2017 Annual Report

MVCAC NPDES Permit Coalition

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Acronyms

BMP	best management practice
Bti	*Bacillus thuringiensis* subspecies *israelensis*
CDC	U.S. Centers for Disease Control and Prevention
CDPH	California Department of Public Health
Coalition	MVCAC NPDES Permit Coalition
DPR	California Department of Pesticide Regulations
EPA	U.S. Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
IPM	integrated pest management
MAD	Mosquito Abatement District
MAP	Mosquito Abatement Program
MGK-264	N-octyl bicycloheptene dicarboximide
MRP	Monitoring and Reporting Program
MVCAC	Mosquito and Vector Control Association of California
MVCD	Mosquito and Vector Control District
MVCP	Mosquito and Vector Control Program
NPDES	National Pollutant Discharge Elimination System
PAP	Pesticide Application Plan
PBO	piperonyl butoxide
PUD	Public Utility District
SLE	Saint Louis encephalitis
SLEV	Saint Louis encephalitis virus
SWRCB	State Water Resources Control Board
U.S.	United States
VC	Vector Control
VCD	Vector Control District
VCP	Vector Control Program
VCSD	Vector Control Services District
WNV	West Nile virus

Executive Summary

The Statewide National Pollutant Discharge Elimination System (NPDES) Permit for Biological and Residual Pesticide Discharges to Waters of the United States from Vector Control Applications (Water Quality Order 2016-0039-DWQ), hereafter called the Vector Control Permit, covers the point source discharge of biological and residual pesticides resulting from vector control applications. The permit's Monitoring and Reporting Program encourages dischargers to form monitoring coalitions with other dischargers performing similar applications in similar environmental settings. The Mosquito and Vector Control Association of California (MVCAC) NPDES Permit Coalition (Coalition) consists of 64 member districts and agencies that collectively report activities covered by the Vector Control Permit.

During 2017, the Coalition did not conduct visual monitoring during pesticide applications. The MVCAC member agencies independently monitor pesticide applications in their districts in compliance with the Vector Control Permit's Monitoring and Reporting Program and annually report visual observations, pesticide application rates, and non-compliant pesticide applications under their purview. No adverse incidents were reported by member districts in 2017.

Any changes to individual district Pesticide Application Plans and their associated best management practices are determined by individual member districts and can be found in the respective member district's annual report, as required by the Vector Control Permit.

1. Introduction

This is the 2017 Annual Report for the Mosquito and Vector Control Association of California (MVCAC) National Pollutant Discharge Elimination System (NPDES) Permit Coalition (Coalition). This Annual Report is a requirement of the Statewide NPDES Permit for Biological and Residual Pesticide Discharges to Waters of the United States (U.S.) from Vector Control Applications (Water Quality Order 2016-0039-DWQ, General Permit CAG 990004), hereafter referred to as the Vector Control Permit. Member districts of the Coalition also submit individual annual reports that focus on application rate monitoring for all larvicide and adulticide applications to waters of the U.S. within their individual jurisdictions and the results of visual monitoring at those application sites. Annual reports developed by the member districts address recommendations to improve Pesticide Application Plans (PAPs) and best management practices (BMPs) and describe any permit violations in their district.

The Coalition's Annual Report describes activities collectively taken by the member districts and agencies. The Coalition consists of 64 member districts and agencies. Members of the Coalition are provided in Table 1.

Table 1. Members of the MVCAC NPDES Permit Coalition

Member Districts	
Alameda County MAD	Consolidated MAD
Alameda County VCSD	Delano MAD
Contra Costa MVCD	Delta VCD
Marin-Sonoma MVCD	Fresno MVCD
Napa County MAD	Fresno Westside MAD
No. Salinas Valley MAD	Kern MVCD
San Benito County Agricultural Commission	Kings MAD
San Francisco Public Health, Environmental Health Section	Madera County MVCD
San Mateo County MVCD	South Fork MAD
Santa Clara County VCD	Tulare MAD
Santa Cruz County MVCD	West Side MVCD
Solano County MAD	Antelope Valley MVCD
City of Alturas	City of Blythe
Burney Basin MAD	City of Moorpark VC
Butte County MVCD	Coachella Valley MVCD
Colusa MAD	Compton Creek MAD
Durham MAD	Greater LA County VCD
El Dorado County Environmental Management	Imperial County VC
Glenn County MVCD	Long Beach VCP
Lake County VCD	Los Angeles West Vector and Vector-borne Disease Control District
Oroville MAD	Mammoth Lakes MAD

Member Districts

Pine Grove MAD	Mosquito and Vector Management District of Santa Barbara County
Placer MVCD	Northwest MVCD
Sacramento-Yolo MVCD	Orange County MVCD
Shasta MVCD	Owens Valley MAP
Sutter-Yuba MVCD	Pasadena Public Health Department
Tehama County MVCD	Riverside County, Dept of Environmental Health VCP
East Side MAD	San Bernardino County MVCP
Merced County MAD	San Diego County Dept. of Environmental Health, Vector Control
Saddle Creek Community Services District	San Gabriel Valley MVCD
San Joaquin County MVCD	Ventura County Environmental Health Division
Turlock MAD	West Valley MVCD

Notes:

MAD = Mosquito Abatement District
MAP = Mosquito Abatement Program
MVCD = Mosquito and Vector Control District
MVCP = Mosquito and Vector Control Program
PUD = Public Utility District
VC = Vector Control
VCD = Vector Control District
VCP = Vector Control Program
VCSD = Vector Control Services District

2. Background

2.1 Vector Control Permit

The Vector Control Permit (Water Quality Order 2016-0039-DWQ) covers the point source discharge of biological and residual pesticides resulting from direct and spray applications for vector control from the following types of pesticides:

- Larvicides containing monomolecular films, methoprene, *Bacillus thuringiensis* subspecies *israelensis* (or Bti), *Lysinibacillus sphaericus* (previously known as *Bacillus sphaericus* or *B. sphaericus*), temephos, petroleum distillates, and spinosad;
- Adulticides containing malathion, naled, pyrethrins, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, prallethrin, resmethrin, sumithrin, piperonyl butoxide (PBO), or N-octyl bicycloheptene dicarboximide (MGK-264); and
- Minimum risk pesticides that the U.S. Environmental Protection Agency (EPA) has exempted from the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements when used in the manner specified by federal regulations.

Product formulations covered by this permit include those currently registered by the California Department of Pesticide Regulations (DPR), those that will become registered in the future that have the active ingredients listed above, and minimum risk pesticide products used for vector control applications.

The permit also includes provisions to allow the Executive Director of the State Water Resource Control Board (SWRCB), or his/her designee, to amend the permit to add new active ingredients which are registered for vector control by DPR and to grant to qualified dischargers regulatory exceptions from compliance with pollutant receiving water limitations in the *California Ocean Plan* (SWRCB 2015) and/or the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy; SWRCB 2005).

Other permit provisions are similar to those found in the prior Vector Control Permit (Water Quality Order 2011-0002-DWQ, as amended).

2.2 Mosquito-Borne Disease

Vector control districts protect public health by controlling mosquitoes that spread disease. Mosquito-borne viruses, such as West Nile virus (WNV) and Saint Louis encephalitis virus (SLEV), belong to a group of viruses commonly referred to as arboviruses (for arthropod-borne virus). These viruses are maintained through a cycle between a host organism (typically wild birds) and the mosquitoes that carry and transmit the virus, and do not depend upon infections in humans or domestic animals to persist.

Mosquitoes (primarily the *Culex* species) become infected by feeding on the blood of infected birds and can transmit viruses to humans and other animals during later feedings. Immature stages of *Culex tarsalis* can be found throughout California in waters ranging from clean to highly polluted waters from a wide variety of sources including irrigation return flows from agricultural crops and urban wastewater. *Culex tarsalis* is considered the primary vector in rural areas, while other mosquito species such as *Culex pipiens*, *Culex quinquefasciatus*, and *Culex stigmatosoma* play an important role in the transmission cycle of WNV and SLEV in urban and suburban areas. Additional mosquitoes, such as *Aedes vexans* and *Culex erythrothorax,* can also be important bridge vectors in transmission (i.e., bird to mammal). Lastly, *Aedes albopictus*

and *Ae. aegypti* mosquitoes, important vectors of dengue and chikungunya viruses in other parts of the world, have been detected in several locations in California and may serve as bridge vectors.

2.2.1 West Nile Virus

WNV is a mosquito-borne disease common in Africa, West Asia, the Middle East, and North America. WNV first appeared in California in 2002, and by 2004, WNV activity was observed in all 58 counties. Human infection with WNV can result in serious illness or death. Fever and other symptoms such as headache, body aches, joint pains, vomiting, diarrhea, or rash develop in about one in five people who are infected with the virus. Less than 1 percent of the people who are infected will develop a serious neurologic illness such as encephalitis or meningitis, inflammation of the brain or surrounding tissues (U.S. Centers for Disease Control and Prevention [CDC] 2015).

ArboNET is the CDC's internet-based passive surveillance system for arboviral diseases in the U. S. Data are uploaded to ArboNET by state and local health departments. California-specific information can also be found on the California WNV website (http://westnile.ca.gov/). The California Department of Public Health (CDPH), University of California Davis Arbovirus Research and Training, and MVCAC contribute data and maintain this website.

Table 2 summarizes WNV occurrence data for California. A total of 516 human cases of WNV and 31 fatalities were reported in California in 2017. This is a higher incidence and fatality rate than that reported in 2016, which had 19 fatalities from the 442 reported human cases of WNV.

Table 2. West Nile Virus Activity in California, 2003 to 2017

Year	Human Cases	Human Fatalities	Horses	Dead Birds	Mosquito Samples	Sentinel Chickens	Squirrels
2003	3	0	1	96	32	70	-
2004	779	29	540	3,232	1,136	809	49
2005	880	19	456	3,046	1,242	1,053	48
2006	278	7	58	1,446	832	640	32
2007	380	21	28	1,396	1,007	510	26
2008	445	15	32	2,569	2,003	585	32
2009	112	4	18	515	1,063	443	10
2010	111	6	19	416	1,305	281	24
2011	158	9	15	688	2,087	391	24
2012	479	20	22	1,644	2,849	540	23
2013	379	15	13	1,251	2,528	485	-[a]
2014	801	31	-[a]	2,442	3,340	443	-[a]
2015	782	53	-[a]	1,349	3,329	449	-[a]
2016	442	19	-[a]	1,352	3,528	343	-[a]
2017	536	41	21	510	3,371	305	-[a]
Average (2003-2017)	438	19	102	1,463	1,977	490	-[a]

[a] No longer monitored.

Sources: CDPH et al. 2018a, b

2.2.2 Saint Louis Encephalitis Virus

Saint Louis encephalitis (SLE) is a mosquito-borne disease caused by SLEV which causes inflammation of the brain (encephalitis). Some people bitten by an SLEV-infected mosquito will develop mild flu-like symptoms including fever and headache. However, severe SLE can result in serious symptoms that affect the central nervous system. These symptoms include fever, headache, stiff neck, confusion, and altered level of consciousness. Coma, convulsions, paralysis, and sometimes death can also occur. Elderly people and those with weakened immune systems are more at risk for developing severe symptoms of the disease. Fatality is rare for individuals under 40 years old (between 1 and 5 percent) but is more common for those over 60 years old (between 15 and 23 percent) (Coachella Valley MVCD 2014).

SLEV has been reported throughout the U. S., with periodic outbreaks occurring in the Mississippi Valley and along the Gulf Coast. Prior to 2003, SLEV was found in many regions of California such as the Central Valley and southern California. Between 2003 and 2014, no SLEV activity was detected in California despite ongoing SLEV surveillance and a six-fold statewide increase in mosquito pool testing (White et al. 2016). After a 12-year period without detection, the virus was detected in Riverside County and in parts of southern Arizona starting in 2015. SLEV activity was then detected in ten counties in California with three human cases in 2016 and 15 counties in California with four human cases in 2017. Table 3 summarizes the recent occurrence data for SLEV in California.

Table 3. Saint Louis Encephalitis Virus Activity in California, 2015 to 2017

Year	Human Cases	Mosquito Samples	Sentinel Chickens
2015	0	38	9
2016	3	180	4
2017	4	179	9

Sources: CDPH 2015, 2016, CDPH et al. 2018b

3. Summary of Monitoring Data

Entities involved in the application of vector control pesticides that result in a discharge of biological and residual pesticides to waters of the U.S. are required to comply with the Vector Control Permit's Monitoring and Reporting Program (MRP).

3.1 Prior Monitoring Activity

Reports of the Coalition's prior monitoring activity can be found on the SWRCB's website at http://www.waterboards.ca.gov/water_issues/programs/npdes/pesticides/vector_control.shtml. Prior efforts include visual, physical, and chemical monitoring of representative samples prior to pesticide applications (background samples), shortly after the time of application, and post-application. The physical and chemical monitoring results contained in the 2012 Annual Report (MVCAC Coalition, 2013) indicates that the pesticide active ingredients were rarely present in the waterway and/or the presence of the material in the waterway was of extremely short duration after pesticide application. The report concluded that there did not seem to be any significant long-term impacts to the beneficial uses of the waters.

3.2 Monitoring Activity in 2017

During 2017, the Coalition did not conduct visual monitoring of pesticide applications. MVCAC member agencies instead completed pesticide application logs and conducted monitoring independently, in compliance with the Vector Control Permit's MRP. Member agencies monitor during pesticide applications (monitoring application rates and visually assessing the area to and around where the pesticide is applied for adverse incidents, when safe and feasible), monitor after pesticide applications, and maintain records of receiving water conditions which are presented in individual district annual monitoring reports. As discussed below in Section 4.4, no adverse incidents were reported by the member districts to the Coalition in 2017.

4. Best Management Practices

4.1 Vector Control Management Practices

MVCAC member agencies employ integrated pest management (IPM). First and foremost, MVCAC promotes education to prevent the formation of mosquito habitat. To that end, MVCAC encourages all public agencies to incorporate the California Department of Public Health BMPs in their planning and permitting documents and requirements. More than any other collective action that MVCAC could implement, educating landowners about the simple, low-cost ways to prevent mosquito breeding habitats will have the greatest effects on disease prevention. This step alone has the greatest potential to reduce the need for adulticides. While MVCAC emphasizes the use of these education and information tools throughout the state, its second level of protection is the use of physical and biological controls to reduce the potential formation of mosquito breeding sites. Such steps include the use of water management practices, the removal of vegetation, and the introduction of predaceous organisms such as mosquitofish to control the mosquito populations in their aquatic (larval) stage. Many districts conduct surveillance to ensure that they are targeting only those mosquitoes with the greatest impact to public health and this surveillance component helps drive control efforts. The third and fourth steps in the IPM process are chemical control of mosquitoes using larvicides and adulticides, respectively.

4.2 BMPs Currently in Use

Member districts of MVCAC implement the BMPs provided in their respective PAPs to meet the requirements of the Vector Control Permit. MVCAC member agencies follow an IPM approach that strives to efficaciously use pesticides and minimize their impact on the environment while protecting public health. Each member agency determines what vector management methods are appropriate in their district, and follows response plans that use surveillance tools to determine the extent of the problem and guide treatment decisions, with an emphasis on source reduction and control of mosquitoes during their immature stages. The least toxic materials available for control of the larval stages are used, focusing on bacterial larvicides, growth regulators, and surface films, rather than organophosphates or pyrethroids. Control of adult mosquitoes may become necessary under some circumstances, such as in the event of a disease outbreak (documented presence of virus in birds, human populations, or adult mosquitoes), or lack of access to larval sources leading to the emergence of large numbers of biting adult mosquitoes. Organophosphate insecticides (naled and malathion) are used in rotation with pyrethrins or pyrethroids to avoid the development of resistance. The active ingredients currently used for control of adult mosquitoes have been deliberately developed for their lack of persistence and minimal effects on non-target organisms when applied at label rates for ultra-low volume mosquito control. All BMPs included in the product labels are followed and include such measures as restrictions in certain land uses and weather parameters (i.e., high winds). Additional information about specific BMPs can be found in member agencies' PAPs.

4.3 BMP Modifications

Modifications to BMPs are handled by individual member districts on a district-by-district basis. Any modifications to BMPs can be found in respective member districts' annual reports prepared for the Vector Control Permit. Pesticide application logs and site locations of the applications are also reported by the member districts in the districts' annual reports.

4.4 Violations

Individual member districts would report violations of the Vector Control Permit in the districts' annual reports. No violations were reported by the member districts to the Coalition in 2017.

5. References

California Department of Public Health. 2015. Arbobulletin Weekly Update, California Arbovirus Surveillance Bulletin #41, Week 50, Friday, December 18, 2015. Vector-Borne Disease Section (Infectious Diseases Branch), California Department of Public Health. http://www.westnile.ca.gov/reports.php?report_category_id=6

California Department of Public Health. 2016. Arbobulletin Weekly Update, California Arbovirus Surveillance Bulletin #40, Week 50 Friday, December 16, 2016. Vector-Borne Disease Section (Infectious Diseases Branch), California Department of Public Health. http://www.westnile.ca.gov/reports.php?report_category_id=6

California Department of Public Health, U.C. Davis Arbovirus Research and Training, and Mosquito and Vector Control Association of California. 2018a. *2003-2016 WNV Activity Summary*. California West Nile Virus Website. http://westnile.ca.gov. Last updated January 19, 2018.

California Department of Public Health, U.C. Davis Arbovirus Research and Training, and Mosquito and Vector Control Association of California. 2018b. *West Nile Virus Activity in California Counties 2017 YTD*. http://westnile.ca.gov. Updated January 19, 2018.

California Department of Public Health, U.C. Davis Arbovirus Research and Training, and Mosquito and Vector Control Association of California. 2018c. *Saint Louis encephalitis virus (SLEV) in California Counties 2017 YTD*. http://westnile.ca.gov. Updated January 12, 2018.

Coachella Valley Mosquito and Vector Control District (CVMVCD). 2014. Saint Louis encephalitis virus, Vector Information Sheet. March 17, 2014. http://www.cvmvcd.org/brochure/sl_encephalitis_infosheet.pdf

Mosquito and Vector Control Association of California NPDES Permit Coalition (MVCAC Coalition). 2013. *MVCAC NPDES Permit Coalition 2011/2012 Annual Report, NPDES Vector Control Permit (Order No. 2012-0003-DWQ).* February 22, 2013.

State Water Resources Control Board (SWRCB). 2005. *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*. Adopted February 24, 2005.

State Water Resources Control Board (SWRCB). 2015. *California Ocean Plan, Water Quality Control Plan for Ocean Waters of California*. Amendments adopted May 6, 2015.

State Water Resources Control Board (SWRCB). 2016. Statewide National Pollutant Discharge Elimination System (NPDES) Permit for Biological and Residual Pesticide Discharges to Waters of the United States from Vector Control Applications. Water Quality Order 2016-0039-DWQ. General Permit No. CAG 990004. March 1. http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2016/wqo2016_0039_dwq.pdf

U.S. Centers for Disease Control and Prevention (CDC). 2015. Symptoms and Treatment. https://www.cdc.gov/westnile/symptoms/

White, GS, K Symmes, P Sun, Y Fang, S Garcia, C Steiner, K Smith, WK Reisen, and LL Coffey. 2016. *Reemergence of St. Louis Encephalitis Virus, California, 2015*. Emerging Infectious Diseases. Vol. 22, No. 12, December 2016.

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