



Public Health
Environmental Health Services



Mosquito & Vector Control Program

2014 Annual Report

San Bernardino County Mosquito and Vector Control Program 2014 Annual Report

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I. PROGRAM OVERVIEW

The San Bernardino County Mosquito and Vector Control Program (MVCP), under the Division of Environmental Health Services, pursues its mission by providing quality and responsive services to County residents within its jurisdiction covering an area of 20,105 square miles. MVCP responds to citizen complaints/service requests for community control of vectors and nuisance pests such as mosquitoes, flies, rodents, and Africanized Honeybees. The MVCP monitors for the presence of vector-borne diseases, and inspects poultry ranches, dairies, and riding academies for flies and other vector-related issues. The MVCP also provides direct abatement and control services in sanitary sewer systems, flood control channels and basins, public streets, and parks.

The California Legislature adopted the “Mosquito Abatement Act” in 1915. The law was later incorporated into the State Health and Safety Code, which authorized the creation, function and governance of Mosquito Abatement Districts in the State of California. This law was amended in 1939 and 1980 and then repealed and replaced by a new comprehensive Mosquito Abatement and Vector Control District Law in 2002.

The 1972 Saint Louis encephalitis outbreak in Los Angeles infected four people in San Bernardino County. This outbreak increased mosquito-borne disease awareness in the County and prompted the establishment of this vector control program in the Department of Public Health.

On November 24, 1986 the County Board of Supervisors adopted a County ordinance which granted authority for the creation of a Mosquito and Vector Control Program with the services provided to County residents in a wider area; enhancing the surveillance of vectors and vector-borne diseases.

The detection of Hantavirus in the County in the mid-1990s increased collaboration with local, state, and federal agencies; later, the arrival of Africanized Honeybees to the County in 1998 increased activities and efforts to mitigate this heightened concern of residents and visitors.

The arrival of West Nile virus (WNV) in the United States in the summer of 1999 required increased vigilance and an extensive outlay of resources nationwide. Once the disease was detected in the County in 2003, the focus of MVCP shifted to monitoring and controlling mosquito-borne diseases. This increase in services demanded additional resources to reduce the risk of WNV in the County.

A recent challenge is the establishment of the Asian Tiger Mosquito (*Aedes albopictus*) and the Yellow Fever Mosquito (*Aedes aegypti*) in nearby counties, which may again shift resources and abatement strategies to properly respond to this newly introduced species capable of transmitting disease such as dengue fever.



Left: Yellow Fever Mosquito (Aedes aegypti) Right: Asian Tiger Mosquito (Aedes albopictus)

Unlike most mosquitos that come out and feed at dusk, the Asian Tiger Mosquito is a daytime feeder. It is an aggressive biter and its feeding peaks in the early morning and late afternoon. The Yellow Fever Mosquito is also a daytime feeder and prefers biting indoors and primarily bites humans. If it is noticed that mosquito bites are occurring during daytime hours, it should be reported so that the MVCP can conduct surveillance activities to determine if either of these mosquitos is present in San Bernardino County.

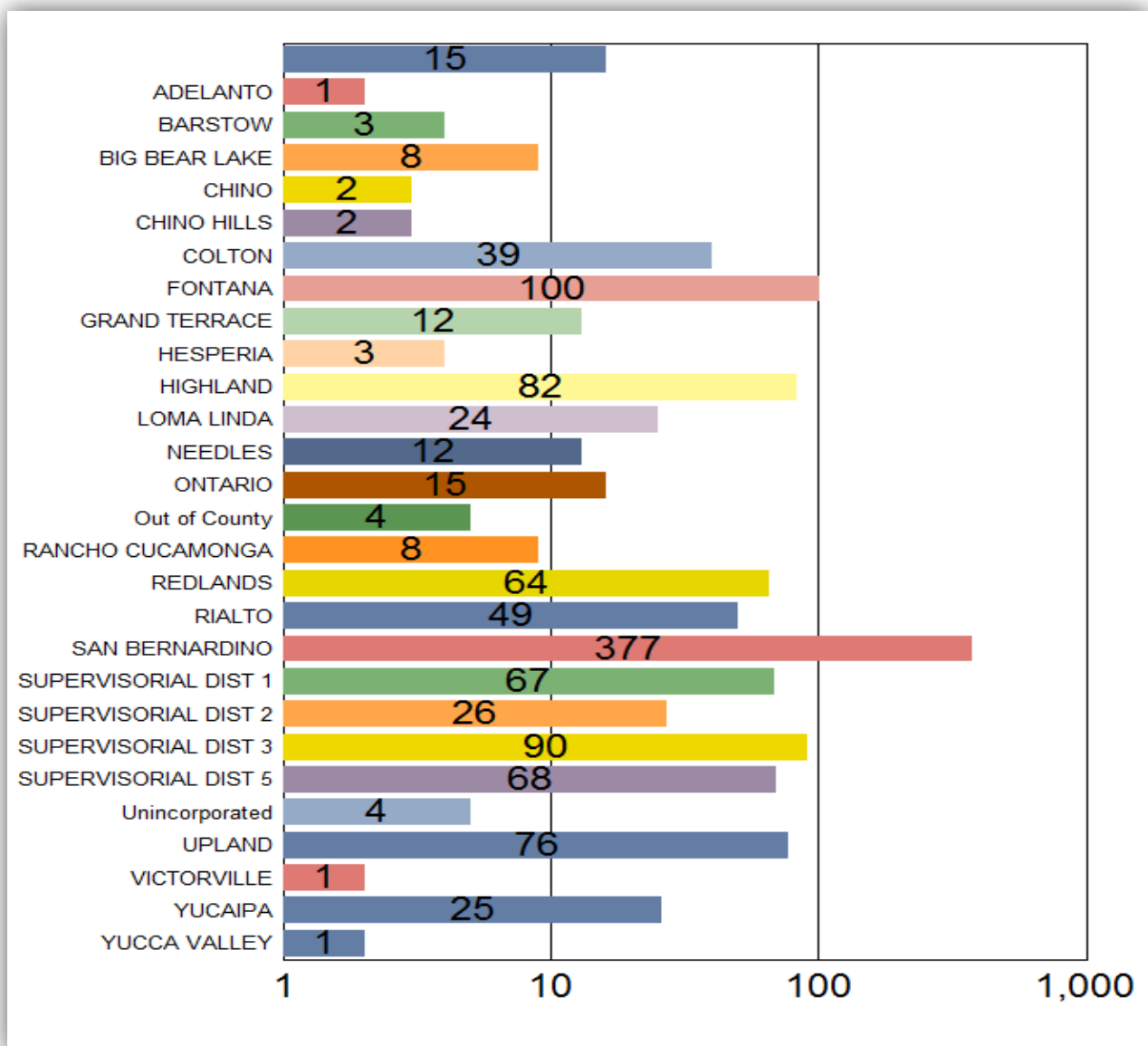
The services provided by MVCP are in line with the Countywide Vision to protect the health and safety of residents and visitors. Information on the Countywide Vision, Job Statement, and Paradigm can be found at www.sbcounty.gov.

The following pages summarize operations, disease surveillance, and health education activities conducted by MVCP from January 1, 2014 through December 31, 2014. The report provides an overview of vector control activities and analyzes the level and distribution of MVCP services throughout the County.

II. OPERATIONS

MVCP is currently staffed by a Supervising Environmental Health Specialist, an Environmental Health Specialist III, a Vector Control Technician II, 7 Vector Control Technician I's, 5 seasonal field staff, an Office Assistant III and other support staff in the County Department of Public Health. Services provided to residents and visitors of San Bernardino County include responding to service requests/complaints relating to vector control issues within 24 to 48 hours, routine mosquito control, surveys that target vector species, and community education. In 2014, MVCP staff responded to over 928 service requests and conducted approximately 11,870 water source inspections on 959 inventoried water sources, to eliminate mosquito breeding.

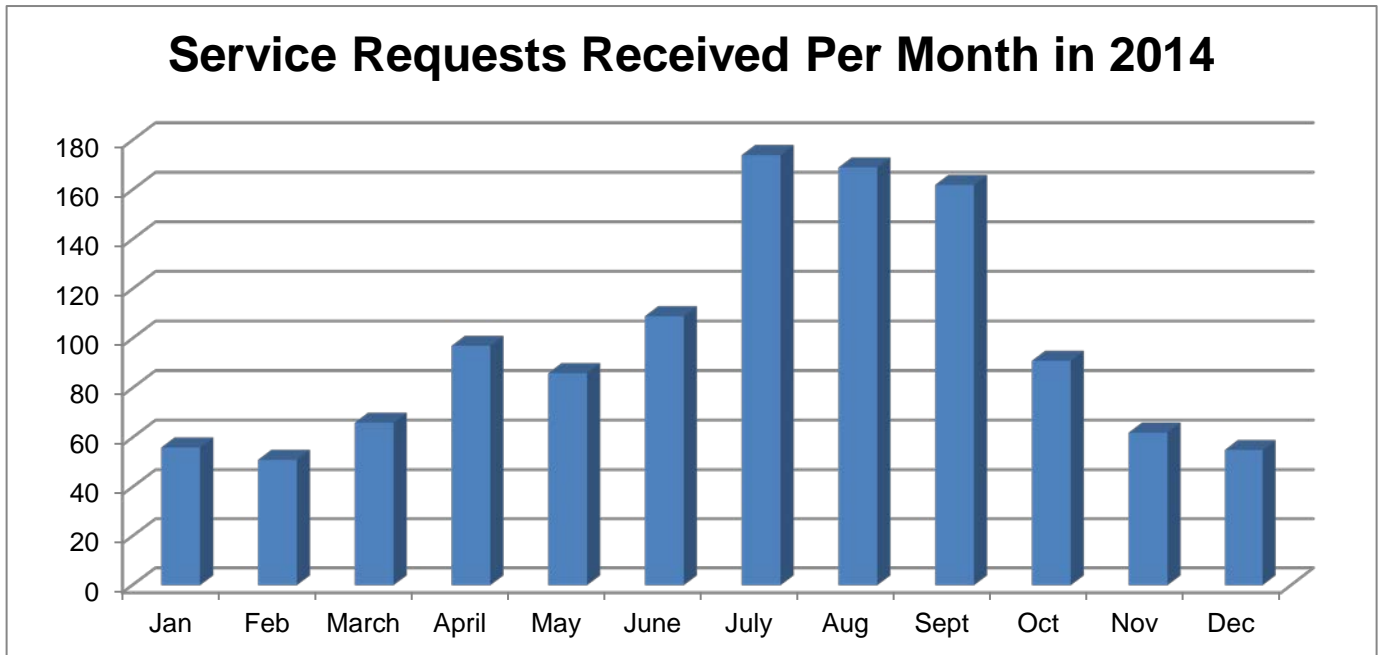
Table 1: Number of service requests received and responded to by city in 2014.



Citizen Request for Service

MVCP responses to citizen requests vary from phone consultations, mailing educational and instructional literature, identifying specimens, inspecting premises, abating vector nuisances and enforcement of County Code. Service requests for the last 5 years include: 1,811 in 2010, 1,668 in 2011, 1,421 in 2012, 1,218 in 2013, and 928 in 2014.

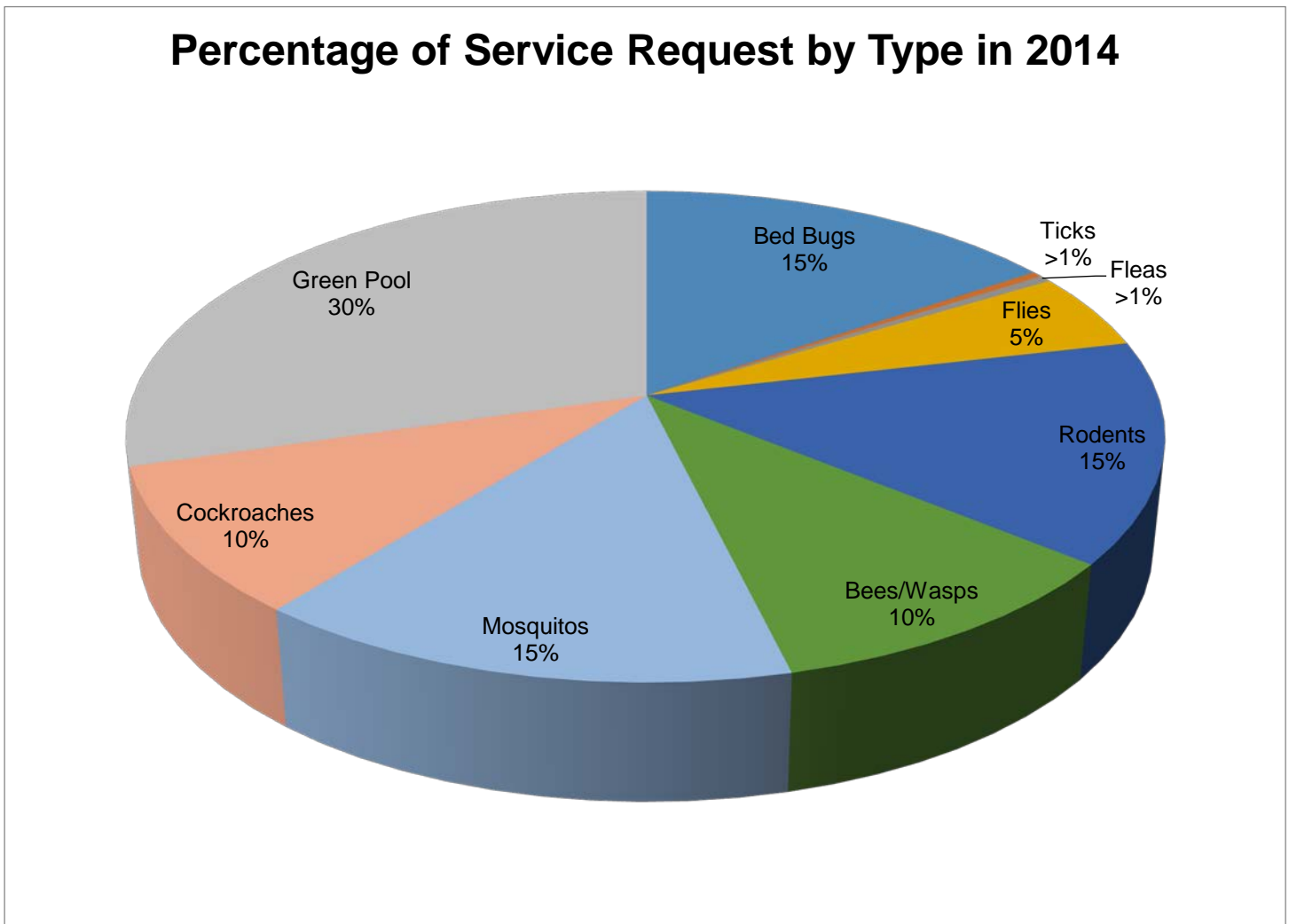
Table 2: *Service requests received per month in 2014 for specific vectors and pests in each area of the County.*



Of the service requests addressed by MVCP in 2014, the highest number was for green pools followed by mosquitoes, bed bugs, rodents, bees & wasps, cockroaches, flies, fleas, and ticks. Green pools are an ongoing concern for MVCP as they can be a major source of mosquito breeding. To address this concern, MVCP has begun working with the San Bernardino County Sheriff's Department Aviation Division to identify unmaintained swimming pools with possible mosquito breeding. Of the 483 mosquito service requests received, 323 were related to green pools. Each was inspected and treated with larvicide to control breeding. Six of these pools were drained by Vector Control staff to eliminate mosquito breeding.

As can be seen in Table 3, bed bugs represented 15% of all the service requests that were received. Bed bug service requests are continuing to increase in numbers and are being seen in a variety of locations such as motels, hotels, camps, health care facilities, apartments, and single family residences. Bed bugs can live in mattresses, linens, headboards, walls, flooring, and other furniture. Bed bugs usually feed at night when people are sleeping and many people do not realize they are being bitten. Bed bugs do not transmit disease, but are a nuisance and infestations should be controlled by a licensed pest control operator.

Table 3: *Percentage of service request by vector type received in 2014.*



Enforcement actions are sometimes necessary to gain compliance. Compliance methods include Notices of Violation, Courtesy Notices to Abate, Office Hearings, and Billable Inspections. Table 4 shows the number of Notices of Violation and Courtesy Notices to Abate issued in 2014.

Table 4: *Total Notice of Violation and Courtesy Notice to Abate during 2014.*

Notice of Violation	Courtesy Notice to Abate
414	337

Animal Establishment Inspections

Confined livestock farming can produce large numbers of nuisance flies, causing annoyance for nearby residents. These animal establishments include commercial poultry ranches, dairies and riding academies. Inspections are routinely conducted to ensure fly, mosquito and rodent breeding are prevented and/or controlled and manure is managed properly. A total of 136 poultry ranch inspections, 36 dairy inspections and 7 riding academy inspections were conducted during 2014.



Sanitary Sewer Inspections

Sanitary sewer systems are a network of underground ducts that can provide a habitat, and sometimes serve as a breeding ground, for cockroaches and rats. MVCP conducts surveys to reduce the number of roaches and rodents in sewer systems so that humans are not negatively affected. Each survey may cover a specific local target area, or a broad area of a city.



Vector Inspections in County Flood Control System

Under a written contract between the MVCP and the San Bernardino County Department of Public Works Flood Control District, MVCP inspects and treats for mosquitoes and other vectors and nuisance pests breeding at all flood control channels and basins. MVCP works with the County Flood Control District to identify basins and channels that require debris and vegetation removal to prevent breeding.

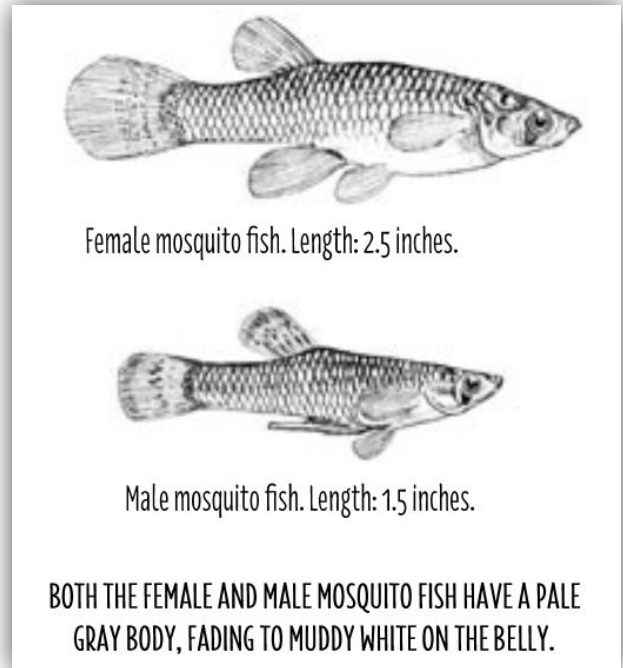
MVCP spent 2,126 direct work hours inspecting and conducting surveillance for mosquitoes and breeding sources in flood control facilities. Physical abatement, biological controls and larvicides were used in the flood control channels and catch basins.



Integrated Vector Management Services

In 2014, MVCP used several strategies to control mosquitoes and other vectors and nuisance pests. These strategies include physical, biological and chemical control, in addition to active surveillance and trapping. Pesticide use is the last option if physical abatement, such as using a shovel or biological controls, are not effective.

Mosquito fish (*Gambusia affinis*) are the primary biological abatement method for controlling mosquito larvae in decorative ponds and other water sources on private property. MVCP places the fish in breeding sources where other methods of control are not practical. Free mosquito fish are also available to San Bernardino County residents to place in their personal ponds or water sources.



Mosquito Fish (Gambusia affinis)

When physical and biological abatement cannot be used, chemical abatement methods are used. Chemicals that MVCP use typically have less toxicity than table salt or caffeine and are targeted towards specific vectors. MVCP used several types of chemicals for the abatement of



European Honey Bee (Apis mellifera)

vectors and nuisance pests. A total of 16.50 pounds of rodenticide was used to control infestations of rats and mice. 7.15 pounds of pesticide was used to treat infestations of Africanized Honeybees and cockroaches. 1.40 gallons of pesticide concentrate was used to control Africanized Honeybees and wasps. 75.67 gallons and 1,951.52 pounds of pesticide was used to control mosquitoes in neglected (green) residential swimming pools, roadside ditches, flood control channels, golf courses, constructed waterways, and other mosquito breeding habitats. A total of 11,870 routine inspections were performed at these water sources.

MVCP introduced a midge (*chronomidae*) control program in 2008. Midges resemble mosquitoes but do not take blood meals. Although they are not a disease vector, in sufficient numbers they effect quality of life for residents and visitors. In 2014, a total of 55.75 lbs. and 54.40 gallons of pesticide was used to control midges.



Midge Fly

Nuisance flies are insects that are an annoyance or can spread diseases to people and domestic animals by biting or physical deposition of pathogens. The immature (larval) stages of flies are found in a range of habitats, including water and semi-aquatic sites.

Fly larvae found in decaying organic matter are sometimes called maggots. The close association of many of these insects with dead animals, feces, or garbage and their attraction to humans and animals allows flies to potentially pick up and spread a variety of bacteria and parasites that may cause disease.



Housefly (Musca domestica)

In order to control adult fly populations, a total of 18.50 pounds of pesticide and 28.64 gallons of mist sprayer formulation was used in 2014 in close proximity to dairies, poultry ranches and other fly breeding sources.

Active surveillance was an additional tool for monitoring and controlling vectors. Trapping techniques were used to monitor for and/or control mosquitoes, ticks, cockroaches, rats, mice, and other nuisance pests within the County.

III. DISEASE SURVEILLANCE

MVCP maintains a proactive surveillance and monitoring program to determine the abundance of vector populations and the prevalence of diseases they transmit, focusing mainly on mosquito-borne viruses, rodent-borne and tick-borne diseases. In 2014, MVCP also made a concerted effort to monitor midge fly populations due to their increasing numbers in specific areas of the County. Surveillance efforts in 2014 are summarized below.

Mosquito Surveillance Program

MVCP disease surveillance program monitors adult mosquito populations throughout the County using New Jersey Light Traps (NJLT), *carbon dioxide* (CO₂) – baited traps, and gravid traps. The NJLT uses a light source to attract both male and female mosquitoes. The CO₂-baited traps use *carbon dioxide* to attract host-seeking female mosquitoes, while gravid traps use a hay infusion as an attractant for ovipositing (egg-laying) females. Combinations of these trapping methods are continually being used across the County to provide an accurate representation of mosquito activity throughout the year. Higher mosquito counts and the presence of WNV in mosquitoes, sentinel chicken flocks, and dead birds are factors used to determine the risk of infection to humans and animals.



New Jersey Light Trap (NJLT)

The abundance of adult mosquito species was monitored weekly using NJLTs throughout the County. 18 NJLTs in 2014 were stationed in rural, suburban, and urban habitats of the valley, mountain, and desert regions of the County. Trap sites in the valley region included the cities of Bloomington, Fontana, Grand Terrace, Mentone, Redlands, Yucaipa, Upland and 3 in San Bernardino. Traps in the mountain region were located in Big Bear Lake and Silverwood Lake. Six sites located in the desert region included two in the City of Needles, one at Park Moabi, one at Parker Dam, one in Hesperia, and one at Mojave Narrows Regional Park in Victorville. All mosquito counts were reported to the California Department of Public Health on a weekly basis.

In 2014, a total of 1,176 mosquito surveys were performed, from which 30,704 mosquitoes were collected. Of the 632 mosquito pools tested, 17 pools tested positive for West Nile virus (WNV), indicating a low prevalence of the virus in mosquito populations.

The following table shows the type of trap and the number of mosquitoes caught per trap, and which traps tested positive for WNV.

Table 5: *Total number of mosquitoes collected, mosquito pools submitted for testing, and the number of pools that tested positive for WNV in 2014.*

Trap Type	Number of Mosquitoes	Number of Pools	Number Pools Tested Positive for WNV
NJLT	3745	N/A	N/A
Gravid	179	56	0
CO2	26,780	632	17

Sentinel Chicken Flock Samples

Nine sentinel chicken flocks, each with 8 chickens, were placed in various areas to monitor arbovirus activity within the County. Arboviruses are viruses that are transmitted between susceptible vertebrate hosts by blood-feeding arthropods, such as mosquitos. Although chickens can become infected with arboviruses, they are not negatively affected and do not show symptoms. Samples were taken from all the sentinel flocks once every two weeks and sent to the State laboratory for viral testing. Of the 72 chickens tested in 2014, 31 chickens were infected with WNV throughout the season. Positive chickens with WNV were confirmed in the cities or areas of Redlands, Colton, Fontana, Needles, Upland , Rialto, and San Bernardino.



Leghorn Chicken (Gallus gallus)

Dead Bird Surveillance Program

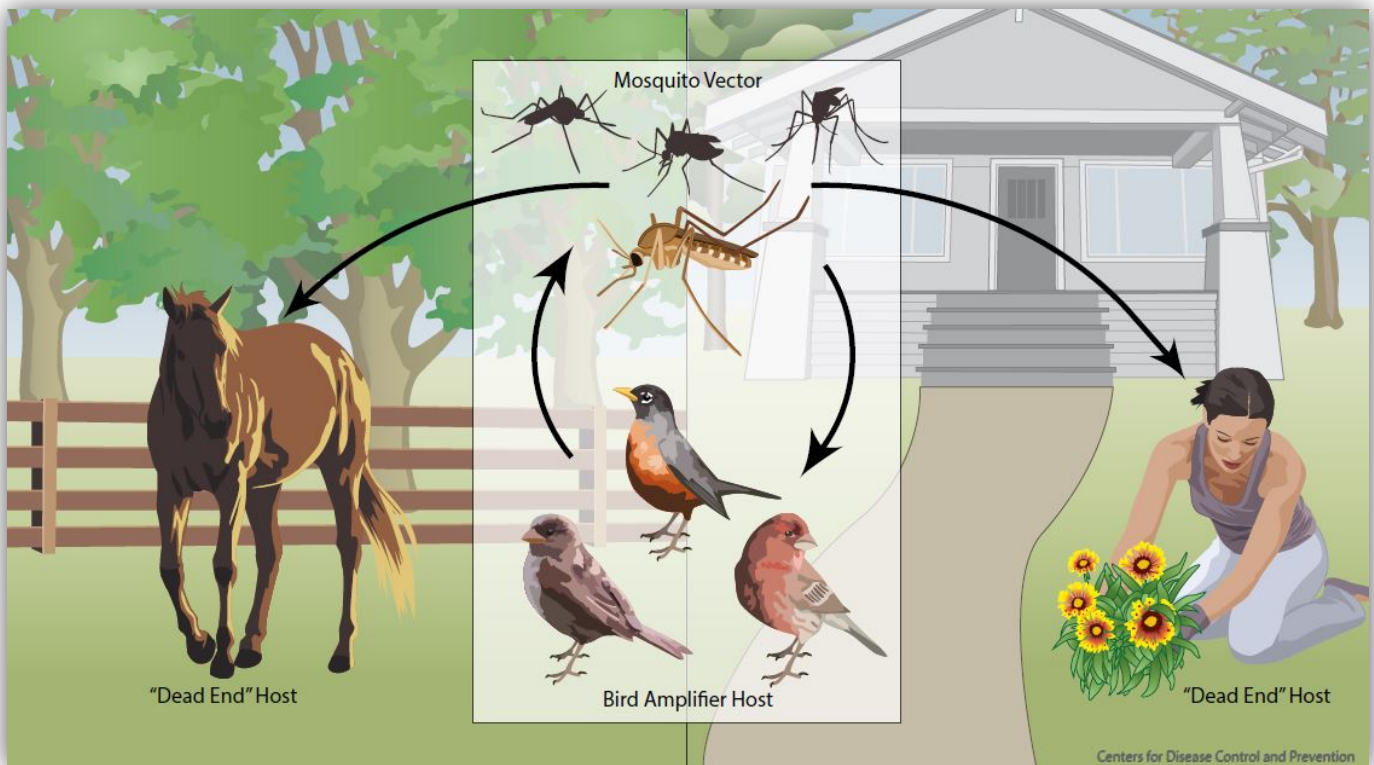


American Crow (Corvus brachyrhynchos)

The dead bird surveillance program started in 2000 to enhance WNV detection capabilities. MVCP responds to dead bird reports related to birds from the family Corvidae, sometimes called Corvids. Corvids are reservoirs for WNV. Crows and Ravens, which belong to the family, die quickly after becoming infected with WNV, which gives an early warning that WNV is present in an area. In 2014, MVCP responded to a total of 23 dead bird reports, where 9 tested positive for WNV. Positive dead birds were collected from the cities or areas of Rialto, Fontana, Grand Terrace, San Bernardino, Upland, and Highland. Individuals are encouraged to report dead birds immediately by calling 1 (877) WNV-BIRD. MVCP staff will then retrieve the bird for testing.

Human Cases of West Nile Virus

Most people who become infected with WNV will not show any symptoms but that doesn't mean that an illness won't develop. According to the Center for Disease Control and Prevention (CDC), 1 in 5 people infected with WNV will show signs of West Nile Fever (non-neuroinvasive) and about 1 in 150 people infected with WNV will develop neuroinvasive symptoms, which affect the brain, spinal cord and nervous system. These symptoms include high fever, muscle weakness, vision loss, paralysis, coma, encephalitis and even death. In 2014, there were a total of 22 WNV human cases, with 18 cases being neuroinvasive (encephalitis) and 4 non-neuroinvasive (West Nile Fever). Of these 22 human cases, no fatalities were reported in 2014. Human cases and the prevalence of WNV in the County increased in 2014 from 13 cases reported in 2013.



West Nile virus (WNV) Transmission Cycle



WNV in Equine (Horse) Population

WNV infections are a serious threat to horses. Horses are very sensitive to the virus and have a high mortality rate if they are infected. The most commonly described symptom of an infected horse is lack of coordination and stumbling. In 2014, WNV was not detected in any horses in the County. This is partially attributed to successful WNV vaccination efforts in the County.

Plague Surveillance

Plague is caused by *Yersinia pestis*, a bacteria that can be transmitted to humans through the bites of infected fleas. Plague is endemic in the mountains and foothills of San Bernardino County, and is commonly transmitted by infected fleas found on ground squirrels and other rodents.



California Ground Squirrel (Otospermophilus beecheyi)

MVCP carried out routine surveys in the mountain, foothill, and valley areas of the County to detect and monitor for plague and the fleas that carry it. In 2014, 14 plague surveys were conducted, trapping a total of 47 rodents. None of the rodents tested positive for plague and no human cases were identified in 2014.

Hantavirus Surveillance

Hantavirus ardiopulmonary syndrome, or HCPS, is a rare but often fatal disease of the lungs. Although there are many types of hantavirus, Sin Nombre virus (SNV) is the specific hantavirus that causes HCPS in the western United States. In California, the deer mouse, *Peromyscus maniculatus*, is the most common species known to carry SNV.

Hantavirus surveillance consists of rodent trapping and testing for antibodies against SNV at various sites within the County. 14 surveys were conducted in 2014 to determine the prevalence of the virus. Of the 26 rodents trapped, none tested positive for SNV.



Deer Mouse (Peromyscus maniculatus)

Tick Surveillance

The Western black-legged tick, *Ixodes pacificus*, can transmit the spirochete *Borrelia burgdorferi* which is responsible for causing Lyme disease in humans. Wild rodents and other mammals are likely reservoirs of these pathogens. This tick is distributed in the Western Pacific region of the United States. Larvae and nymphs feed on birds, lizards and small rodents, while adult ticks feed on deer and other mammals.

The tick surveillance program primarily involves the collection of host-seeking ticks for tick-borne infections, especially Lyme disease. 102 tick surveys were conducted in 2014 that yielded 570 ticks. None of the ticks tested positive for Lyme disease.



Western Black Legged Tick (Ixodes pacificus)

IV. HEALTH EDUCATION

Community outreach and health education benefit the residents and visitors of the County by delivering vector control information and educational material directly to the public. In 2014, health education efforts by MVCP included telephone and personal visits, distribution of flyers and brochures, lectures, presentations and participation at local health fairs. Presentations were also provided in public forums, to businesses and community organizations. Radio and television interviews were conducted, and press releases were distributed to the media when incidents of public health significance occurred.

In 2014, MVCP conducted block surveys, making direct contact with residences and leaving MVCP information at the residences where direct contact could not be made. MVCP also held 3 vector control events, focusing specifically on MVCP issues, and 11 general program events which covered all DEHS programs. These events included presentations, health/career fairs, and the distribution of written material to the public.



Over 400 people attended presentations, which included K-8 school children, students from local colleges and universities, senior center staff and members, and the general public at various city chambers of commerce. Over 800 people at health/career fairs were provided with written material and inquired about the program and its services.

For more information about the Health Education Program or to schedule a presentation, please contact MVCP at 1 (800)44- ABATE or visit the website at www.sbcounty.gov/dph/dehs.

V. AWARDS

Each year, the National Association of Counties (NACo) recognizes counties that have developed and implemented innovative and cost-efficient programs to better serve their citizens. The County of San Bernardino, Department of Public Health Division of Environmental Health Services (DEHS) received the prestigious 2014 NACo Achievement Award for their West Nile Virus Aerial Surveillance Collaboration.



Since 2004, DEHS' MVCP has collaborated with the County of San Bernardino Sheriff's Department Aviation Division in using aerial surveillance to identify unmaintained swimming pools in residential neighborhoods. This technology has allowed MVCP technicians to inspect and abate mosquito breeding hazards in previously unknown locations.

VI. ACKNOWLEDGMENTS

- ❖ San Bernardino County Mosquito and Vector Control Program Staff
- ❖ Cities of Big Bear Lake, Colton, Fontana, Grand Terrace, Highland, Loma Linda, Needles, Redlands, Rialto, San Bernardino, Upland, and Yucaipa
- ❖ San Bernardino County Departments of Agriculture, Public Health, and Transportation/Flood Control
- ❖ Mosquito and Vector Control Association of California (MVCAC)
- ❖ California Department of Public Health Vector-Borne Disease Section
- ❖ Viral and Rickettsial Disease Laboratory, California Department of Health Services
- ❖ California Department of Fish and Wildlife
- ❖ California Department of Food and Agriculture
- ❖ California Department of Parks and Recreation
- ❖ School of Veterinary Medicine and Center for Vector-Borne Disease Research, Department of Entomology and the Davis Arbovirus Research Unit at University of California – Davis
- ❖ Bureau of Land Management
- ❖ United States Forest Service

**For Information about the San Bernardino County Mosquito and Vector Control Program
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