SHASTA MOSQUITO AND VECTOR CONTROL DISTRICT
2003 ANNUAL REPORT

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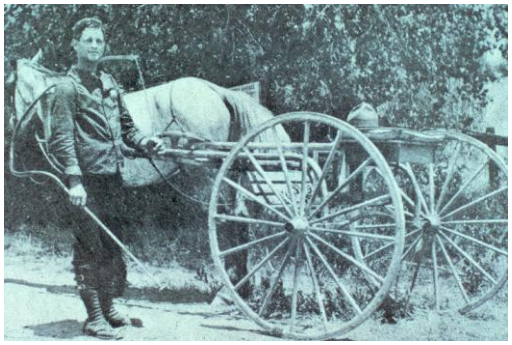
HISTORY


Early Mosquito Control

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 uncommon in the District today, however 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 with heavy mosquito population that had previously been sparsely populated with people.

DISTRICT ORGANIZATION

District Boundaries

The Shasta Mosquito and Vector Control District is a special district type of government agency operating within the boundaries of Shasta County. The District encompasses approximately three hundred eighty-seven square miles and includes the incorporated cities of Anderson, Redding and Shasta Lake. The District boundaries extend from Mountain Gate on the north to Cottonwood Creek on the south and extend from the town of Shasta on the west to Millville 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 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, are determined by land use and size, and are collected on Shasta County property tax bills. Only the people within

the District pay the benefit assessment charges.
The District does not receive any share of sales tax, cigarette tax, motel occupancy tax, gasoline tax, state grants, or other allocations. In the 2002-2003 fiscal year, the District's income was approximately $1.31 million; approximately 60% derived from property taxes and 40% from the benefit assessment charge. In the 2003 year, the District employed twelve full-time people, one part-time person, and two seasonal people.

DISTRICT ACTIVITY

The District performs mosquito control activities and vector information services to protect the public's health 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 the 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 diseases 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 and often does 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.

Dog Heartworm is a disease transmitted by mosquitoes that are abundant 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. The West Nile Encephalitis Virus, which first appeared in the United States in New York in 1999, and has killed hundreds of people, countless wild birds, and thousands of horses in the U.S. since its arrival, is a disease transmitted by mosquitoes. Migrating birds and blood-feeding mosquitoes have spread Went Nile virus throughout the U.S. in the four years since its introduction. In 2003, West Nile Virus was found for the first time in California in wild birds, sentinel chickens, three people and one horse. West Nile Virus is an example of the ever-present human health risks from new, emerging human diseases transmitted by mosquitoes. The type of mosquito that transmits the West Nile Encephalitis Virus disease is the most abundant species of mosquito found in the District.

The District's mosquito control program is a comprehensive control program, which 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 before they become adult mosquitoes. The District's larviciding chemical control program includes the use of relatively new types of chemicals that are effective in killing mosquito larvae but are safe for non-target organisms. These chemicals are by-products of bacteria, and 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.

The District performs adult mosquito (adulticide) control 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. Adulticide chemicals are applied in ultra low volume amounts and the pesticides used in these applications are 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.

Chemicals 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 Health Services 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 insect 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 for 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.

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.

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. The District also plans and staffs an exhibit at the Shasta District Fair annually. Educational materials relating to District activities are provided to the public in static displays at the Turtle Bay museums. In addition, the District provided training and demonstration supplies to the Museum Teen Volunteers to talk to visitors at Turtle Bay about mosquito and vector control issues. The District provides information to various media to inform residents about District activities and to promote help in minimizing or eliminating mosquito breeding sources, particularly sources around the home, such as standing water in buckets, tires, birdbaths, etc.

The District responds to calls for service by having a technician visit, survey and discuss the mosquito problem with the caller. When possible and necessary, additional mosquito control is performed to respond to mosquito problems.

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.

The District also conducts an encephalitis surveillance program to monitor the human health risk from mosquito-transmitted diseases (See Encephalitis Surveillance Program in this report). 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 Health Services 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.

RESULTS OF DISTRICT ACTIVITY

An on-going challenge for the District is to provide information to the public on the District's activities and resulting public benefit. Shasta Mosquito & Vector Control District provides a high level of mosquito control, which protects the public's health and comfort from diseases and nuisance caused by mosquitoes through the use of environmentally compatible, state of the art products and techniques. Adult mosquito control programs are conducted early in the morning or late in the evening when public outdoor activity level is lowest. Much of the District's other control activities take place in remote inaccessible areas out of public view. Therefore many citizens may not realize that the lack of mosquito problems and diseases caused by mosquitoes in this area is the result of efficient, effective on-going mosquito control. Potential human health problems from diseases caused by mosquitoes such as Malaria, Western Encephalitis and St.

Louis Encephalitis as well as Dog Heartworm in pets are an ever-present risk. New emerging diseases, such as West Nile Encephalitis Virus and other mosquito-borne diseases present on-going challenges for mosquito control.

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT ISSUE

Shasta Mosquito and Vector Control District faces many challenges in performing its duty to protect public health while protecting the environment and meeting legal requirements imposed by a wide variety of government agencies. Occasionally, the conflict between these different responsibilities can be so severe that in-depth legal interpretation may be required in order for the District to decide what it may or may not do. In 2001 a legal issue arose that, in the opinion of the District manager and Board of Trustees, threatened the District's ability to protect public health through environmentally responsible control of mosquitoes that may transmit disease. The issues involved are too complex to be explained thoroughly in this report; but a more complete explanation of the situation can be obtained by contacting the District for more information. What follows is a very general overview of the agencies and issues involved in this situation:

Shasta Mosquito and Vector Control District uses public health pesticides to kill mosquito larvae in water following joint recommendations of the National Centers for Disease Control and the United States Environmental Protection Agency (USEPA). USEPA is the federal agency that establishes regulations for the safe and effective use of pesticides in the United States under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA). USEPA is also the agency that protects the quality of waters of the United States through the Federal Clean Water Act (CWA). The California State Water Resources Control Board (SWRCB) is the state agency in charge of protecting water quality in California through enforcement of the same Federal Clean Water Act (CWA). A 2001 decision by the Federal Ninth Circuit Court of Appeals (the Court) has led the SWRCB to the opinion that all public agencies that apply <u>any</u> pesticides to waters of the U.S. must possess an NPDES permit in order to comply with the Clean Water Act. In 2003 USEPA wrote an opinion stating that mosquito control agencies using legally registered products for their intended purpose of controlling mosquito larvae do not need a NPDES permit to apply these products to waters of the U.S. The SWRCB has ignored this USEPA opinion and stuck with the earlier ruling by the Court as the basis for requiring a NPDES permit for mosquito larval control.

Shasta Mosquito and Vector Control District has carefully considered this issue and concluded that the SWRCB has misinterpreted the Court's ruling, disregarded USEPA guidance, and overstepped its authority by issuing the new NPDES permit. The District is continuing to work with agencies and organizations at the state and federal level to obtain official exemption from the requirements of these types of permits.

PROFESSIONAL AFFILIATIONS

The Vector Control Joint Powers Agency provides for various insurance needs of the District while providing a substantial cost savings to the District. The District also belongs to the Mosquito and Vector Control Association of California for benefits such as the continuing education of mosquito control technicians, legislative representation, funding for mosquito research through the MVCAC Research Foundation, and the gaining and sharing of information on the effective operation and management of mosquito and vector control districts. These

affiliations have been useful in developing a unified statewide approach to dealing with issues of mutual concern, such as the NPDES permit and the anticipated arrival of West Nile Virus in California. As part of a larger unified body we can help to assure that support of mosquito and vector control will be a component of regulations affecting public health pest control chemicals and other issues that affect the health of the public.

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. Additionally, it has given District personnel access and input with key officials involved in making land use decisions involving mosquito-breeding wetlands within the city limits of Redding affecting a large segment of the public served by 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.

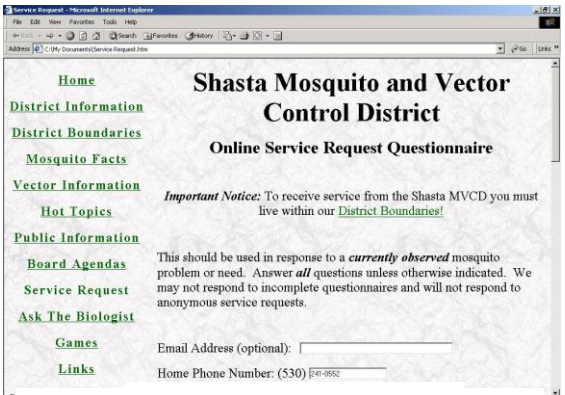
Shasta Mosquito and Vector Control District's comprehensive pest management strategy includes an active program of public health education. The District provides over twenty-five brochures on a wide variety of topics related to mosquitoes as well as other vectors and the diseases they spread. In the 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. Biologists on-staff provide 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 Biologist and Associate Biologist also give 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.

The District Biologist and Associate Biologist gave classroom presentations at four local elementary schools on mosquito and vector control and other issues related to biology. The District manager and biologist also gave informational talks on District activities to the Redding City Council, Shasta Lake City Council, Anderson City Council, and the Shasta County Board of Supervisors. Additionally, interviews were given with KNVN Channel 24, KHSL Channel 12, KRCR Channel 7, 9 and KQMS Radio as well as the Valley Post and Record Searchlight newspapers.

The District's field trip program was in its third year. Ten classroom groups of about forty students each visited the District's Educational Demonstration area in 2003. Field trips were conducted from April through November. Classes attending the field trips were shown such things as mosquitofish rearing, weather observation, sentinel chickens and a light trap together

in a relatively small and aesthetically pleasing location. The field trips lasted about two hours and the participants generally brought sack lunches to eat under the gazebo and on the lawn. We received excellent feedback and plan to host many more field trips in 2003.

The District's fair display that deals with the public health importance of vector-borne disease and the nature of the work done by the District was updated this year for the Shasta District Fair in June. The fair booth this year was twenty-feet (two booth spaces) wide. Topics in the display included District activities such as biological, physical and chemical control of mosquitoes. Live specimens included mosquito eggs, larvae, pupae and adults as well as mosquito fish. A new demonstration encouraged people to place their hand in a cage full of male mosquitoes. This was a great way to initiate interest and questions. The booth also had a contest to guess how many mosquitoes were in a jar. People submitting the closest guesses won family passes to Turtle Bay. Other display items included views of mosquitoes through a microscope and preserved specimens of vectors and other pests important in disease transmission. All of the Districts brochures, bookmarks, stickers, hand-stamps and activity books were available free-of-charge and District personnel were at the booth to answer questions from the public directly from 11:00 A.M. until the Fair closed at 10:00 or 11:00 P.M. The District finds the fair booth to be an effective way to get our message out to thousands of people who live within the District that allows one-on-one contact between District personnel and a large segment of the public.



SMVCD Web Site

The Associate Biologist trained the Museum Teen Volunteers at Turtle Bay to talk to visitors once a week from the end of April through the beginning of September about mosquitoes and the District programs. The display, brochures and demonstration materials were provided to the volunteers weekly as well as a review and any new updates. The Associate Biologist also updated many of the brochures produced at the District.

Major changes were made to the Shasta Mosquito and Vector Control District web site www.snowcrest.net/mosquito in 2003. The site still has a wealth of information and links related to mosquito and vector control and District activities but is organized in a more user friendly way. Forms on the website allow the public to ask biologists questions via email or submit service requests online. A section with several different mosquito games has also been added that is geared for kids. In 2003 there were approximately 2000 hits on the website.

SERVICE REQUESTS

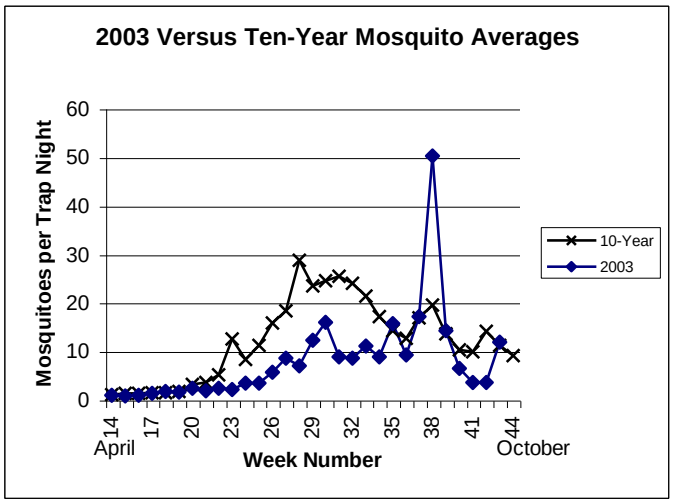
District personnel personally respond to all requests for service by members of the public within the District. Types of services performed include providing information, distributing mosquitofish, and performing various types of mosquito control as needed.

Total Service Requests:	725 (some requests have multiple causes)
Mosquito Complaints	430
Requests for Fish	313
Other	18

Outside District	18
Vector	1

ADULT MOSQUITO LIGHT TRAP PROGRAM

Adult mosquito traps are used by the District to monitor adult mosquito population trends. Traps are place 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 eighteen traps comprised the adult mosquito surveillance program, which was operated from January through October 2003. Per night tallies of mosquito numbers from all operational traps were reported to the California Department of Health Services as part of an integrated statewide surveillance program



Mosquitoes achieved peak populations of 50.24 mosquitoes per trap night on August 1. 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. Mosquito numbers throughout the District were lower in the 2003 season as a whole compared to the previous ten years. Yearly mosquito totals showed a decline from 1997 through 1999 but rose between from 2000 to 2002. The average number of mosquitoes per trap night in 2003 was down 44% and 37% compared to the years 2002 and 2001 respectively. There were difficulties in controlling mosquitoes at a lumber mill that influences mosquito numbers at two of the traps. The use of new products tested in 2003 may help control mosquitoes at those locations (see section on research).

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. No evidence of encephalitis was found in the Shasta Mosquito and Vector Control District in sentinel chickens, pools of mosquitoes, or dead birds. All encephalitis activity within the state was restricted to Riverside, Imperial, San Bernardino, Los Angeles and Orange Counties in Southern California in 2003.

Sentinel Chicken Flocks: The 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 twelve to thirteen chickens per flock within the District. Chickens were bled every two weeks from April 9 through October 23, for a total of 770 blood samples, which were submitted to the

California Department of Health Services (DHS) for analysis in 2002, all of which were negative.

Mosquito Pools: In seventeen areas of high mosquito occurrence, samples of live mosquitoes were collected, sorted, grouped by species, placed into vials, sent to the California Viral and Rickettsial Disease Lab (VRDL) and tested for the presence of encephalitis viruses. Because of the possibility of West Nile Virus, the number of pools was increased from seventy-seven pools in 2002 to 104 pools of approximately fifty mosquitoes each in 2003. Fifty pools of *Culex tarsalis*, the most common encephalitis-transmitting mosquito in California, were tested. Forty-three pools of *Culex pipiens*, a mosquito species known to transmit West Nile Virus were captured and submitted. Eleven more pools of mosquitoes of other species that may transmit WNV were submitted. In addition, approximately 20 smaller pools of mosquitoes of various species were tested in-house in our lab. All mosquito pools tested or submitted by the District in 2003 were negative for any kind of encephalitis virus.

WEST NILE VIRUS

West Nile Virus (WNV) is a type of encephalitis closely related to St. Louis encephalitis. 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 Oregon, Alaska, and Hawaii. In the United States 9186 people were diagnosed with and 231 people died from West Nile Virus in 2003. This disease is particularly devastating to horses and birds where obvious neurological symptoms and death are common. The District has not detected the virus in any sentinel chickens, mosquitoes, or dead birds but anticipate the arrival of the disease within the District within the next couple of years.

Like most Western Equine encephalitis and St. Louis encephalitis West Nile Virus is transmitted by mosquitoes and the reservoir hosts are usually 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). West Nile Virus has also been found in many other species unaffected by other types of encephalitis, such as dogs, seals, and alligators.

District Technician Picking Up Dead Magpie

Most people infected with the disease 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 Salton Sea area in July of 2003. From then until the end of 2003 locally acquired WNV was detected in 70 sentinel Chickens, 32 mosquito pools, 96 dead wild birds, one horse and three humans. There have been no human or horse fatalities from WNV so far in California.

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 Health Services 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. The state then determines if the bird is appropriate for testing and notifies the mosquito control agency that covers the area in which the bird was found and requests the district to pick up the bird and mail it for testing. This is an important new early-warning tool to protect public health from this new emerging disease threat. Shasta Mosquito and Vector Control District responded to 14 calls relating to dead birds in 2003. The District submitted 8 birds to the state for virus testing. No West Nile Virus was detected in the birds submitted by Shasta MVCD.

West Nile Virus Task Force: In 2003, Shasta Mosquito and Vector Control District joined with thirteen other agencies and organizations with interests in health, the environment, animal control and wildlife issues to form a countywide task force to develop a Shasta County West Nile Virus Action Plan. The action 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 group 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.

Out of District Control and Surveillance Contract with Shasta County: The imminent threat of the arrival of West Nile Virus raised new concerns about how Shasta County could deal with a public health emergency in the event of the occurrence of WNV or other mosquito-borne diseases outside of areas covered by organized mosquito districts. Shasta Mosquito and Vector Control District considered that allowing WNV to become established within Shasta County, but outside the District, increased the risk that this disease could be brought into the District by infected birds or mosquitoes.

The District had to consider several issues before deciding to perform any sort of mosquito control work outside the District. The California State Health Code only permits mosquito control by District personnel outside of District boundaries within the flight range of mosquitoes. This does not take into account the role of birds in transporting diseases such as WNV. Also the District needed assurance that the Shasta County Board of Supervisors and the Local Agency Formation Commission (LAFCO) felt that mosquito control for public health protection outside of the District was appropriate and necessary. The District also considered the fact that there was not adequate surveillance information available to our personnel to indicate the level and extent of mosquito breeding outside of District boundaries. Without this information the District could not make informed decisions about where mosquito control could or should be conducted outside the District. Finally, the District was concerned that it might not be appropriate to take equipment, materials, and manpower paid for by residents of the District and use it to provide services to people who have historically chosen not to pay for mosquito control services.

An agreement was drawn up between the District and Shasta County to deal with these issues. The agreement authorized the District by agreement of the Shasta County Board of Supervisors to provide surveillance and control of mosquitoes for the protection of public health from the threat of West Nile Virus. The agreement specified that the District would do limited surveillance of mosquito populations and virus activity in populated areas of Shasta County outside of the District. The agreement also stated that the District could perform adult mosquito control outside of the District, if necessary, to contain the spread of West Nile virus. Finally, the County would reimburse Shasta Mosquito and Vector Control District for the cost of the out-of-District surveillance and control. The District Biologist set portable traps to catch mosquitoes for population estimates and virus testing in the areas of Igo-Ono, French Gulch, Shingletown, Round Mountain, and Interstate 5 north of Lake Shasta in 2003. No mosquito-borne virus was detected from any of these out-of-District mosquito pools and no emergency control action was conducted.

RESEARCH

University of California researchers have continued to study Culex pipiens mosquito larvae from Shasta Mosquito and Vector Control District. University personnel have had difficulty in raising these mosquitoes in laboratory conditions, so the District traps live samples, and sends them to researchers for use in various projects. These mosquitoes have also been found to transmit West Nile Virus in a laboratory setting.

There is always a concern that too much reliance on a single product or technique can lead to the production of mosquitoes that can survive those types of control efforts. In 2003 the District experimented with new products and application techniques for treating mosquitoes that breed in stacks of logs at local lumber mills. We found that we could get very effective mosquito control using a product that we had previously believed would not be effective in the polluted water at these locations. We also found a larval control application technique that will greatly increase our efficiency in treating larval sources at one of the lumber mills.

Since the type of mosquitoes that breed at lumber mills can spread West Nile Virus, the District has a interest in these mosquitoes and where the adults travel after they leave the mills. In 2003, the District did an experiment called a marked release-recapture in an attempt to track mosquitoes leaving one of the local lumber mills. In this experiment, a large number of adult mosquitoes were trapped at the mill and “marked” with a fluorescent powder. They were then released at the mill. A pattern of mosquito traps was set up leading away from the mill, and attempts were made on subsequent evenings to recapture marked mosquitoes. We were unable to retrieve any of our marked mosquitoes on this attempt. Most often, when these types of experiments are conducted, many more mosquitoes are released than we were able to get for our experiment. We may have to try the experiment several more times in upcoming years to reliably ascertain how far mosquitoes travel from these sources.

All of the above research has been reported to professional pest control and health protection associations and some of it is slated for publication in peer-reviewed journals.

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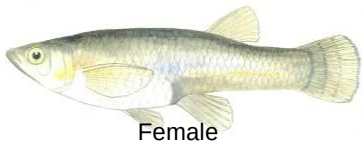
BIOLOGICAL CONTROL


Female


Male

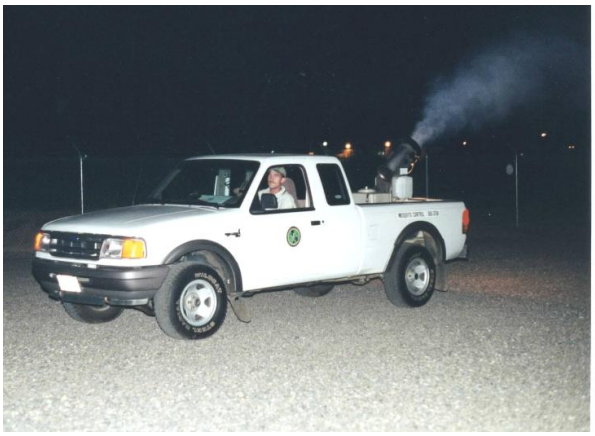
The Shasta Mosquito and Vector Control District uses the mosquito-eating fish (*Gambusia affinis*) to control mosquito larvae in permanent water sources within the district. Mosquito-eating fish are maintained in holding ponds, and transferred to holding tanks at the district office. In addition to stocking 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.

Fish Retrieving:	52.42 Hours Retrieving
Fish Transferring:	5.67 Hours Transferring
Fish Stocking:	62.25 Hours Stocking
Fisheries Maintenance	196.17 Hours
Total Biological Control	316.50 Hours

CHEMICAL 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 that do not adversely affect 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-borne diseases within the District triggers application of adulticides in areas of concern. 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.


Adult Mosquito Control

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 California Department of Health and the California Department of Pesticide Regulation. All pesticide use is reported to these agencies on a monthly basis.

Adulticiding:	160.65 Hours	
Total Acres	39687.65 Acres Treated	
Larviciding:		
Agricultural Sources	236.17 Hours	19.23%
Industrial Sources	115.00 Hours	9.36%
Natural Sources	713.75 Hours	58.12%
Residential Sources	163.17 Hours	13.28%
Total Larviciding	1228.08 Hours	100.00%
Oil-based:	170.47 Acres Treated	
Biorational:	2,272.83 Acres Treated	
Total Acres:	2,443.30 Acres Treated	
Chemical Vegetation Control	444.25 Hours	
Total Acres	222.91Acres 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.

By Equipment:

Total Backhoe Time	349.33 Hrs,
Helper Time	48.67 Hrs

Physical Control By Hand

Beaver Dam Removal	7.75 Hours
Brushing	472.00 Hours
Brushing by Sugar Pine	129.25 SMVCD Hours
Burning	274.33 Hours
Empty Containers	2.58 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 and lot splits, in an attempt to reduce the creation of new mosquito breeding sources, to ensure adequate drainage, and District access to mosquito breeding sources.

SHASTA MOSQUITO & VECTOR CONTROL DISTRICT

2003 ANNUAL REPORT

William C. Hazeleur, District Manager
John Albright, District Biologist

District Board of Trustees
President C. Bruce Wade, Shasta County
Vice President Glenn Shaw, City of Shasta Lake
Secretary Marvin Bennett, City of Anderson
Gary Hergert, Shasta County
Bob Michiels, City of Redding

Board of Trustees Meetings are held the third Tuesday of each month at 1:30 p.m. at the District Office:

19200 Latona Road
Anderson, CA

Agendas are available online at www.snowcrest.net/mosquito/Agendas/current_agenda.