

As early as 1772, hordes of mosquitoes welcomed the first Europeans as they explored the San Francisco Bay Area. According to the explorers' travel log, they saw few signs of indigenous people in the area. It would soon become clear the Native Americans avoided the mosquito infested area.

More than 100 years later, thousands of men were dying of an unknown illness while working on the construction of the Panama Canal. In 1897, British officer Ronald Ross discovered mosquitoes transmit malaria parasites and in 1900, Dr. Walter Reed and his associates confirmed Carlos Finlay's hypothesis of mosquitoes as the vector (carrier) of yellow fever. These discoveries were important to the workers of the Panama Canal, as well as Californians who had contracted malaria. Scientific research proved mosquitoes are not only a nuisance, they can also carry the causative agents of diseases.

In California, mosquito abatement activities in the early 1900s focused on controlling the mosquito that carries malaria parasites and reducing the numbers of nuisance salt marsh mosquitoes. Before 1915, mosquito control in the state was financed by subscription and donation. In 1915, the State Legislature passed a bill that was signed by the governor to provide for the formation, organization, and financing of mosquito abatement districts. Noble Stover, manager for both Marin County Mosquito Abatement District and Three Cities Mosquito Abatement District in San Mateo County coauthored the Act.

Quite often, schools in Contra Costa County had to be closed, waterfront industry was periodically shut down, and recreational areas were abandoned, all due to salt marsh mosquitoes. Periodically, citizens of Pittsburg lined the street curbs with smudge pots (pots that release smoke) in an attempt to drive the mosquitoes away. Realtors found it difficult to attract home buyers into mosquito-infested neighborhoods. As a result of the mosquito activity, Contra Costa County citizens, together with several waterfront industries, formed a committee in 1926 to address the need for mosquito control.

In 1926, Stover directed the first operations of Contra Costa Mosquito Abatement District (CCMAD #1), concurrently with his duties in Marin and San Mateo Counties. The District's main purpose was to control marsh mosquitoes in north central Contra County. CCMAD #1 was formed work began on April 15, 1927. The District, with two employees, began various engineering projects near the cities of Martinez, Concord, and Pittsburg. Much of the work was contracted out to dredging and construction companies. The District contracted with Delta Dredging Company to excavate ditches at the cost of \$5 per hour. The District supplemented the program by spraying standing water with light oil, such as stove or diesel oil to kill the mosquito larvae. They also stocked various sources with mosquitofish.

Stover was a pioneer in drainage and engineering methods, which were his primary approaches to controlling salt marsh mosquitoes. Many of those early projects still exist and are functional now more than 90 years later. Stover served as manager/engineer for CCMAD #1 until his death on September 17, 1935. Ernest Campbell, who had worked for the District since its inception, was appointed manager/engineer by the Board of Trustees.

In the summer of 1930 there was an outbreak of a horse plague in the San Joaquin Valley that resulted in the death of 3,000 horses. In 1933, it became known that mosquitoes could transmit what is now called Western equine encephalomyelitis (WEE). In 1938, a human case of WEE infection was confirmed. Human cases of another virus, St. Louis encephalitis (SLE), were isolated in California in 1938 as well. Before the early 1940s, people thought that it was only *Aedes* mosquitoes that transmitted disease. In 1941, *Culex tarsalis* mosquitoes were found to transmit the encephalitis virus.

Until 1941, the District's jurisdiction only covered the waterfront and marsh areas from Martinez to Antioch. On November 25, 1941, the communities of Saranap, Danville, and the City of Walnut Creek petitioned the CCMAD #1 Board of Trustees, requesting annexation into the District. Annexation took place on December 19, 1941. In November 1943, CCMAD #1 annexed the area comprising the Lafayette and Orinda School Districts upon their request. Oak Grove School District was annexed in July 1946 upon their request. In the midst of these events, and

while serving as manager/engineer for CCMAD, Ernest Campbell, helped found and manage Northern San Joaquin Mosquito Abatement District.

At this time, other portions of Contra Costa County were also in need of mosquito control, which led to the formation of CCMAD #2, CCMAD #3, and Antioch-Live Oak MAD. Under Ernest Campbell's leadership and the Board of Trustees, CCMAD #1 merged with Antioch-Live Oak MAD, CCMAD #2, and CCMAD #3 in December of 1952. As of January 1953, CCMAD #1 provided mosquito control for the communities of Orinda and Port Costa in the west to the Antioch-Live Oak school District in the east, an area of 509 square miles.

Mosquito control was established in the eastern portion of Contra Costa County by the formation of the Diablo Valley Mosquito Abatement District (DVMAD) in 1952. The Diablo District was 136 square miles in size and encompassed the communities of Oakley, Brentwood and Byron. The Diablo District's headquarters was located in the community of Brentwood. The primary purpose of creating DVMAD was for the control of pasture and irrigation mosquitoes. Diablo Valley MAD came into existence in time for the largest human outbreaks of WEE the state had been known to experience. In 1952, there were 375 human cases of WEE and 45 human cases of SLE in California. There were eight reported human cases of WEE in Contra Costa County that same year.

In the 1940s and 1950s, with the introduction of broad spectrum chemicals such as DDT the District changed to other strategies to control mosquitoes in the county. A "flit gun" was used to create a pesticide fog to kill adult mosquitoes. Jeeps were used to gain access to hard-to-reach areas and aircraft were used to spray large areas that were producing mosquitoes. The District hired its first entomologist, James Mallars, in 1952 and soon expanded its

focus from mosquito control of the marshes to include treatment of creeks as well. In 1956, the District treated 1,080 miles of creeks at a cost of approximately \$5.10 per mile. By the late 1950s, the District began to see mosquitoes develop resistance to DDT.

From 1945 to 1957, CCMAD #1 retained a commercial telephone answering service, utilized part-time secretarial service, owned limited yard facilities for automotive and other equipment, and raised mosquitofish on Berrellessa Street in Martinez. In 1955, the District purchased approximately one acre of land on Concord Avenue in Concord and embarked on building its new headquarters, which opened in January 1957. Prior to that time, the District office was located in various managers' homes from 1927 until 1957. The Board of Trustees held their board meetings at one of the local oil refineries until the completion of the new headquarters.

Contra Costa County in the 1950s was primarily a rural county with commercial rabbitries, poultry ranches, stables, cattle ranches, and orchards. In April of 1955, CCMAD #1 expanded its program to include fly control. This was the first time CCMAD #1 officially sought to control a disease vector other than mosquitoes. On occasion, the District would also remove or destroy bee hives.

In 1959, the employees joined the County Employees Association. From that date to the present, the District's field employees have been represented by Associations or Public Employee Unions.

In the 1960s, in response to DDT resistant mosquitoes, CCMAD #1 switched to organophosphate pesticides as the primary method for control of mosquitoes. By the 1970s, mosquitoes were beginning to show resistance to these pesticides as well.

Contra Costa County had its most recent reported human cases of SLE in 1967 and WEE in 1968. The District continued an active source reduction program into the 1970s. In 1970, the District started treating non-structural yellowjacket nests located underground.

Ernest Campbell retired in March of 1966. In July of 1966, John Brawley became the new manager. Under John Brawley's tenure the District annexed the Western portion of the county in June of 1969. Before June 1969, West County, which included the City of Richmond and the communities of El Cerrito, Kensington, San Pablo, El Sobrante, Pinole, Hercules, and Crockett, had no organized mosquito control. In the 1930s; however, some ditching was conducted in the Richmond marshes under the supervision of Harold Gray, the manager of Alameda Mosquito Abatement District. John Brawley retired in September 1976.

Brawley's replacement was Brad Anderson who became manager in November of 1976. During Anderson's tenure, California passed Proposition 13, which reduced residential, business and farming property taxes and resulted in reduced funding for mosquito abatement districts throughout the state. CCMAD #1 lost 50 percent of its revenue. In response, the District's Board of Trustees laid off 13 of the 21 full-time employees in November of 1978. Brad Anderson chose to resign so that his position and the entomologist's position could be combined. Charles Beesley, Ph.D., who was already employed by CCMAD #1 as the entomologist, became the new manager. The Board of Trustees chose to cease fly control and only continue mosquito and yellowjacket control. The District's source reduction program also ended at this time and equipment was sold to keep the District afloat. After Proposition 13, there were only four of 14 field personnel retained.

*In 1986,* CCMAD #1 and DVMAD merged to create one countywide agency, Contra Costa

Mosquito Abatement District (CCMAD). In 1988, CCMAD purchased land on Mason Circle in Concord and built a new facility that included a greenhouse for mosquitofish rearing. The District began modernizing its equipment with the purchase of new vehicles, modern spray equipment, and eight-wheel all-terrain vehicles. The work that took 16 field employees before Proposition 13 (including DVMAD) was now being done by nine. The District expanded services by conducting field surveys and testing the *Ixodes pacificus* tick for the Lyme disease spirochete. Research projects on wetlands were also initiated to determine ways to eliminate mosquito production and enhance wildlife habitat in the county.

In 1993, Contra Costa County transferred its rat and rabies risk reduction programs to CCMAD. Along with the programs, three employees and equipment were transferred to CCMAD from the county. Subsequently, the District changed its name to Contra Costa Mosquito & Vector Control District (District). In 1993, the District's mosquito arbovirus surveillance program detected WEE in sentinel chickens and in mosquitoes collected in Contra Costa County. No human cases were reported. Surveillance and control of *Culex tarsalis* mosquitoes once again became the District's primary focus. In the spring of 1994, the District purchased a custom built landing craft from a boat builder in Seattle, Washington. The landing craft could transport all-terrain vehicles, which allowed for regular inspection and treatment of islands in the Sacramento and San Joaquin Rivers.

In 1993 and 1994, the state of California took 40 percent of the District's property tax revenues to be used to balance the state budget. District leadership and the Board of Trustees made sure the District was financially prepared for this event and enacted a county parcel fee to replace the local property tax revenues that the state had taken.

The District was able to continue tick surveillance and Lyme testing while the mosquito control program relied more on "biorational" methods (biopesticides and mosquitofish) that have minimal environmental impact. The District was viewed as a leader regarding wetland restoration, protection of endangered species and the environment. In 1996, the District received an Environmental Achievement Award in marsh management. Due to changing legislation (Proposition 218), the District anticipated the loss of its parcel fee that originated in 1993 and established a benefit assessment fee to ensure sufficient operating funds in 1996 and beyond.

In 1999, West Nile virus (WNV) was first detected on the East Coast of the United States. The District began preparing for its eventual migration into California.

In 2001, after 27 years of distinguished service, General Manager Charles Beesley, Ph.D., retired. The building at 155 Mason Circle in Concord was dedicated in his honor. Assistant Manager Craig Downs was promoted to general manager. Downs began his career at the District as a vector control technician in 1981, advanced to biologist, superintendent, and assistant manager prior to his appointment to general manager.

The District detected WNV in Contra Costa County for the first time in 2004 in dead birds submitted for testing. The first human cases appeared in 2005. The virus was also detected that year for the first time in mosquitoes. To date, every year since 2005, WNV has been detected in the county with several human cases. In 2006, two people died from the virus.

In 2017, Craig Downs retired after 36 years with the District and Paula Macedo, DVM, Ph.D., became the District's general manager. Prior to the District, Macedo was the laboratory director of the Sacramento -Yolo Mosquito & Vector Control District. She is a Doctor of Veterinary Medicine and holds a Ph.D. in entomology from the University of Nebraska.