2009 Annual Report

SHASTA MOSQUITO & VECTOR CONTROL DISTRICT

Compiled by John Albright, District Biologist

Peter Bonkrude, District Manager

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The public is welcome to attend the Board of Trustees Meetings, which are held the third Tuesday of each month at 1:30 p.m. at the District Office:

19200 Latona Road
Anderson, CA
Phone: (530) 365-3768
Fax: (530) 365-0305
Website: shastamosquito.org
Email: contact@shastamosquito.org

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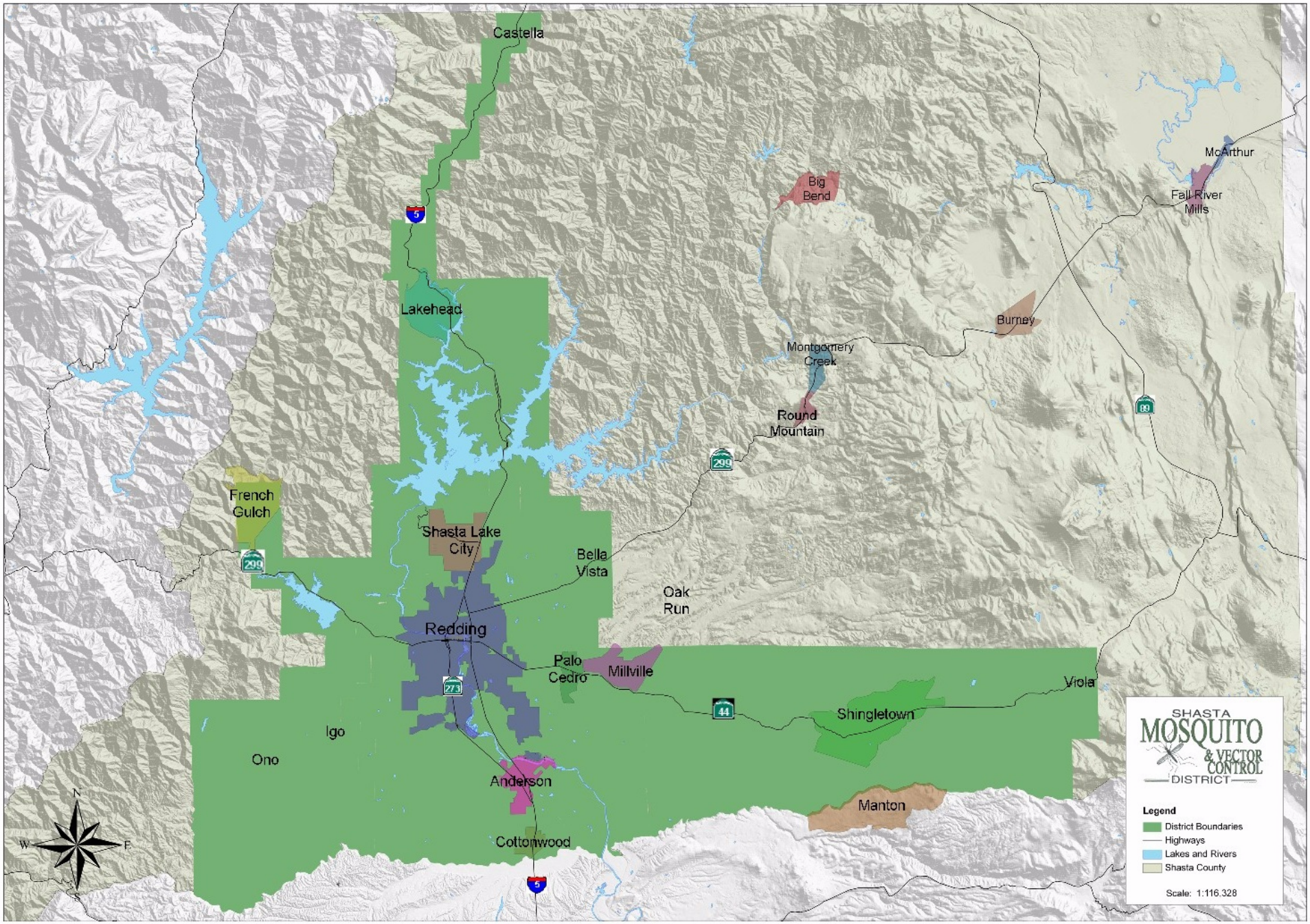
Shasta MVCD Boundaries



SHASTA MOSQUITO AND VECTOR CONTROL DISTRICT
2009 ANNUAL REPORT

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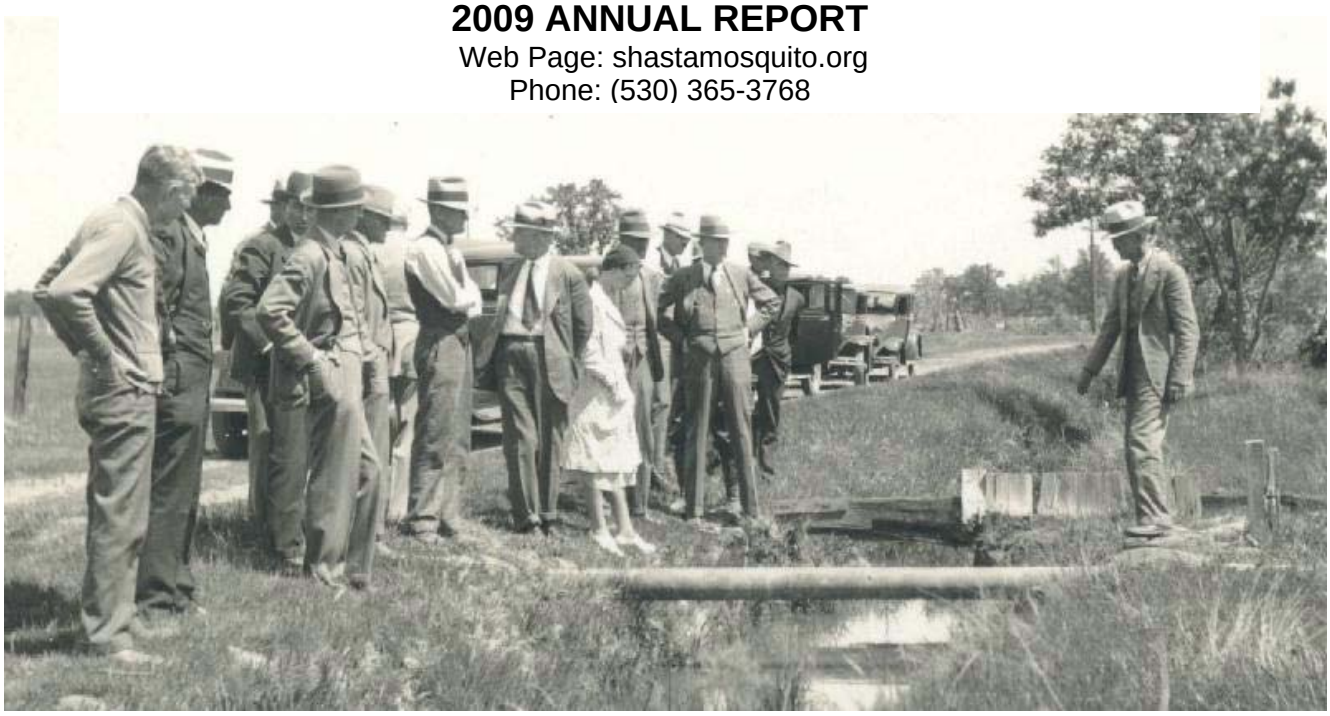


Educational Tour of Mosquito Breeding in Anderson, California, April 26, 1933

HISTORY

The first local mosquito control district was formed in 1919 in the Redding area and formation of other districts in the Anderson and Cottonwood areas followed in the 1920's. These districts were formed to combat the terrible mosquito problems that plagued the area at that time. Malaria (a disease transmitted by mosquitoes) was widespread when the districts were formed. The Anderson, Cottonwood, and Redding areas had some of the highest malaria rates in the continental United States. Malaria and other mosquito-borne diseases are still a threat in the District today. The mosquitoes that transmit these diseases are still abundant in this area and the potential for serious human health diseases transmitted by mosquitoes still exists. In the mid 1950's the districts consolidated into one district and annexations to the district occurred over the years as more and more people moved into areas where heavy mosquito populations occurred.

DISTRICT ORGANIZATION

The Shasta Mosquito and Vector Control District is a special district type of government agency operating within the boundaries of Shasta County. Shasta Mosquito and Vector Control District does not serve all of Shasta County. Two other districts, the Burney Basin Mosquito Abatement District and the Pine Grove Mosquito Abatement District serve areas of northeastern Shasta County, and many other areas of Shasta County are not served by any organized mosquito control agency.

In 2007 an election was held in the areas supporting annexation, following Proposition 218 guidelines, and new areas adjoining the old District Boundaries were annexed to the District. The landowners in those areas voted for a benefit assessment to pay for the Districts services. Communities added to the district by the annexation include Igo, Ono, French

Gulch, Lakehead, Sweetbriar, Castella, Shingletown and Viola. The annexation increased the size of the District from approximately 384 square miles to about 1086 square miles.

The District boundaries extend from Castella on the north to Cottonwood Creek on the south and from the town of French Gulch on the west to Viola on the east. A five member Board of Trustees governs the District. One Board member is appointed by the city council of each of the incorporated cities within the District: Anderson, Redding and the City of Shasta Lake. Additionally, two Board members are appointed by the Shasta County Board of Supervisors. The Board establishes District policy and is responsible for the expenditures of the District. The District is financed by a share of property taxes and from mosquito and vector surveillance and control benefit assessment charges. The benefit assessment amounts, which vary for different parcels, and are determined by land use and size, are collected on Shasta County property tax bills. Only the people within the District pay the benefit assessment charges. The District does not normally receive any share of sales tax, cigarette tax, motel occupancy tax, gasoline tax, state grants, or other allocations. In the 2008-2009 fiscal year, the District's total revenue was approximately $2.46 million; approximately 48% derived from property taxes and 44% from the benefit assessment charges. The remainder of the District's income came from miscellaneous sources such as charges to agencies, businesses and individuals receiving services that are beyond routine District functions. In 2009, the District employed thirteen full-time people and one seasonal person.

DISTRICT ACTIVITY

The District performs mosquito control activities and vector information services to protect the public from diseases and nuisance caused by mosquitoes and other vectors. Vectors are defined as small animals or arthropods that spread disease causing organisms or cause discomfort to humans and domestic animals. Examples of vectors are mosquitoes, flies, fleas, ticks, spiders and stinging insects, such as yellowjackets. Examples of some diseases transmitted by vectors other than mosquitoes are Lyme disease transmitted by ticks and plague transmitted by fleas.

Mosquito Larvae

Adult mosquitoes are flying insects that, after taking a blood meal, lay their eggs in water. The mosquito eggs need water to develop into larvae and then into adult mosquitoes. The life cycle of mosquito development repeats itself and, unabated, staggering numbers of mosquitoes are produced and transmission of disease occurs. Examples of water sources where mosquitoes lay their eggs and develop are: ornamental ponds, industrial and agricultural water, lakes, river isolations, wetlands, sewer ponds, buckets, cans, and holes in trees. Anything that holds water can produce or breed adult mosquitoes. Mosquitoes that transmit the human diseases malaria, western equine encephalitis, St. Louis encephalitis and West Nile virus are common within the District. In addition to these diseases, there are new, emerging diseases transmitted by mosquitoes, which can become a serious human health problem within the District. Canine heartworm, a non-human disease, is an often-fatal disease of dogs and cats transmitted by

mosquitoes that breed in the oak treeholes. In the Spring these mosquitoes are abundant within the District and require a great deal of time to control.

The West Nile virus (WNV), which first appeared in the United States in New York in 1999, and has killed over 1,100 people, countless wild birds, and thousands of horses throughout the U.S. since its arrival, is a disease transmitted by mosquitoes. Since the first detection of WNV within the District in 2004, WNV has been present every year. Since 2004 the District has stepped up surveillance and control efforts aimed at protecting public health from this disease. In 2009 WNV was detected in eight dead wild birds, and two samples of live adult mosquitoes. There were no reported WNV human cases in the District in2009. A single human case in 2006 represents the only confirmed human fatality from WNV in Shasta County to date. More detailed information about surveillance and control of WNV within and near the District can be found in later portions of this report. West Nile virus is an example of the ever-present human health risk from new, emerging human diseases transmitted by mosquitoes. The type of mosquito that transmits the West Nile virus disease is the most abundant species of mosquitoes found in the District.

The District uses public health pesticides to reduce mosquito populations under an integrated mosquito control program. This program uses state of the art equipment, techniques and products to control mosquitoes and protect the public's health and well-being. District employees are licensed in mosquito control and receive on-going training and continuing education to keep licenses current. Aerial photographs of the District are utilized and all known mosquito-breeding sources within the District are mapped. District personnel survey these sources for mosquito breeding on a regular basis and perform control activities when necessary. Control activities to kill mosquito larvae in water sources include the use of mosquito-eating fish, drainage, reduction, or elimination of mosquito breeding sources and/or chemical control.

Larviciding at a Vernal Pool

The District's chemical control program focuses on killing mosquito larvae in the water (larviciding) before larvae become biting adult mosquitoes. The District's larviciding program includes the use of relatively new types of chemicals that are effective in killing mosquito larvae but are safe for non-target organisms. Most larviciding chemicals used by the District are by-products of bacteria or chemicals that are mosquito growth regulators. These chemicals are often very specific to mosquito larvae. To be effective they often must be applied to specific species of mosquitoes and at specific developmental stages of the mosquito's life cycle. District technicians must be well-trained and knowledgeable in order for these types of chemicals to be effective in killing mosquito larvae. These products are considerably more expensive than more conventional pesticides. They are only applied directly to standing water sources where the presence of mosquito larvae has been confirmed. These products quickly

biodegrade and do not spread elsewhere in the environment. Other larviciding products are highly refined oil-based products that float on the water, which suffocate mosquitoes by creating a barrier that prevents the developing mosquitoes from breathing oxygen at the surface of the water. These products dissipate after a few days.

The District performs adult mosquito control (adulticiding) to augment its larval control program when large numbers of adult mosquitoes create severe pest problems or when an increased risk to human health from diseases carried by mosquitoes is present. Adult mosquito control is performed when larval control would not be feasible or effective. Adulticiding is the only way to quickly eliminate infected adult mosquitoes in the environment. Adulticide chemicals are applied in ultra low volume amounts and the pesticides used in these applications are typically not harmful to non-target organisms at the rates used for adult mosquito control. The adulticide applications are performed in the early morning or late evening. Most adulticides used by the District are pyrethroid products similar to products used in homes and on pets to control insect pests. Adulticiding products are dispensed by highly specialized, truck-mounted equipment. The equipment dispenses very small volumes (about two tablespoons per acre) of adulticide in extremely small droplets that are intended to migrate through an area rather than deposit on plants, water or other surfaces. These products quickly dissipate and are broken down by sunlight.

Vegetation Control Using Herbicides

Chemical herbicides are also used for vegetation control work around the margins of certain water sources. Weeds may protect mosquito larvae from natural predators like mosquitofish and prevent mosquito larvicides from reaching sources. Vegetation control chemicals are also used to maintain access to mosquito breeding sources.

All pesticide work is done through cooperative agreements with the California Department of Public Health in cooperation with the California Department of Pesticide Regulation. All pesticide use is reported to these agencies on a monthly basis.

The District monitors the effectiveness of its mosquito control program by placing mosquito-collection traps throughout the District. Contents of these traps are collected weekly and mosquitoes are identified and tabulated as to species and numbers of mosquitoes. (See “Adult Mosquito Monitoring Program” later in this report). This information is also added to a statewide surveillance database of mosquito population statistics.

The District performs physical control to reduce or eliminate mosquito-breeding areas. A District-owned backhoe is used to maintain and clean certain drainages to reduce mosquito breeding areas, as well as doing trail access work to improve access to mosquito breeding sources. The District utilizes the California Department of Forestry Conservation Crews from Sugar Pine Conservation Camp to perform hand brush cutting activities to maintain access trails to mosquito breeding sources.

Physical Control Using Backhoe

The District gives input to the planning departments of Shasta County and the cities of Anderson, Redding and Shasta Lake on proposed developments, etc. to reduce or prevent the creation of new mosquito breeding sources, assure adequate drainage and access to mosquito breeding sources.

The District maintains a high level of mosquito control in public areas of the District, but can do little to directly control mosquitoes breeding in residents' yards. Therefore, the District has taken the additional step of paying for public service ads to provide information on mosquito prevention around the home. The information focuses on minimizing or eliminating mosquito breeding sources, particularly residential sources, such as standing water in buckets, tires, birdbaths, etc. Public information and education is an important part of the control process. The District provides information on its activities by talking to schools and organizations and distributing literature. In 2009 the District provided an exhibit at the Spring Home and Garden Show at the Shasta District Fairgrounds in March. Educational materials relating to District activities are also provided to the public in static displays at the Turtle Bay Museum.

The majority of the District's control activities are based upon routine inspection and treatment of more than 3,000 mosquito-breeding standing water sources that have been identified and mapped throughout the District's 89-year history. Generally these efforts are sufficient to keep mosquito populations below thresholds that would present a public health risk from mosquito-transmitted diseases. Additionally the District responds to calls from the public for service by having a technician visit, survey, and discuss mosquito problems with the callers. When necessary, additional mosquito control is performed to respond to mosquito problems identified through these service requests.

In addition to the District's mosquito control program, the District has a vector control program, which involves answering calls and providing information regarding vectors. Information on diseases caused by non-mosquito vectors such as Lyme Disease transmitted by ticks and plague transmitted by fleas, is also disseminated. The District provides literature, advises people on what they can do and/or recommends help from a non-specific private pest control agency. In November of 2009 the District expanded its vector surveillance program to include a comprehensive program to monitor tick populations in areas where there is a threat of human exposure to tick bites, which can spread a variety of diseases. The program will be active through March of 2010, so statistics will not be available until the 2010 annual report.

An encephalitis surveillance program to monitor the human health risk from mosquito-transmitted diseases (See Encephalitis Surveillance Program in this report) is an integral part

of the District's mosquito-transmitted disease control program. This program uses sentinel chicken flocks placed throughout the District. District personnel take blood samples from these chickens throughout the mosquito season. The California Department of Public Health Viral and Rickettsial Disease Lab tests these blood samples for the presence of encephalitis antibodies. Live adult mosquitoes are also collected by the use of special traps. These mosquitoes are collected, sorted, grouped by species, sent to the University of California at Davis and tested for the presence of encephalitis virus. The results of the chicken blood tests and live adult mosquito virus tests are used by the District to determine the risk for transmission of western equine encephalitis, St. Louis encephalitis, and West Nile virus to humans. Should the program indicate an increased risk for mosquito-transmitted disease, the District's adult mosquito control program could be increased to protect the public's health. The District also collects and tests dead wild birds for the presence of West Nile virus.

PROFESSIONAL AFFILIATIONS

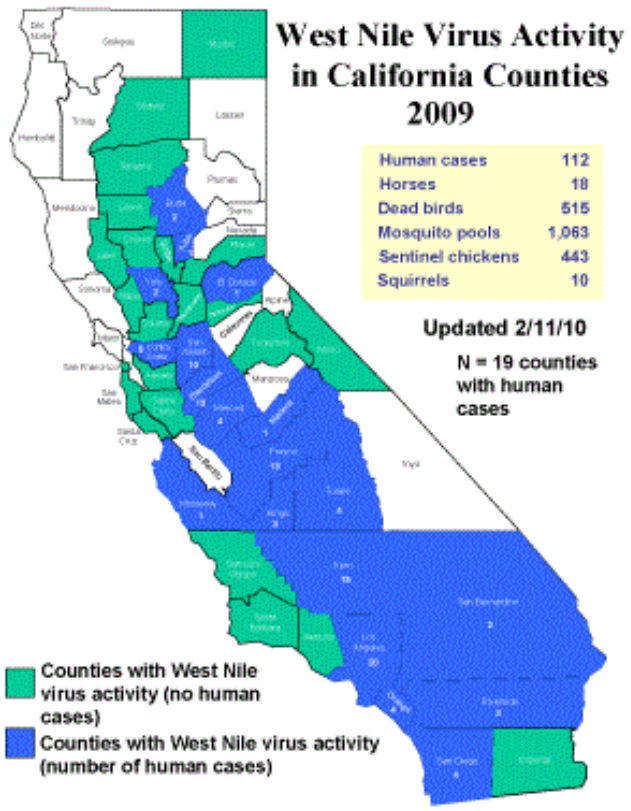
The District is a member of the Mosquito and Vector Control Association of California (MVCAC). This is a professional organization providing a cohesive means of communication between mosquito and vector control agencies on matters of mutual interest. MVCAC provides continuing education opportunities to help mosquito and vector control agencies' employees meet licensing requirements of the California Department of Public Health. This organization also acts as a conduit from mosquito and vector control agencies to regulatory agencies and lawmakers on matters of interest to its member districts.

The American Mosquito Control Association (AMCA) provides a similar opportunity for interaction and cooperation between mosquito and vector control agencies on a national level. The Society of Vector Ecologists (SOVE) provides communication and access to research on vector-related issues worldwide. The California Special Districts Association provides information to special districts of all types throughout the state on matters of administrative, legal, and legislative importance. This organization also provides feed from special districts to agencies and legislators whose activities impact special district operations.

The Vector Control Joint Powers Agency provides for various insurance needs of the District while providing a substantial cost savings to the District. These affiliations have been useful in developing a unified statewide approach to dealing with issues of mutual concern, such as the arrival of West Nile virus and legislative efforts to protect and provide funding for mosquito control in California. The District is a supporting member of the Turtle Bay Museums and Arboretum. This has given district personnel a new venue for the distribution of information on the methods and importance of mosquito and vector control in northern California

WEST NILE VIRUS OVERVIEW

West Nile virus (WNV) is a type of mosquito-transmitted virus that has contributed significantly to the workload of Shasta Mosquito and Vector Control District since before its detection within the District in July of 2004. Prior to 1999 the disease was limited to Africa, West Asia, and the Middle East. In 1999 an outbreak of West Nile virus was reported in New York City. Since that time it has spread to all states except Alaska, and Hawaii.



CDPH WNV Stats from westnile.ca.gov

In the United States 663 people were diagnosed with and 30 people died from West Nile virus in2009. This is approximately half of the level of human WNV disease recorded in 2008. California led the nation in human WNV cases with 112 in 2009, which is a 75% decrease over the level there in 2008. The bulk of WNV in California was found in the central and southern portions of the state in 2009 (see map at left).In California the level of WNV was the lowest that has been detected since WNV was first detected in the state in 2003. Nonetheless, most experts believe that WNV will remain a public health problem every summer and fall from now on. An ongoing, effective, organized and integrated mosquito control program is the best defense that the public has against this potentially debilitating and deadly disease. This disease is particularly devastating to horses and birds where obvious neurological symptoms and death are common. Small indications of WNV activity were found widely scattered throughout Shasta Mosquito and Vector Control District in 2009. A horse found positive for WNV within the District is one of only 18 found in the entire state of California in 2009.

Like Western Equine encephalitis and St. Louis encephalitis, mosquitoes transmit West Nile virus and the reservoir hosts are infected wild birds. Unlike these other encephalitis diseases, West Nile virus often makes the birds sick and is especially fatal to birds in the Corvid family (crows, jays, ravens and magpies). WNV has been detected in over 300 bird species in North America. West Nile virus has also been found in many other species unaffected by other types of encephalitis, such as squirrels, seals, and alligators.

Most people infected with WNV do not show symptoms. Some people develop mild symptoms that include fever, headache, body aches, skin rash and swollen lymph glands. More severe symptoms include headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis. The U.S. Centers for Disease Control estimates that 1 in 150 persons infected with the West Nile virus will develop a more severe form of disease. West Nile virus was first detected in California in mosquito pools in the southeastern corner of California
in July of 2003. Further information about the detection of WNV within the District in 2009 can be found in the sections on surveillance later in this report.

West Nile Virus Task Force: In 2003, Shasta Mosquito and Vector Control District joined with thirteen other agencies and organizations from throughout Shasta County with interests

in health, the environment, animal control and wildlife issues to form the Shasta County West Nile Virus Task Force (the Task Force) to develop a Shasta County West Nile Virus Response Plan (the Response Plan). The Response Plan outlines the roles of the specific agencies and organizations based upon different surveillance indicators of the presence or absence of WNV in or near Shasta County. The Task Force also provided an effective way of disseminating new information about the West Nile virus issue to and from various groups that previously had little contact with one another prior to the introduction of WNV into the United States. Answers to common questions and talking points to be used by the different groups were developed to assure the public that members of the Task Force were all educated, united, and prepared to deal with the WNV issue within Shasta County. Draft press releases were prepared, reviewed, and approved by the group. Also an email list was put in place to assure that all future contacts from members of the Task Force were mutually acceptable and agreed with the best information available to the group. In 2009 the Task Force proved to be a very useful tool, particularly in the dissemination of information to affected agencies and the public. In particular, efforts by Shasta County Public Health to provide materials, information and support in the area of public information took a tremendous load off of the District.

PUBLIC INFORMATION ACTIVITIES

Effective public health protection through mosquito and vector control depends largely on the efforts of informed citizens to prevent and control these pests around their homes and properties. Everyone needs to know how to avoid exposure to vector-borne disease in environments where pests of public health importance may be found. Since the beginning of mosquito control efforts in California in the early 1900s major emphasis has been put on educating the public about protecting themselves against health threats posed by mosquitoes and other vectors. Shasta Mosquito and Vector Control District's comprehensive pest management strategy includes an active program of public health education. The District provides over forty-five brochures on a wide variety of topics related to mosquitoes as well as other vectors and the diseases they spread. In the course of their work, all District personnel answer questions from the public based upon years of training and experience in all phases of disease and vector issues. The District provides answers to questions by phone, email or in person on any topic related to vectors, diseases, insects in general and pest management that may require additional special expertise. The District also gives talks to classrooms, civic groups or any club, organization or agency with an interest in the type of work we do, as well as interviews with the press and broadcast media. Topics covered range from mosquito biology and personal protection against vectors to careers in biology and vector control.

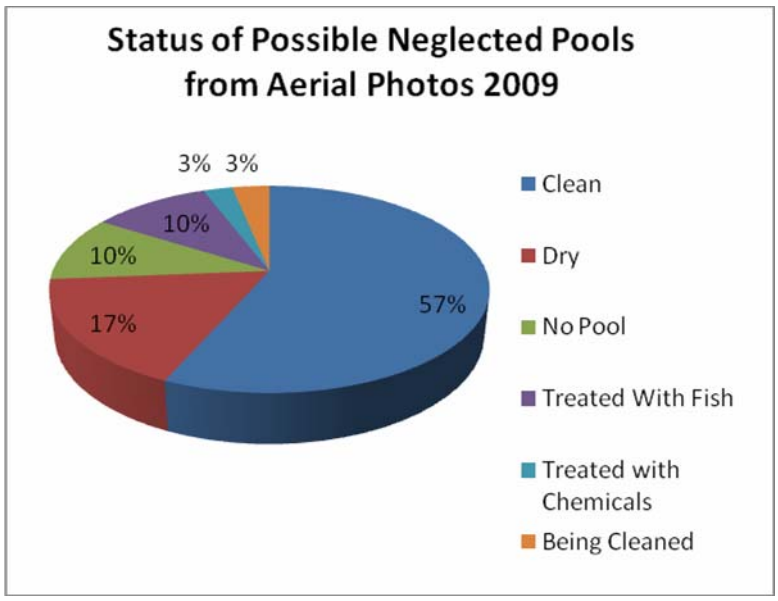
We provide the Shasta Mosquito and Vector Control District Annual Report to local government officials and other stakeholders to educate them about the activities of the District. On request, the District will give presentations in person to local government or private businesses, agencies and governing bodies to inform them about mosquito control issues and District activities. Presentations about District activities were given to government agencies including the Shasta County Board of Supervisors and the City Councils of Anderson, Redding, and the City of Shasta Lake. Additionally, interviews were given with, KNVN Channel 24, KHSL Channel 12, KRCR Channel 7, and KQMS Radio as well as the Valley Post and Record Searchlight newspapers throughout 2009.

Shasta Mosquito and Vector Control District maintained our web site (shastamosquito.org) with a wealth of information and links related to mosquito and vector control, and District activities. The site allows the public to access information about meetings of the District's Board of Trustees. Forms on the website allow the public to submit service requests online or ask the biologists questions via email. The District web site provides real-time weather updates from the District's weather station every five minutes. In addition to being an educational tool for the public, this has enabled District personnel to assess weather conditions from home prior to the beginning of the workday. This information is useful in helping to make decisions about whether to proceed with planned treatments for adult mosquitoes that are dependent upon very specific weather conditions. In 2009 content was added to the website to provide information to the public about scheduling and locations of adult mosquito control using truck-mounted ultra-low volume (ULV) application equipment.

NEGLECTED SWIMMING POOLS

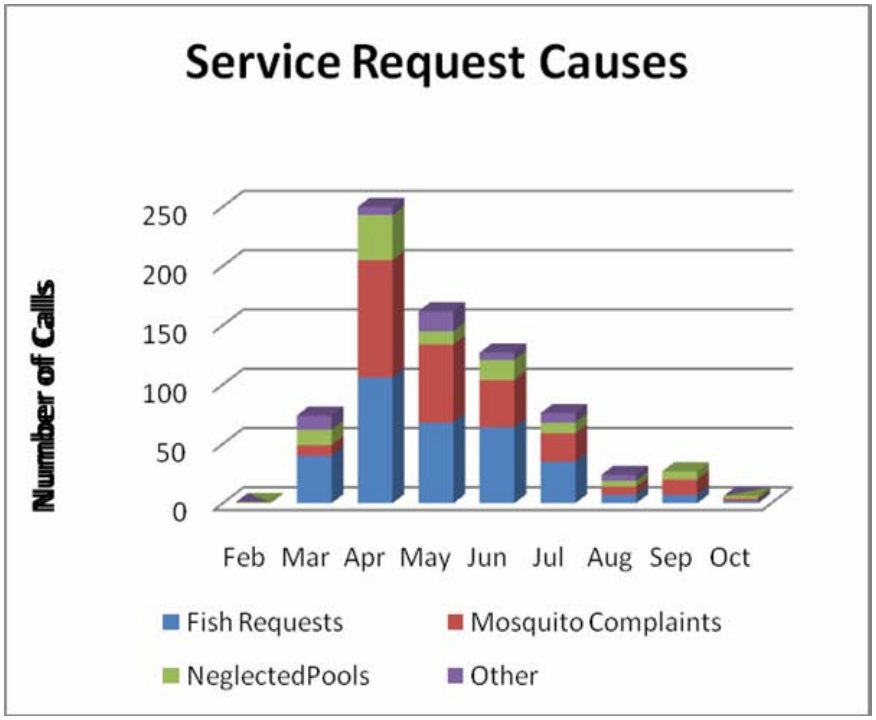
Technician Inspects Neglected Pool for Mosquito Larvae

An increase in the number of foreclosed homes in 2009 led to a corresponding increase in the number of abandoned swimming pools within the District. Because maintenance and chemical treatment of these pools is neglected they can soon become filled with the organic debris, bacteria and algae that the aquatic larvae of mosquitoes feed upon. These pools provide ideal breeding habitat for mosquitoes that can spread WNV and other diseases. Research has shown a statistical correlation between areas that have foreclosed homes with neglected swimming pools and an increase in the occurrence of WNV in nature and in humans.



Aerial Photography Located 742 Possible Neglected Pools in 2009

The District surveyed for neglected swimming pools using aircraft and citizen reports. Reports of these swimming pools generated service requests leading to inspections and treatment by District personnel. These swimming pools were treated by the District with environmentally compatible mosquito control products and/or *Gambusia affinis* (mosquito fish). Due to the difficulty of locating the responsible parties for foreclosed properties with neglected swimming pools, the District obtained a time-limited warrant to allow for the inspection and treatment of neglected pools where permission to access was not otherwise readily available, A total of 845 possible neglected swimming pools were investigated by the District in 2009, including reports from concerned residents and observations from aerial surveillance.

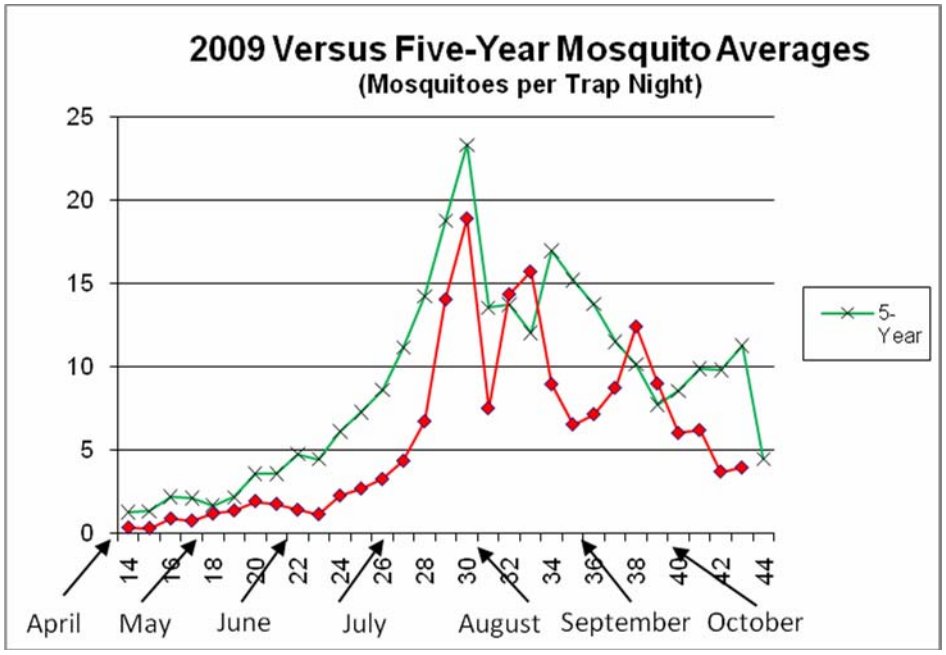


SERVICE REQUESTS

District personnel personally respond to all requests for service by members of the public within the District. Types of services performed include providing information, distributing mosquito fish, and performing various types of mosquito control as needed. Service requests are a useful tool to assist the District in locating specific mosquito problems that are not easily detected by other surveillance methods. Typical causes of service requests by the public include mosquito nuisance problems, reports of neglected swimming pools or other potential mosquito breeding sites, and requests for mosquito eating fish. There were a total of 746 service requests of various kinds (see chart above) in 2009.

ADULT MOSQUITO LIGHT TRAP PROGRAM

Adult mosquito-collection traps are used by the District to monitor adult mosquito population trends. Traps are placed strategically throughout the entire district to attract and capture mosquitoes over long periods of time. Mosquitoes from the traps are sorted and counted weekly to provide statistics used by the District to set mosquito control priorities. A total of twenty-five traps comprised the adult mosquito surveillance program, which was operated from April through October 2009. Per night tallies of mosquito numbers from all operational traps were reported to the California Department of Public Health (CDPH) as part of an integrated statewide surveillance program.



Adult Mosquito Light Trap Counts

Mosquitoes achieved peak populations of 22 mosquitoes per trap night on about July 30. Mosquito populations were generally at or below seasonal averages in 2009. The common species observed in the traps throughout the season was *Culex pipiens*, a species that has been implicated in the spread of West Nile virus. The average number of mosquitoes per trap night in 2009 was down 22.1% and 47.4% compared to the years 2008 and 2007 respectively. The single greatest factor influencing overall numbers of mosquitoes within the District is mosquito breeding that occurs in industrial settings at the District. The predominant species of mosquito produced at these locations is a known vector of West Nile virus.

WEATHER MONITORING

Weather has significant effects on mosquito activity as well as the District's ability to perform chemical mosquito control. For this reason four weather-monitoring towers are located throughout the District to provide real-time information to District personnel. This information is vital to help guide mosquito control efforts and can be viewed by following the Weather Page link on the District's homepage at shastamosquito.org.

Increased temperatures speed up the rate at which mosquitoes reproduce. Increases in precipitation increase areas of standing water in which mosquitoes can breed. Other factors such as unseasonably cold temperatures, low humidity and high wind decrease the level of

mosquito activity. For this reason, the weather station located at the District office provides continuous data on temperature, humidity, wind speed and precipitation, which is stored on a computer where the information can be used for data analysis useful to District personnel and researchers.

Proper weather conditions are vitally important to assure the safety and efficacy of products applied for adult mosquito control. These products are put out by highly specialized application equipment that applies very low doses of concentrated mosquito control products in the form of extremely fine droplets over large areas. To be effective these products must drift through an area and stay low to the ground where the mosquitoes are flying or resting. The weather condition that allows this to occur is called a temperature inversion. This means that cold air near the ground is capped by a layer of warmer air above. This keeps the air near the ground from rising, and carrying the mosquito control product out of the target area. The four weather stations within the District take temperature readings at eight feet and thirty feet above the ground to ascertain whether a temperature inversion is present. Adult mosquito control is not performed unless the presence of an inversion assures that safe and effective use of these products is possible.

ENCEPHALITIS SURVEILLANCE PROGRAM

Mosquito-borne encephalitis diseases are viral diseases transmitted to birds, humans and horses by mosquitoes. In California these diseases include western equine encephalomyelitis, Saint Louis encephalitis and West Nile virus. These viruses are found naturally in birds where they usually cause no obvious physical symptoms (except for West Nile virus), but can be transported long distances by bird migration. Shasta Mosquito and Vector Control District is part of a statewide, integrated program for the detection of mosquito-borne virus diseases.

Sentinel Chicken Flocks: Mosquito-borne viruses in California have birds as their natural reservoir hosts. For this reason Shasta Mosquito and Vector Control District maintained chicken flocks to check for the presence of mosquito-borne diseases in the bird population that are transmissible to humans and horses. Cooperating landowners within the district allowed their properties to be used by the District as sentinel chicken locations. There were five sites with eleven chickens per flock within the District. Blood samples were taken from the chickens every two weeks from April 15 through October 14, for a total of 845 blood samples, which were submitted to the California Department of Public Health (CDPH) for analysis in 2009. No West Nile virus or other mosquito-borne disease was detected in any of the District's sentinel chickens in 2010. This is the first year since WNV arrived in Shasta County in 2004 that no WNV has been detected in any of the District's sentinel chickens.

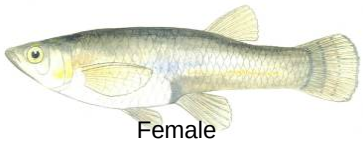
Live Mosquito Samples: In areas of high mosquito occurrence, samples of live adult mosquitoes were collected, sorted, grouped by species, placed into vials, and tested for the presence of encephalitis viruses. A total of 298 samples of live mosquitoes, generally 12 to fifty mosquitoes per sample, were tested at the U.C. Davis Arboviral Research Unit. Two of the samples submitted to Davis in 2009 were found positive for WNV. No other evidence of any type of mosquito-transmitted disease was found in mosquitoes within the District in 2009. Three different species of mosquitoes in Shasta Mosquito and Vector Control District have

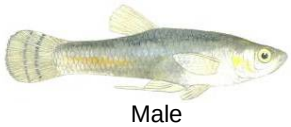
been found infected with WNV since its arrival in the District in 2004.

Dead Bird Surveillance: The spread of West Nile virus on the east coast has been characterized by conspicuous die-offs of birds – particularly in the crow family. The California Department of Public Health (CDPH) has instituted a program to receive and test dead birds submitted by mosquito districts for the detection of West Nile virus. When someone finds a dead bird they are encouraged to call the state West Nile virus Hotline, 1-877-WNV-BIRD. Dead birds can also be reported through the CDPH West Nile virus website at westnile.ca.gov. Depending on workload and the prevalence of WNV in a particular area, Districts may collect dead birds to test for the presence of WNV or merely track the locations of dead birds as a statistical indicator of the level of WNV activity in affected areas. Eight of 41 dead birds collected within the District were tested and found positive for WNV in 2009. The number of dead birds reported in 2009 was so low that the District was able to continue collecting and testing birds throughout the season. In all 62 dead birds were reported from within the District in 2009. Although very few WNV-positive dead birds were found, they were collected over a very broad area including the vicinity of Shasta Lake City, several areas of Redding, and Shingletown.


Technician Collects a Dead Magpie

BIOLOGICAL CONTROL


Female

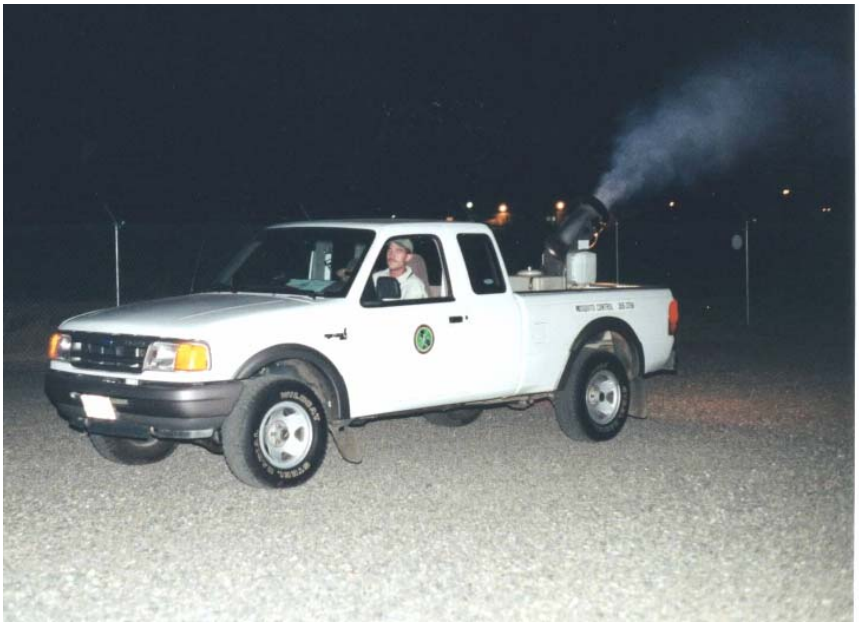

Male

The Shasta Mosquito and Vector Control District uses the mosquito-eating fish (*Gambusia affinis*) to control mosquito larvae within the district. Mosquito-eating fish are maintained in holding ponds, and transferred to holding tanks at the District office. In addition to stocking natural areas throughout the District by mosquito control technicians, mosquito-eating fish are distributed free-of-charge to residents within the District for use on their properties. District personnel will deliver fish to residents for use in permanent water sources anywhere within the District. With the help of two fish ponds added in 2008 the District had adequate fish supplies to meet its needs throughout the 2009

season. The following is a summary of District activities related to the distribution of *Gambusia affinis* in 2009:

Fish Retrieving:	84.9 Hours Retrieving
Fish Transferring*:*	3.0 Hours Transferring
Fish Stocking:	233.5 Hours Stocking
Fisheries Maintenance	325.25 Hours
Total Biological Control	**646.65 Hours**

CHEMICAL CONTROL



Adult Mosquito Control

The Shasta Mosquito and Vector Control District uses a variety of chemical control techniques in circumstances where other methods are ineffective or impractical. Larvicides are applied to standing water to control mosquito larvae in areas that cannot be controlled by mosquito-eating fish due to their inaccessibility, transient nature, or other factors. Very sophisticated chemicals are used for larvicide work. These chemicals have very low impacts on the environment due to their highly specific nature and the very low doses which can be used for mosquito control work. These products provide a high level of control, but are more expensive and require more training and continuing education for the mosquito control technicians.

The presence of large numbers of adult mosquitoes, or the detection of mosquito-transmitted diseases within the District triggers application of adulticides in areas of concern to eliminate infected adult mosquitoes. Adulticides are applied at ultra-low volumes (ULV) as aerosols over large areas. Pesticides used in these applications are not harmful to non-target organisms at the rates used for adult mosquito control. The applications are generally made before dawn under very stringent weather guidelines to provide maximum effectiveness while minimizing human exposure.

Vegetation control products are used by the District to eliminate cover around the edges of water sources that may provide protection to developing mosquito larvae and/or prevent mosquito sprays from getting to the water surface. Vegetation control products are also used to help keep trails open and maintain access to mosquito sources. All pesticide work is done through cooperative agreements with the CDPH and the California Department of Pesticide Regulation (CDPR). All pesticide use is reported to these agencies on a monthly basis.

Adulticiding:	335.25 Hours	
Total Acres	143,775 Acres Treated	
Larviciding:		
Agricultural Sources	181.67 Hours	29.61%
Industrial Sources	62.50 Hours	10.22%
Natural Sources	287.17 Hours	46.97%
Residential Sources	45.58 Hours	7.46%
Uncategorized	34.42 Hours	5.63%
Total Larviciding	611.33 Hours	100.00%
Total Larviciding Acres:	5,087 Acres Treated	
Chemical Vegetation Control	219.83 Hours	
Total Acres	217.83 Acres Treated	

PHYSICAL CONTROL:

The Shasta Mosquito and Vector Control District has a program to reduce or eliminate mosquito breeding areas by managing the water sources where mosquitoes breed. Such physical control includes clearing vegetation around pond or stream banks, improving drainage, and providing access for other types of control work. The District works in cooperation with the local California Department of Fish and Game

Physical Control with Bulldozer

on its physical control projects.

Equipment:

Total Bulldozer Time	0.8 Hrs.
Total Backhoe Time	95.2 hrs.
Helper Time	4.4 Hrs.
Total Equipment Time	100.4 Hrs.

Physical Control By Hand

Brushing	249.00 Hours
Brushing by Sugar Pine	103.6 SMVCD Hours
Burning	33.8 Hours
Empty Containers	1.4Hours
Beaver Dam Removal	64.5 Hours
Total Physical Control by Hand	425.3 Hours

SOURCE PREVENTION INPUT

With the cooperation of the planning departments of Shasta County and the cities of Anderson, Redding and Shasta Lake, the District reviews proposed development, such as subdivisions, commercial developments, and lot splits, in an attempt to reduce and prevent the creation of new mosquito breeding sources, to ensure adequate drainage, and District access to mosquito breeding sources.