

# 2010 ANNUAL REPORT



## Santa Cruz County Mosquito and Vector Control



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(831) 454-2590

Write to us at: Pesthelp@agdept.com

Visit our website at: [www.agdept.com/mvc.html](http://www.agdept.com/mvc.html)

## Manager's Introduction:

Your Mosquito and Vector Control program is now in its 18<sup>th</sup> year. Formed in 1993 by the Santa Cruz County Board of Supervisors as a result of public demand, Mosquito Abatement / Vector Control CSA53 is a section of the Agricultural Commissioner. The program went countywide in 2005 with additional funding as a result of approved annexations and successful public balloting with property-based benefit assessments. Our mission is to provide responsive and effective protection to the public and improve the quality of life here in Santa Cruz County by managing pests that are a threat to public health.

We are proud of the efficiency of our operations in the control of vectors such as mosquitoes, rodents, flies and yellow jackets, the education of the public regarding ticks and the monitoring and reduction of diseases transmitted by these pests. Staff is skilled in Integrated Pest Management, inspecting wetlands, investigating complaints, informing property owners and finding and monitoring breeding sources. They use good judgment and ecologically sustainable practices and find non-pesticide and least-toxic mosquitocide solutions in the control of vectors.

We are grateful for a supportive and cooperative community that appreciates our hard work and the assistance of the State, other County departments, the universities and the Mosquito and Vector Control Association of California. Please enjoy this record of our achievements and provide your feedback so that we can further enhance our public health services. We strive to serve and be transparent. Call us at (831)454-2590 or visit our website at <http://www.agdept.com/mvc.html>.

Respectfully, *Paul Binding*



Pictured from left to right: Paul Binding, Lori Filiau, Ray Travers, Andria Hernandez, Doug Anderson, Melanie Benedetti, Nader Sidhom, Steve Driscoll

## Staff 2010:

Ken Corbishley	Director / Agricultural Commissioner
Mary Lou Nicoletti	Deputy Director / Agricultural Commissioner
Paul Binding	Assistant Vector Control Manager
Ray Travers	Vector Control Specialist
Nader Sidhom	Vector Control Specialist
Andria Hernandez	Vector Control Specialist
Melanie Benedetti	Vector Control Specialist
Steve Driscoll	Vector Control Specialist
Lori Filiau	Senior Account Clerk
Doug Anderson	Student Worker
Jay Perna	Student Worker
Kirby Tan	Student Worker



## Mission Statement

At Santa Cruz County Mosquito and Vector Control we are committed to protecting the public from pests capable of transmitting disease or creating a nuisance through:

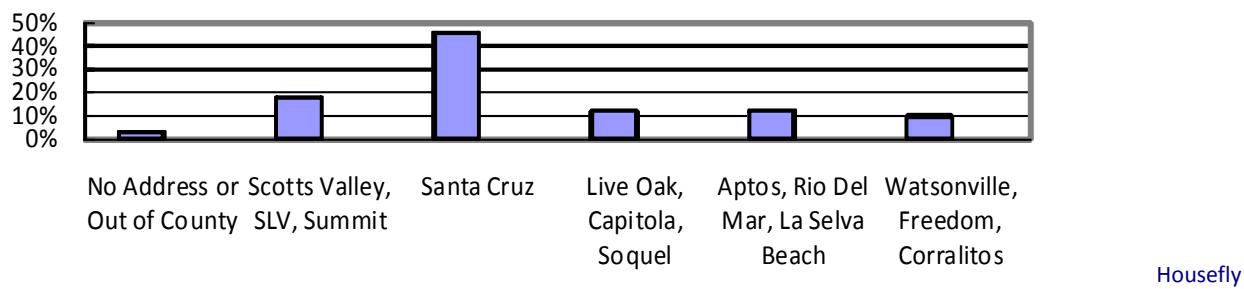
- Accountable, efficient service to safely suppress mosquitoes in an environmentally sustainable manner.
- Inspection, consultation and providing literature for the management of vectors such as Africanized honeybees, wasps, ticks, rodents, flies, etc.
- Control of nuisance yellow jackets in public areas.
- Monitoring for the presence of mosquito-borne encephalitis, West Nile virus, rodent-transmitted hantavirus and tick-borne Lyme disease, and reducing their risk to the public.
- Providing mosquito fish as a biological mosquito control to residents with ponds, animal troughs and fountains.
- Educational presentations about vector biology and control to public groups and schools.

## A History of Service

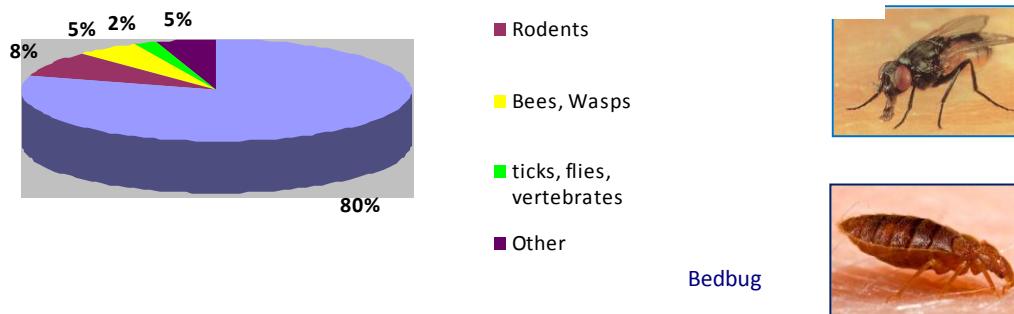
The Santa Cruz County Mosquito and Vector Control (MVC) was established in 1993 as a program within the Agricultural Commissioner's Office, in response to public demand for mosquito relief. In August 2005 the service area expanded from the south county (approximately 70 square miles, population 85,430) to the entire county (446 square miles, population 245,000).

The MVC recorded 389 requests for service in 2010 with the majority (46%) of calls coming from the Santa Cruz area. Seventy nine percent of calls were in regard to mosquitoes, 8% for rodents, 5% for bees and wasps, and less than 2% on average for ticks, flies, and various vertebrates (raccoon, skunk, ground squirrel, etc.). The percentage of calls regarding other vectors including mites, fleas, bedbugs, spiders, and parasitic worms was above average at 5%.

### Percentage of Service Requests by Area in 2010



### Types of Service Requests in 2010



## Mosquito Control

Source reduction, public education and the use of biorational larvicides are the functional elements of our program. The need to use mosquito adulticides is thus averted, as adulticides are less selective than the more targeted use of larvicides. Decisions to control mosquitoes are based on the species of mosquitoes found, their potential to spread disease and nuisance, and the presence of protected wildlife species, in cooperation with State and Federal natural resource management agencies and public and private landowners.

Helicopter treatments in South County sloughs and lakes are timed to reduce mosquitoes during the peak-breeding season using *Bacillus* and methoprene larvicides, which are largely non-toxic to non-target organisms (see page 10).

**Table 1. Mosquito Source Treatments from 2006 to 2010**

Year	Larvicide Applications*	Complaint Inspections	Locations Stocked With Mosquitofish**	Acres Treated by Helicopter
<b>2006</b>	2086	282	94**	341
<b>2007</b>	2012	288	96**	295
<b>2008</b>	1546	324	142	293
<b>2009</b>	1815	367	163	402
<b>2010</b>	1706	322	145	269

\* Includes mosquito sources treated with two different larvicides simultaneously, counted as two applications.

\*\* Does not include mosquitofish picked up at our office, which increases this number by up to 30%. In 2008 MVC discontinued the practice of public pick-up of fish, in cooperation with CA Department of Fish and Game. Instead we have adopted the policy of delivering the fish in order to prevent the introduction of mosquitofish into sensitive habitats.

The reduction of pesticide applications beginning in 2008 corresponded with the increased use of extended residual methoprene briquettes, which reduced the need for repeated applications, including surface films, in street drain catch basins that are designed to hold some residual water.

Private properties produce mosquitoes within ponds, neglected swimming pools, septic systems, animal troughs, tires, and plant containers. The MVC consults with residents in order to manage or eliminate breeding habitats. Source reduction is the preferred approach over pesticide applications. Notices are sometimes sent to residents asking for help in locating hidden mosquito sources. Residents contribute significantly in reporting pools and other sources that are found breeding mosquitoes.



Mosquitofish provide excellent control of mosquitoes in many situations. Mosquitofish in Santa Cruz County pre-date our program having been used statewide for several decades. The MVC cooperates with wildlife management agencies by not introducing mosquitofish into natural water bodies where they may compete with native fish and amphibians. They are stocked typically in yard containers such as large fountains, animal water troughs and fishponds.

The battle to control mosquitoes can be difficult. Machetes, brush-cutters, and chainsaws are wielded to access breeding sites that may contain poison oak, stinging nettle and blackberry; and yellow jackets may add to the challenge. Treatments often involve wading through deep mud and dense aquatic vegetation while carrying a backpack blower that can weigh up to 50 lbs.

## Vectorborne Diseases in Santa Cruz County

### Ticks and Lyme Disease

In 2010 Santa Cruz County had six reported cases of Lyme disease. The average is five cases per year, making Lyme our most important vector-borne disease. To assist the California Department of Public Health (CDPH) in surveillance, we collected three hundred sixty Western black-legged ticks (*Ixodes pacificus*) from high use recreational areas in State Parks including: Wilder Ranch, Henry Cowell, and Nisene Marks and tested for the bacteria (*Borrelia burgdorferi*) that causes Lyme disease. The 211 adult ticks and 149 nymphal ticks yielded an infection rate of 0% and 4.7% respectively (Table 2).



In recent years the infection rate of adult ticks from all locations averaged about 2%. Nymphal ticks were not collected until 2010. The tiny nymphal ticks present a greater risk of spreading Lyme disease than adult ticks as they carry a higher infection rate, and they and their bites are more likely to go unnoticed. Nymphs are found in cool moist environments, typically in leaf litter or on logs and tree trunks. Adult ticks of three common species are found on the tips of grasses and shrubs, often along trails, and readily attach to dogs, horses and our clothing.



According to the CDPH, the chance of getting Lyme disease is very low if ticks are removed within 24 hours of becoming attached. MVC identifies removed ticks for persons who have been bitten, and provides tick bite prevention and symptom recognition information to the public. We find awareness to be the most effective means of preventing tick-borne disease. Antibiotics are effective in treating Lyme disease in its early stages. For more information on Lyme disease please refer to the CDPH website at [www.cdph.ca.gov](http://www.cdph.ca.gov). Currently there is no efficient means to control ticks other than clearing brush and leaf litter.

Table 2. Santa Cruz County Tick Collection and Testing in 2010

Site	Collected	Adults	# Borrelia Positive Adults	Nymphs	# Borrelia Positive Nymphs
Wilder Ranch, Chinquapin Trail	1/8/2010	36	<b>0</b>	0	0
Wilder Ranch, Chinquapin Trail	4/9/2010	52	<b>0</b>	0	0
Wilder Ranch, Chinquapin Trail	5/5/2010	0	<b>0</b>	99	7
Wilder Ranch, Chinquapin Trail	6/2/2010	0	<b>0</b>	50	0
<b>Total for Wilder Ranch, Chinquapin Trail</b>		<b>88</b>	<b>0</b>	<b>149</b>	<b>7</b>
Henry Cowell, River Trail	1/8/2010	19	<b>0</b>	0	0
Henry Cowell, River Trail	4/9/2010	48	<b>0</b>	0	0
<b>Total for Henry Cowell, River Trail</b>		<b>67</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total for Nisene Marks, George's Picnic Area</b>	Mixed dates	<b>56</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Mosquitoes and West Nile Virus

No human cases of mosquito-borne West Nile virus (WNV) or other viral encephalitides were reported in the County, while statewide there were 111 confirmed human cases of WNV with 66 neuroinvasive cases and 6 fatalities in 2010 (Figure 3).



Figure 3. Human cases of WNV in California, 2010 Map courtesy of U.S. Geological Survey

The most significant vector of WNV in Santa Cruz County is the common house mosquito, *Culex pipiens*. This species is especially difficult to control because breeding sources can be difficult to locate. The larvae are often hidden within backyard sites in unmaintained pools, buckets, tires, animal troughs, roof gutters, and in underground sources of stagnant water, including utility vaults, street catch basins, sewer, and septic systems. Accordingly, treatments of street catch

basins are prioritized and coordinated with the aid of GIS mapping programs. Chronically breeding storm water systems are reported to City and County Public Works. The MVC contracts with aerial photography services to find unmaintained “green” pools using low-resolution photographs. Residents are also instrumental in reporting hard to find mosquito sources in their neighborhoods.



Twenty one dead wild birds were reported by County residents to the CDPH Dead Bird Hotline and collected and submitted by MVC for WNV testing in 2010, with four dead birds testing positive (5%). Thanks to residents for their valuable cooperation!

Blood samples from 'sentinel' chicken flocks located at Watsonville High School and our Capitol Road office were also submitted, with no positive WNV detections. Thanks to the students and staff of Watsonville High's Agricultural Sciences program!

## Special Projects

- Ray Travers, a Vector Control Specialist with MVC, earned a county employee recognition award for his work in GIS. Ray utilized GIS to conduct computer mapping of breeding sources and merge mapping with surveillance and control information for greater efficiency and reduced use of pesticides. It is cutting edge techniques such as this that earned mosquito districts in California the California Department of Pesticide Regulation's IPM Innovator Award.
- Thanks to the California Department of Corrections trail crews along with captains of the California Department of Forestry and Fire for assisting us with trail clearing projects to create access to mosquito breeding habitats in Watsonville and Scotts Valley.
- MVC assisted the California Department of Public Health (CDPH) in rodent surveillance and a Hantavirus study at Wilder Ranch. Hantavirus Pulmonary Syndrome is a rare yet frequently fatal virus transmitted through feces and urine of small wild rodents such as the deer mouse. Trapped mice were blood-sampled and released. Samples tested negative, and further study is planned.

## In the Laboratory

- Thousands of larvae and tens of thousands of adult mosquitoes were collected and identified to species.
- 21 dead birds were submitted for WNV testing, with four positive results.
- 14 samples of mosquitoes were submitted for encephalitis and West Nile virus testing with no viral activity detected.
- 640 sentinel chicken blood samples were submitted for encephalitis and WNV testing with no viral activity detected.
- 360 Western black-legged ticks were collected and submitted to DHS for Lyme disease testing, resulting in a total infection rate of 1.9%.



## Yellow Jackets and Bees

Five percent of callers inquired about yellow jackets and bees. The MVC abates yellow jacket nests when found in public areas and present a danger to residents. MVC generally does not eliminate honey bees, but refers reports of wild hives and swarms to beekeepers for their collection.



The spread of the Africanized honey bee (AHB) presents a threat to public health and beekeeping. Stinging incidents in some situations may result in life-threatening injury and death. Africanized bees respond in greater numbers than our European honeybee, and pursue their victims over greater distances. A disturbed colony may remain agitated for as long as 24 hours, attacking perceived threats up to a quarter mile from the hive. The bees may respond aggressively to everyday occurrences such as vibrations generated by passing vehicles, power equipment, and even foot traffic.

The AHB has colonized more than half of California and have been found as far north as Monterey County. The advance of the AHB throughout the central coast is anticipated, but has slowed significantly at its present position. Mosquito and vector control agencies where the AHB is established have dedicated significant resources to AHB abatement programs. The Santa Cruz County AHB Task Force developed an Action and Response Plan. The Agricultural Commissioner and the MVC will continue to monitor the movement of the bees.



### Current Distribution of Africanized Honey Bees in California

Counties shaded in brown are considered to have potential for colonization of Africanized Honey Bees. (Map courtesy of Sting Shield Insect Veil)

## Community Education

The MVC strives to educate and inform the public about vectors in our community and the services we offer, with special emphasis on mosquitoes, their breeding habitats, and how to eliminate and report mosquito sources. In 2010 our program provided:

- Educational exhibits on mosquito and vector control at the County Fair and Earth Day event in Watsonville.
- Classroom and other presentations on vector biology and control to over 360 students and various adult groups.
- Radio, newspaper, and television interviews on vector issues.
- Distribution of mosquito/WNV, tick/Lyme disease and other vector control pamphlets.
- Annual open house inviting the public to visit our facility.



## Environmental Care

The MVC prioritizes care for the environment, and utilizes Integrated Mosquito Management techniques, which involves:

- Emphasis on mosquito habitat reduction and water management techniques.
- Prioritization of least toxic means of pest reduction.
- Selective and sustainable treatments when mosquitoes exceed threshold levels with consideration of resident proximity, ecosystem balance, disease risk and other environmental factors.

- Focus on more efficient mosquito control in the larval stage, as opposed to the adult stage that requires less selective pesticides.
- Bio-control with fish where appropriate. Mosquito fish are delivered along with a written notice not to re-release them into natural bodies of water.
- Cooperation with environmental agencies in wildlife preserves, and assessment of mosquito abatement activities with respect to sensitive species.

## Pesticide Use and the Environment

Integrated Mosquito Management affords public protection and environmental safety. Some control strategies may involve water management and landowner education, while others require sustainable treatment, source reduction or abatement.

The MVC limits pesticide use to EPA registered materials that are biorational or least-toxic. Mosquitoes are controlled in the aquatic larval (juvenile) stage rather than the adult stage, as larval control treatments are environmentally sound and more effective in reducing mosquitoes before they emerge as adults and disperse. The MVC cooperates with the County's Integrated Pest Management (IPM) Departmental Advisory Group and the County and City of Santa Cruz's IPM policies.

California Tiger salamander



The MVC applies aquatic larvicides under a National Pollution Discharge Elimination System (NPDES) permit required in waters of the United States, and reports use to the Central Coast Regional Water Quality Control Board. The MVC has a Mosquito Management Plan on file with that agency and with the U.S. Fish and Wildlife Service.

***Bacillus thuringiensis israelensis (Bti)*** is a highly selective microbial larvicide (pesticide that targets mosquito larvae). Bti has an extremely low toxicity to humans, animals and other non-target pond life, and biodegrades in a matter of hours. ***Bacillus sphaericus (Bs)*** is a related larvicide that is particularly effective in polluted sources such as dairy and septic ponds. The California Department of Food and Agriculture and the Organic Materials Review Institute (OMRI) have certified some formulations of Bs as organic. Bti and Bs accounted for 85% of the total acreage treated in 2010 (page 10).

**Methoprene** is another biorational larvicide, known as an insect growth regulator. It mimics the juvenile hormone and disrupts mosquito metamorphosis into the adult stage. Methoprene is very selective, having little impact on non-target organisms. It is biodegradable and breaks down rapidly in the environment. Methoprene is non-toxic to humans and other animals at labeled dosage rates, is labeled for fish habitat, and approved by the World Health Organization for controlling mosquitoes in drinking water. Methoprene accounted for 13% of the total acreage treated in 2010.

**Larviciding oils** are of monomolecular film type or refined mineral oil that when applied to breeding sources form a thin film that suffocates mosquito larvae. The mineral oil biodegrades within a day, and the monomolecular film biodegrades within one to three weeks and can be used in potable water. Larviciding oils are the only available larvicides that can control mosquitoes in

their pupal (non-feeding) stage. Larvicing oils accounted for less than 2% of the total acreage treated in 2010.

**Herbicide** spot treatments are made to control poison oak along access trails to mosquito-breeding sources.

**Mosquito fish** are an important biological control method and may eliminate the need for pesticide treatments. The MVC has mosquito-eating fish available for backyard ponds, animal water troughs and non-maintained pools. Mosquito fish are not stocked where they may compete with native fish or amphibians.

## PESTICIDE USE BY SANTA CRUZ COUNTY MOSQUITO AND VECTOR CONTROL 2006-2010

Pesticide/Units	Units/Acre	2006	2007	2008	2009	2010
<b><i>Mosquito Larvicides</i></b>						
<i>Altosid - Methoprene</i>						
Briquets - (lbs)	7.0	11.6	15.3	19.4	20.3	13.0
Briquets - XR (lbs)	41.8	8.5	93.4	124.0	83.1	68.1
packets – WSP (lbs)	10 - 20	43.0	33.8	1.9	41.2	25.9
Pellets (lbs)	5 - 10	3.7	6.8	11.9	7.9	5.3
Single Brood Granule (lbs)	10 - 20	973.5	541.3	193.9	226.4	890.3
Liquid (gal)	0.03	0.1	0.1	0.1	0.1	0.04
Large packets – Tossits (lbs)	5 - 10	-	-	45	0.2	0
<i>Bacillus thuringiensis israelensis (Bti)</i>						
Vectobac 12AS (gal)	0.06 - 0.13	0.6	0.6	0.8	1.7	0.5
Vectobac Granules (lbs)	10 - 20	3648.6	3231.0	3847.6	5526.6	4464.4
<i>Bacillus sphaericus (Bs)</i>						
Vectolex (lbs)	10 - 20	2551.7	3408.5	3229.8	3151.6	2006.1
Zoecon WDG (lbs)	0.75 - 1.3	14.2	4.7	1.9	0.02	0
Vectolex WSP (lbs)	24	32.0	8.9	1.9	1.9	4.4
<i>Bti with Bs</i>						
Vectomax (lbs)	-	-	-	-	966.3	222.0
<i>Water Surface Films</i>						
Agnique MMF (gal)	0.5 - 1.0	0.3	0.2	0.2	0.3	0.3
Agnique Granule (lbs)	10 - 20	-	-	-	-	49.0
Golden Bear 1111 (gal)	3 - 5	41.6	54.4	48.5	11.4	15.8
<b><i>Wasp Insecticide</i></b>						
Hornet & Wasp Killer (15 oz can)	-	7	23	21	8	11
Drione (lbs)	-	0	0.3	1.3	1.0	2.5
<b><i>Herbicide</i></b>						
Monsanto Rodeo (gal)	0.6 - 0.9	0.2	0.3	0	0	0.1
Monsanto Aquamaster (gal)	0.6 - 0.9	2.6	6.7	6.2	1.1	0.9
ProSpreader Surfactant (gal)	0.06 - 0.1	.2	1.1	1.2	0.2	0.2

## Summary of Mosquito Larvicide Types Used In 2010



Larvicide Type	Acres treated	% of total treatments
Surface Films	7.1	1.7%
Methoprene	54.4	13.3%
<i>Bacillus</i> (Bti and Bs)	347.2	85.0%
<b>Total Acres Treated</b>	<b>408.7</b>	



## Mosquito Life Cycle



*Eggs*



*Larvae*



*Pupae*



*Adult Male*

## Financial Statement

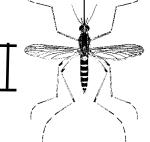
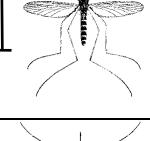
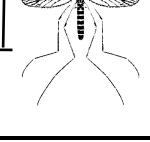
Revenues	2008-09	2009-10	%Change
South County Assessment (Original)	\$284,151	\$284,277	+0.05
South County Disease Control Assessment (est. June 2004)	210,893	210,849	-0.02
North County Mosquito Control Assessment (est. August 2005)	745,779	746,964	+0.16
Interest	25,040	13,318	-53
<b>Total</b>	<b>\$1,265,863</b>	<b>\$1,255,408</b>	<b>-0.8</b>

## Expenditures

Salary	\$716,206	\$688,497	-4
Services and Supplies	259,663	201,451	-29
Fixed Assets (mobile and computer)	0	0	
Fund Balance	289,994	365,460	+26
<b>Total</b>	<b>\$1,265,863</b>	<b>\$1,255,408</b>	<b>-0.8</b>

# HOME GROWN MOSQUITOES

## MOST IMPORTANT MOSQUITO SPECIES IN SANTA CRUZ COUNTY

	<p><b><i>Aedes sierrensis</i> (Tree hole mosquito)</b></p> <p>This species breeds in tree holes (rot cavities or depressions in trees which hold water). If near trees and partially filled with organic debris, containers such as tires and buckets may produce these mosquitoes. The eggs hatch when the tree hole or container fills with water. The adults hatch in March and remain in the area until early summer. This mosquito has a short flight range, is an aggressive biter, and is the primary vector of canine heartworm in Santa Cruz County. It is found in any area where suitable tree holes are found.</p>
	<p><b><i>Anopheles freeborni</i> (Western Malaria mosquito)</b></p> <p>This species breeds in clear, seepage water in sunlit algal-laden pools. The adult females overwinter, and lay eggs in the spring through fall, with summer being the peak season of activity. Females are active at dusk, flying great distances to feed on most mammals. They readily enter houses to attack humans. This species is the primary vector of human malaria in the Sacramento Valley. This mosquito is common throughout Santa Cruz County in sloughs, ponds, channels, and flooded fields. Most of the control effort on this species is by use of biorational larvicides and mosquitofish.</p>
	<p><b><i>Aedes washinoi</i> (Woodland pond mosquito)</b></p> <p>This mosquito is produced in woodland depressions that fill with water and in the Watsonville Slough System. Most aerial applications are undertaken to control this mosquito during the winter months. Eggs are laid on the mud and organic material along the edges of receding water in these areas. Adults are generally present in the early spring, are very aggressive, and may be found in large numbers. Most of control effort on this species is by use of biorational materials and mosquitofish.</p>
	<p><b><i>Culex erythrothorax</i> (Tule mosquito)</b></p> <p>This species breeds in tule marshes throughout MVC, but especially in the Watsonville Slough system. Larvae over winter and emerge as adults during the spring and summer months. This species is capable of reaching extremely high numbers, but does not cause considerable nuisance to the public as it is not an aggressive biter and does not venture far from the marsh. Control is undertaken using biorational materials in granular or pellet form when numbers are relatively high in sources close to populated areas.</p>
	<p><b><i>Culex pipiens</i> (Northern house mosquito)</b></p> <p>This species causes the largest number of service requests and is generally an urban problem. The adult can be found all year and breeds in storm drains, catch basins, utility vaults, septic tanks, flooded basements, sumps, and in just about any water container found near humans. The adult readily enters homes and bites at night. Because of the type and variety of breeding sources, it can take many hours to locate the cause of a problem. Continual treatment and monitoring of sources is required to maintain control of these mosquitoes. Calls from the public are vital in locating sources. A West Nile virus vector.</p>
	<p><b><i>Culex tarsalis</i> (Encephalitis mosquito)</b></p> <p>This mosquito is produced in rain pools, marshes, swimming pools, ponds, and other fresh water sources. Although this species does not produce a large number of MVC's service requests, it requires a large part of the control effort to prevent the spread of encephalitis in Santa Cruz County. This species feeds primarily on birds and is only moderately aggressive towards man. <i>Culex tarsalis</i> is capable of reaching very high numbers. Control is by application of biorational materials and mosquito fish stocking. A West Nile virus vector.</p>
	<p><b><i>Culiseta incidunt</i> (Cool weather mosquito)</b></p> <p>This mosquito is produced in fishponds, creeks, and containers. Small sources can produce sufficient numbers to cause discomfort in a neighborhood. This mosquito is moderately aggressive, bites in the evening or shade, and is very noticeable because of its large size. It is primarily a problem of urban and suburban areas. Control is by use of biorational larvicides and mosquito fish.</p>
	<p><b><i>Culiseta inornata</i> (Winter marsh mosquito)</b></p> <p>Females of this species rest during the summer and become active in the fall after the first rains. Eggs are laid on the surface of rain filled ponds in the fall. Many generations can be produced in one season. This mosquito bites at dusk in the fall and spring and is moderately aggressive, quite large, and may reach very high numbers. It is very noticeable to the public because of its size and activity. This species is generally found close to temporary fresh water sources. Most of the control effort is by using biorational materials.</p>
	<p><b><i>Culiseta particeps</i></b></p> <p>Larvae of this mosquito occur in shaded clear pools containing algae, leaves, and other debris. Over wintering as adult females, this species becomes active during the early spring through fall. Females prefer large mammals and may feed on man in shaded places. This species occurs in shaded drainages from Freedom to the north coast section of Santa Cruz County. Adults can reach high numbers in localized areas and cause problems in some suburban neighborhoods. Like the other members of this genus occurring in this area, it is a large species. Control is through the use of biorational materials and source modification.</p>

