

MOSQUITO SERVICES

An Integrated Pest Management Program of the Santa Cruz County Mosquito Abatement and Vector Control

BACKGROUND

The Santa Cruz County Mosquito Abatement and Vector Control (MAVC) was a result of public demand for relief from mosquitoes, formed in 1993 as County Service Area 53 by resolution of the Board of Supervisors, serving as our governing body. The MAVC was created as a division of the Agricultural Commissioner's Department. The Agricultural Commissioner is Mary Lou Nicoletti, who acts as Director of the MAVC.

The MAVC now serves the entire County, approximately 445 sq miles and 250,000 people. Abatement powers are authorized within Title 1 and 7 of the County Code (Chapter 1.14) and the California Health and Safety Code (Division 3, Chapter 1, Section 2000 *et seq.*).

PURPOSE

The MAVC is charged with the responsibility for the abatement of breeding mosquito populations in order to provide relief from biting annoyance for residents and visitors to the County. More importantly, our responsibilities include the prevention of mosquito-transmitted diseases. We also provide assistance and information to the public on other vectors. A vector is any insect, rodent, or other arthropod or animal that can threaten health by carrying disease agents or causing discomfort.

The program's primary function is mosquito surveillance and control following Integrated Pest Management practices incorporating public education, biological control, breeding source reduction and least toxic pesticides that have minimal impact on people, wildlife, and the environment. Surveillance includes sampling immature mosquitoes in water bodies and monitoring populations of adult mosquitoes using traps. We focus on prevention of the immature, aquatic stage of the mosquito because this approach is the most effective and environmentally sound.

The prevention of mosquito production is achieved by reducing breeding sources and controlling aquatic stages using biorational materials selected on the basis of maximum safety to the public, applicator and environment, and otherwise follows general principles of the California Department of Public Health (CDPH), the Mosquito and Vector Control Association of California, the University of California and the American Mosquito Control Association.

The program contains many elements in its comprehensive and sustainable approach. As a reflection of its size and budget, the MAVC and its full-time staff of eight operates with efficiency and makes full use of the benefits derived from the County structure.

The special cultural, economic and political atmosphere of Santa Cruz County combines an agricultural history with sensitivity to environmental values and a questioning attitude toward pesticides, growth and development. In this environment, the program has developed an emphasis upon public contact, inter-agency cooperation and education. Many sources are reduced through encouraging property owners to place emphasis on good water management practices which lead to improvements in water quality, depth and circulation, such as irrigation and runoff control, pond maintenance and aquatic vegetation management.

OPERATIONS

Priority is placed upon requests for service from residents, ahead of other routine operations.

The MAVC rarely conducts adulticiding measures (fogging), as it is more selective and effective to control larvae before they emerge and disperse as adults. Therefore, intense efforts are made to inspect sources and monitor mosquito breeding by sampling the water for larvae. We usually talk with the landowner to discuss ways to modify the source to reduce mosquito breeding habitat for the long term. We also treat with EPA-registered mosquitocides when necessary to

interrupt the breeding cycle and reduce emergence. Some sources require checking and treatment several times a year. Pre-treatment and post-treatment larval counts are taken to measure effectiveness.

To assist in determining interventions, threshold levels for larvae are established for many sources by evaluating species, proximity to residents, stage of development, presence of predators and other aquatic life and other environmental factors. When threshold levels are exceeded, larviciding may ensue using material appropriate for larval instars present; either microbial formulations, or the insect growth regulator methoprene, or spinosad, or a pupacide, further described below.

BIOLOGICAL CONTROL / MOSQUITO FISH

The MVC has limited facilities (700 gals.) upon the premises for holding *Gambusia affinis*, captured locally. These mosquito fish are an effective way to provide long-term control without pesticides. They are provided for residential properties after inquiries into the suitability of the mosquito breeding source. Residents are advised that mosquito fish are an established but non-native species, and should only be stocked in ornamental ponds, disused pools and spas, animal watering troughs and similar artificial containers, as they may be disruptive to native organisms.

For agricultural ponds and artificial residential ponds with a history of breeding, a determination is made following consultation with the California Department of Fish and Game (CDFG).

CHEMICAL CONTROL

At present the program makes maximum effort to use *Bacillus thuringiensis israelensis* larviciding products for their efficacy and selectivity. A similar microbial larvicide, *Bacillus sphaericus* is used in highly organic sources such as sewage, dairy and apple processing ponds because the live bacteria recycles in the mosquito larvae it controls, thereby providing longer control. Some formulations are also acceptable for use around organic crops.

The larvicides methoprene and spinosad are used in aqueous, granular, pellet or briquet formulations. Methoprene is a juvenile growth hormone mimic that prevents emergence of live adult mosquitoes. Spinosad stops proper nerve functions in mosquito larvae and is derived from naturally-occurring soil bacteria. These reduced-risk products and the bacilli are applied to large areas by contracted helicopter, by boat, amphibious vehicle, on foot by backpack sprayer or motorized backpack blower, or with a truck-mounted power sprayer.

EPA registered mineral oils are applied in spot treatments as a pupacide and a larvicide in some polluted sources. This light oil and mono-molecular films made from animal fats are less selective so are used judiciously.

Trails, ditches and gates are sometimes kept clear using an herbicide applied with backpack sprayer. Physical weed control in some sources reduces harborage and development of mosquitoes.

SOURCE PREVENTION / REDUCTION / ACCESS

Proposed development plans are reviewed to determine their impact upon mosquito and vector populations and modifications recommended when necessary.

Source reduction needs such as silt removal and maintenance of ditches and channels are achieved by collaborating with County Public Works and other government agencies for permitted projects, and with property owners on private land for small scale jobs. The majority of source reduction effort by the MVC is small hand and power tool work consisting of clearing drainage obstructions and maintaining trails to or around a source.

Inspection of sources on private properties necessitates courtesy and tact as well as safety and efficiency. Efforts are made to contact landowners for consent, particularly where privacy is an issue. Staff uses good judgment when exercising its State and County Code authority.

SURVEILLANCE

Mosquito breeding sources are inspected systematically by following a route list. All life stages of mosquitoes are sampled for identification as to species and to determine abundance in our laboratory. Aquatic larvae are sampled with a dipper, counted, averaged and identified. Adult mosquitoes are collected weekly from traps placed throughout the area. Semi-permanent light-baited traps give adult population data, while carbon dioxide-baited traps placed overnight give a 'snapshot' of mosquito activity. Live mosquitoes collected from these traps can be submitted to a virus laboratory for detection of mosquito-borne viruses, such as West Nile.

Staff cooperates with CDPH and local health officials in surveillance of diseases transmitted by ticks, rodents, and other vectors by assisting with collections and coordinating with the human and animal health community.

EDUCATION

Staff prepares and distributes information sheets, pamphlets, newsletters, news releases and public service announcements to residents, other agencies and the media. These describe MVC activities, mosquito control information for property owners, and help with other pest problems and vector-borne diseases. Staff provides information and may assist with identification of mosquitoes, ticks, flies, gnats, yellowjackets, rodents and other pests and vector-borne diseases such as plague, Lyme disease, Hantavirus, mosquito-borne encephalitis and others.

The MVC prepares an information booth for the County Fair and other events, and gives presentations to students, County employees and public groups to increase awareness of mosquito biology, vectors and disease and water and waste management issues that relate to pest control. The Agricultural Commissioner is the lead agency for West Nile virus response and for Africanized Honey Bee information.

WILDLIFE REFUGES

The MVC maintains good communication and cooperation with environmental regulatory agencies. We consult with these agencies on their wetlands restoration projects to ensure compatibility with mosquito management goals.

In our County there are about 15 acres of federal wetland within the 150-acre Ellicott Slough National Wildlife Refuge that offer protection for the endangered Santa Cruz Long-Toed Salamander and threatened Red-Legged Frog, and another 30 acres managed by the CDFG as ecological reserve within the Watsonville Slough. The MVC also reports pesticide applications to the State Park system on its 10-acre coastal freshwater marsh at Sunset State Beach.

Under a Pesticide Use Permit, the protocol agreed upon with the US Fish and Wildlife Service (USFWS) for treatment of mosquito larvae in the Ellicott amphibian refuge allows for some use of mosquitocides while reducing the possibility of non-target impacts. Applications are made under the following conditions:

- Unless there is a public health emergency, application of methoprene are made only to ponds not breeding endangered amphibians.
- The San Francisco Bay Area National Wildlife Refuge is contacted so that a Service biologist can be present when the larvacides are applied.
- Staff that sample for mosquito larvae with a dipper are informed of the appropriate techniques for avoiding the capture of amphibian larvae or dislocating eggs and egg masses and for their release if they are inadvertently caught. Workers conducting monitoring activities do not enter the water.
- Disinfection protocol recommended by the Service is followed to prevent the spread of pathogens infecting amphibians or invasive species.

Note: In addition, the MVC informs the Service of surveillance activities at Ellicott and faxes a treatment map following applications. Similarly, precautionary measures are taken on a voluntary basis in other State and Federal properties where amphibian recovery efforts are being conducted. Currently, the USFWS is reviewing mosquito management in its refuges. Other areas within the South County are being considered for acquisition within the federal refuge and State reserve systems.