fact that the inspectors who primarily work with rats and mice, could also assist with mosquito and yellowjacket inspections is testament to the importance of the District's emphasis on cross-training. Each state-certified inspector and technician receives training on vectors outside of that employee's specialty, thus ensuring the District's mission to protect public health from the county's insects and animals that can cause discomfort or transmit disease is never diminished due to available staffing.



## 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 monitored the risk of Lyme disease by collecting and testing black-legged ticks from several locations in the county for more than 15 years. On average, only one or two in a hundred black-legged ticks test positive, although we have found a few locations where the rate is higher, and these tend to change over time. In 2011, ticks were collected from two locations, but not tested due to insufficient numbers collected.



Vector Ecologist Eric Ghilarducci collects ticks for Lyme disease testing by dragging a cloth flag through the grass

District staff continue to identify ticks brought in by members of the public; however, in 2010, the District discontinued Lyme disease testing on these 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.

### Ticks of Contra Costa County

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

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

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

### Protect Yourself from Tick Bites

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

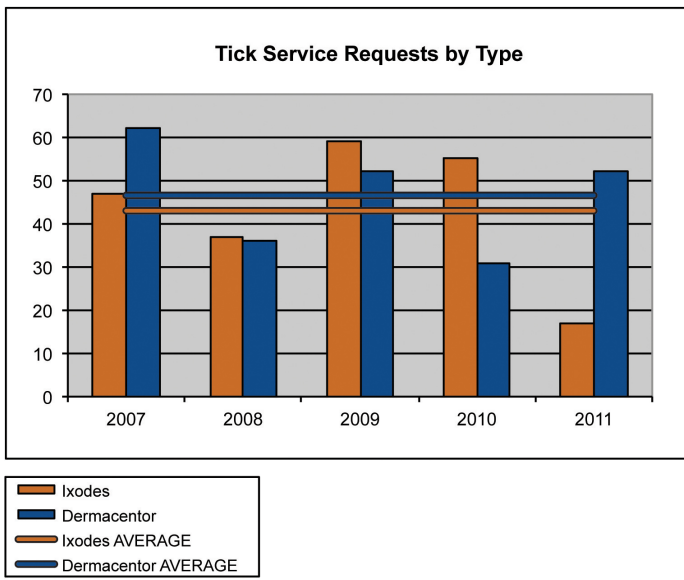
Use a repellent with DEET (on skin or clothing) or permethrin (on clothing and gear). Products containing permethrin can be used to treat boots, clothing and camping gear, which can remain protective through several washings. Repellents containing 20 percent or more DEET (N, N-diethyl-m-toluamide) can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

## Perform Daily Tick Checks

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

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

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



## What to Do If You Are Bitten by a Tick

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

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

## Prevent Ticks on Animals

Prevent family pets from bringing ticks into the home. Maintain your family pet under a veterinarian's care. Two of the ways to get rid of ticks on dogs and cats are putting on tick medicine or using a tick collar. Be sure to use these products according to the package instructions.



*The Western black-legged tick is one of three species of ticks in Contra Costa County and the only one of them known to transmit Lyme disease.*

---

## *Skunks and Rabies Risk Reduction*

Contra Costa County is home to two species of skunks: the Spotted Skunk (*Spilogale putorius*) and Striped Skunk (*Mephitis mephitis*), however, the striped version is the primary skunk that can be found in the county. In California, skunks are the mammal with the highest rate of rabies infections. The Contra Costa Mosquito & Vector Control District provides free inspections and advice to reduce the risk of rabies by skunks.

The District has two vertebrate control inspectors with a total of nearly 20 years of experience who provide the majority of the skunk services to county residents. In 2011, the District received 642 requests for free services, reduced from 741 requests in 2010. The cities of Walnut Creek and Concord had the largest number of requests with 103 and 72, respectively. But, Walnut Creek and Pleasant Hill also experienced the largest decreases in requests for service compared to 2010, while Orinda, El Cerrito, Pittsburg, and San Ramon recorded noticeable increases. The overall decreases are the result of a combination of factors.

Mother Nature plays the biggest role in the skunk population each year, but there is rarely rhyme or reason for the trends. For example, with equally hot temperatures, one year will produce more skunks and the other year will produce fewer. The most important way to impact the number of skunks that come into contact with people is to encourage residents to take the necessary steps to prevent skunks on their property in the first place. Removing food and shelter options is fundamental.

Key to removing food opportunities is to avoid storing water and pet food outdoors, pick up fallen fruit, and keep tight-fitting lids on garbage cans. Skunks will make shelter out of wood piles, as well as the space under a raised deck, home or shed. Limit skunk access by filling holes that are larger than four inches or larger along the foundation because this could provide entry into a home or shed. Use hardware cloth screen that is buried into the ground to cover the space below a raised deck or building and keep wood piles elevated off the ground to reduce the risk of skunks.

In the vast majority of cases, the District's state-certified inspectors report skunk problems were prevalent in 2011 at residential locations that backed up to open spaces and where attractants like pet food and fallen fruit had not been properly removed. District inspectors worked with each resident to educate the citizen about proper prevention. They also inspected each area to learn if a skunk or multiple skunks were living on the property. Where skunks had created a den, most often, the District inspector loaned the resident a live-catch trap and provided instruction on proper usage. Once a skunk was caught in the trap, the District employee returned to remove the skunk. By law and due to the risk of rabies, all skunks that are caught may not be relocated. The District humanely euthanizes the skunks.

In 2012, the focus will be on educating homeowners to take the steps necessary to prevent the skunks and dissuade them from establishing a habitat on private property. As the District continues to pursue the 85-year old mission of protecting public health, the best approach remains to prevent the vectors that provide the risk of disease. It's an appropriate approach for skunks, as well as the other five vectors for which the District provides service.



*A skunk casually walks through a homeowner's yard.*



## Yellowjackets

Yellowjackets pose a threat to public health through their habit of repeatedly stinging and biting anyone who threatens their home or well-being. This characteristic sets the yellowjacket apart from its cousin the bee. The yellowjacket's stings and bites are notorious for being more painful than those of a bee and due to a yellowjacket's multiple attempts to induce pain, the assault can be dangerous for someone allergic to the aggressive insect. This threat to public health makes the arthropod a vector for which the Contra Costa Mosquito & Vector Control District provides free service.

There are four species of yellowjackets in Contra Costa County. Two species build their nests above ground, while the other two, 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.

In 2011, yellowjackets conducted their usual behavior threatening outdoor enthusiasts, while District inspectors and technicians also observed yellowjacket behavior that appeared to differ from the norm. Typically, ground-nesting yellowjackets and the two species in Contra Costa County that prefer to make nests above ground will create homes in opposite locations. In 2011, however, District employees found both above and underground yellowjackets within close proximity. Ground-nesting yellowjackets were actually building nests above ground in shrubs or masonry. Vector control inspectors do not normally observe behavior like this, but yellowjacket behavior can differ from year to year.

When homeowners or members of the public contact the District for a free yellowjacket inspection, most often District inspectors or technicians will locate one, possibly two nests per property. In 2011, it was not uncommon for District employees to find three or four nests on one property. In fact, one particular property in Walnut Creek was home to eight nests. While multiple nests are not unusual on large acreage, in this case, the nests were found in the front and back yards of one private home.

The increased number of nests per property was not an anomaly in 2011. The total number of requests for yellowjacket service made by Contra Costa County residents increased by 53 percent compared to 2010. It is theorized that 2011's late rains created more vegetation that served as food for the insects. More food allowed the population to grow respectively. The same rain may have forced the insects from their underground home to locations above ground.



*Vector Control Aide Heidi Budge treats ground-nesting yellowjackets.*

To respond to the increased number of yellowjacket service requests, the District hired one vector control aide to respond to the requests. The demand for service was very high so District employees from the mosquito and vertebrate programs also responded to calls for yellowjacket service that continued right through the end of the year. In fact, one service call was completed in December. District employees do not recall a time when they had to provide service for yellowjackets in December.

---

## *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 2011, the District received 23 calls about honey bees compared to 29 calls in 2010. Most calls are due to the presence of a honey bee swarm passing through or resting in a neighborhood. These swarms are generally not a threat as the bees are simply in search of a new hive location, but they can look rather alarming and may sting, but only if provoked.

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

Since Africanized honey bees have not colonized in Contra Costa County to date, the District advises homeowners who observe a swarm in their neighborhood to 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.



[www.DesertUSA.com](http://www.DesertUSA.com)

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



## Fisheries

The District distributed 100,455 mosquitofish (*Gambusia affinis*) in Contra Costa County. District personnel placed 76,835 (25,270 in unmaintained swimming pools), while 23,620 were distributed to residents. The District produced approximately 984,000 in 2011.

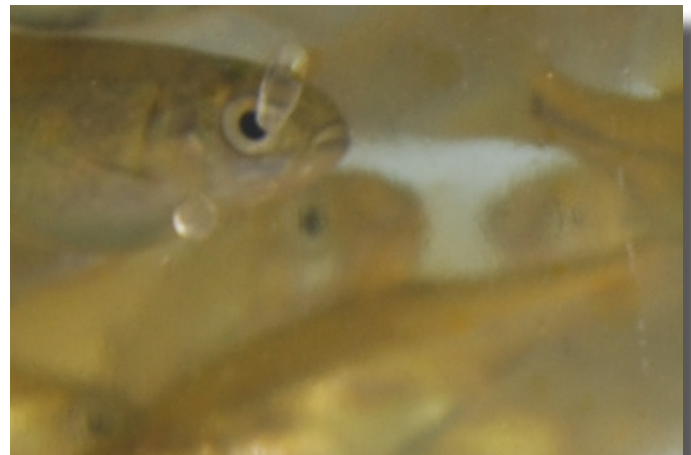
The District has continued to aquarium spawn California Roach fish (*Lavinia symmetricus*) in efforts to evaluate a native fish species for use in mosquito control and to add an additional weapon to our arsenal of biocontrol agents. A 208 liter aquarium was set-up, with filtration, 16 adult California roach fish (approximately five years of age-collected in December 2008) and an egg trap. As this species needs flowing water to spawn, a current was provided by the outflow of the filter. The egg trap was placed below the filter out flow at a depth of 40 centimeters. Spawning was delayed over a month in 2011 due to cooler spring temperatures (2010 spawning started April 8th). Fish began spawning May 24th and continued through July 18th. They produced 14 batches of eggs for a total number of 7,359 roach larvae. All larvae were stocked in a 7,500 liter grow-out tank.

To evaluate their effectiveness in controlling mosquito larvae, 19 non-maintained swimming pools were stocked with between 40 and 100 roach (with different age classes). Pools were stocked from April through November. On several occasions, roach were observed eating mosquito larvae just after release. During the monitoring period, five pools were cleaned and chlorinated and roach were eliminated. In the 14 remaining pools, roach controlled mosquito larvae and no larvae were observed. There was some mosquito production observed in two hot tubs (part of a pool system) that did occur with roach present. We added additional roach and control was reached. As this species is a "schooling" fish, we hypothesize that there may be a minimum "schooling number" that needs to be stocked in order to form a school and feed naturally. District employees will continue to monitor pools stocked with roach.

In November 2011, the District stocked 2,000 California roach in a wetland pond on Holland Tract. This was done in order to evaluate their diet in this type of habitat. In 2012, staff will trap and sample the population and conduct gut content analysis to determine what portion of their diet consists of mosquito larvae.



*California roach fish are acclimated to water temperature in the Holland Tract Wetlands. Scientists conducted the study to learn if California roach fish are effective for mosquito control. The study concludes in 2012.*



*California roach fish at 90-days old in an oxygen-infused bag and ready for stocking and mosquito control.*

## Public Affairs & Community Outreach

Every year, the Contra Costa Mosquito & Vector Control District strives to reach and educate every one of the county's 1,052,827 residents across 735 miles. Reaching everyone is crucial to ensuring a healthy community because everyone has a role in reducing their risk of vector borne diseases such as West Nile virus. Working individually and collectively garner healthy rewards. For example, just one residential neglected swimming pool can produce more than 1 million mosquitoes and affect people up to five miles away. Neglected swimming pools are notorious for harboring two of the types of mosquitoes capable of transmitting West Nile virus and other diseases. The District urges residents to report neglected swimming pools and other mosquito sources and accepts anonymous calls.

### Multifaceted Communications

The District provides important health information in a multifaceted approach. One tried-and-true communication vehicle the District used again in 2011 was a flier inserted into the Penny Saver publication. That design also served as a cover piece on the Penny Saver in some areas. All arrived in residents' mailboxes. Two separate pieces were mailed to every household in Contra Costa County in the summer months with important mosquito and West Nile virus information as well as a list of services. This communication piece, one of the District's most popular and successful outreach efforts, is two sided with information in English on one side and Spanish on the other. This same insert also serves as a flier to hand out to the residents at fairs and events, resulting in a keeper piece at a fraction of ordinary costs.

### Outreach

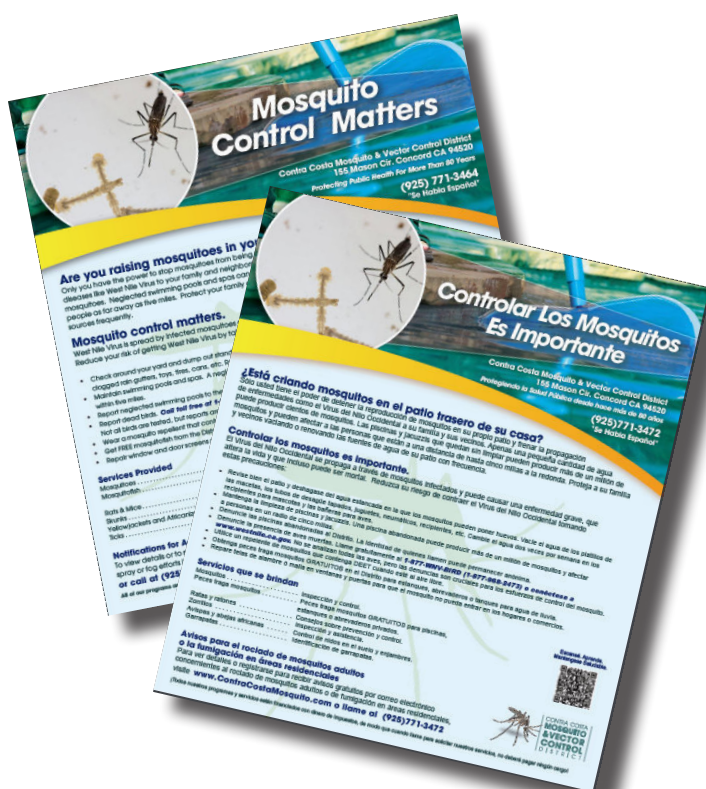
Outreach to constituents include presentations to a variety of groups and audiences, library displays, and informational booths at fairs and events. Farmer's markets proved once again an important venue and is now a mainstay of District outreach.

Contributing timely articles for publication in community publications has proven quite successful. Quarterly articles written by District staff appeared in 43 community publications with a total circulation of 107,450 residents. Strategies such as this, communicating in a global manner, allow the District to reach a greater audience with important vector information more efficiently than some in-person group presentations.

Other tactics included listings inside the Penny Saver publication or various services, advertisements in the Contra Costa Times, at BART stations, and on and inside transit buses.

### Videos

Videos proved quite valuable as research predicted. Viewers watched **District videos** more than 40,000 times in 2011 on the website and on the District's YouTube.com channel. The new **Mosquito Control Matters** video was a highlight, not only as part of a local campaign, but statewide as well. The District created the video to be used by all mosquito control districts in California, personalized with each district's logo and contact information. Collective outreach to advocate mosquito control benefits all Californians. The video garnered the **District two Silver Award of Distinction awards** from the 2011 Communicator Awards competition.



West Nile virus, mosquito and services offered information is mailed to every resident in Contra Costa County twice throughout mosquito season.



## Media

Media is a crucial component of the public affairs department as it helps the District reach the greatest amount of people free of charge. In addition to news stories, reporters and the public alike opt into three available communication pieces: **media releases**, **adult spray notifications**, and the **Mosquito Bytes** newsletter. The District is well connected with and rely on the media to share information and breaking news. In 2011, 15 television broadcasts and news website posts were published - a 15 percent increase from 2010. Newspaper, magazine and their subsequent website posts increased a whopping 148 percent from 2010 to nearly 100 stories published. Interestingly, stories produced by the District often receive national coverage.

News stories were broadcast on radio stations and their websites four times in 2010. Assorted website and blogs published District stories 41 times, down two percent from 2010. Blogs such as Claycord.com and Romick in Oakley post stories consistently, reaching residents on a more local level. They are becoming increasingly important venues for disseminating important news and tips.

## Social Media

Social media is the new kid on the block. Its popularity has secured it to be a key component of the District's communication strategy. In 2011, District followers on Twitter.com increased by 86 percent to nearly 300. Communication emphasis is placed on the quality and ability to educate residents and not on the number of people who follow District posts. Exponential reach can be achieved through the amount of people following our followers, which increased by 108 percent in 2011 to nearly 221,000. District Twitter followers include most media outlets and individual reporters as well. It's clear that efforts to communicate via Twitter are essential to successful outreach.

## Quick Response Codes

Quick response codes or QR codes were added to all published materials, including the BART advertisements. QR codes allow those people with a smart phone to simply take a picture of the code with any free QR reader application for the phone and it takes the person to the exact website page designated. This technology is very popular and can be seen on a great number of consumer products, from artichoke tags to outdoor displays. Evaluation of this new technology will be forthcoming in 2012.

Much emphasis is placed on the District's award-winning website which is by far the most popular communication method the District produces. The website is updated daily if needed, often with suggestions from our residents. For example, a resident from Concord requested an interactive map to better illustrate the

location of West Nile virus activity. This addition enhanced the written locations the District supplied in the past, making it very easy for residents to learn exactly where the activity is occurring with a quick glance. Feedback and comments from Contra Costa County constituents are immensely important to the District and requested often.

## Mosquito Bytes Newsletter

The Mosquito Bytes newsletter garnered the District a 2011 All Star Award from Constant Contact, the distribution vehicle for the online newsletter. Noted were high open rates, high click through rates and low bounce rates. The District adheres to a strict no spam policy and only those people who opt in or provide permission to receive District communications receive them. This applies to the spray notification email, the Mosquito Bytes newsletter, and media releases—all delivered by Constant Contact.

## Research & Evaluation

All communication efforts and outreach strategies are researched and evaluated to ensure the best and appropriate communication for the most efficient costs. One evaluation tool is the use of individual marketing phone numbers printed on each tactic. This allows the District to track how many phone calls are received as a result of the specific advertisement. While this illustrates the degree of success for each tactic, it is important to note that it does not illustrate the amount of awareness the tactic generated. There are many factors that contribute to the tactic's overall success.



*QR code and custom phone number help evaluate effectiveness of new advertisements at BART stations*

## *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. For example, the District is a past recipient of an award for its water recycling program that ensures water from trucks using pesticide products is diverted from catch basins that carry water to creeks and waterways. Another example is the solar panels that 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.

## *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 2011, one significant project the IT technician completed was the design and implementation of an electronic time sheet. This in-house application saves time and money because of more efficient payroll processing and reduction of clerical errors.

## *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.*



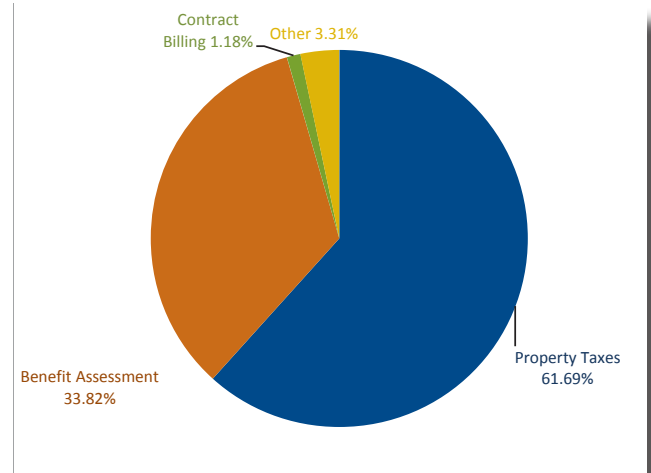
## Financial Statement

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 independent auditing firm. This firm audits the District's financial statements to obtain reasonable assurance that the financial statements are free of material misstatement, they review the accounting principles used, all financial disclosures, and the overall financial statement presentation. The District annually receives an *Unqualified Opinion*, which is the best opinion available.



District revenues

Revenues	2010/2011*	2011/2012**
Property Taxes	\$3,620,656	\$3,461,684
Contracts	69,491	60,000
Interest Income	45,385	24,000
Benefit Assessment	1,984,921	1,984,921
Miscellaneous	149,015	80,704
<b>Total Revenues</b>	<b>5,869,468</b>	<b>5,611,309</b>
Expenditures	2010/2011	2011/2012
Salaries & Wages	4,284,675	4,431,198
Operations	1,225,396	1,242,455
Capital	20,568	38,661
<b>Total Expenditures</b>	<b>\$5,530,639</b>	<b>\$5,712,314</b>

\* Audited \*\* To be audited



**Protecting Public Health Since 1927**  
155 Mason Circle • Concord, CA 94520  
[www.ContraCostaMosquito.com](http://www.ContraCostaMosquito.com)