

Sutter-Yuba
Mosquito & Vector Control District

MANAGER

Ronald L. McBride

GENERAL FOREMAN

Michael R. Kimball

ADMIN. MGR.

Cathy F. Burns

June 21, 2011

State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

RECEIVED
JUN 24 2011
DIVISION OF WATER QUALITY

Attn: Trinh Pham

Please find enclosed our:

Check #1-005433 in the amount of \$136.00,

Notice of Intent with Attachments

A – Map of water conveyances

B – Pesticides Used by the District

Pesticide Application Plan with Attachments:

A – Map of the District

B – District Established treatment thresholds.

Best Management Practices to Reduce Mosquitoes

If you have any questions please telephone our office at 530-674-5456.

Sincerely,

Ronald L. McBride

Ronald L. McBride
Manager

*Post Office Box 726, 701 Bogue Road
Yuba City, California 95992
530/674-5456
Fax 530/674-5534*

ATTACHMENT G – NOTICE OF INTENT

**WATER QUALITY ORDER NO. 2011-0002-DWQ
 GENERAL PERMIT NO. CAG 990004**

**STATEWIDE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT
 FOR BIOLOGICAL AND RESIDUAL PESTICIDE DISCHARGES
 TO WATERS OF THE UNITED STATES
 FROM VECTOR CONTROL APPLICATIONS**

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item <input checked="" type="checkbox"/> A. New Applicator	<input type="checkbox"/> B. Change of Information: WDID# _____
<input type="checkbox"/> C. Change of ownership or responsibility: WDID# _____	

II. DISCHARGER INFORMATION

A. Name Sutter-Yuba Mosquito & Vector Control District			
B. Mailing Address P.O. Box 726			
C. City Yuba City	D. County Sutter	E. State CA	F. Zip Code 95992
G. Contact Person Ronald McBride	H. Email address mcbride@sutter-yubamvcd.org	I. Title Manager	J. Phone 530-674-5456

III. BILLING ADDRESS (Enter Information only if different from Section II above)

A. Name			
B. Mailing Address			
C. City	D. County	E. State	F. Zip Code
G. Email address	H. Title	I. Phone	

IV. RECEIVING WATER INFORMATION

A. Biological and residual pesticides discharge to (check all that apply)*:

1. Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.

Name of the conveyance system: _____

2. Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.

Owner's name: See attachment A
Name of the conveyance system: Applications may be made to some of the water conveyances shown on the map.

3. Directly to river, lake, creek, stream, bay, ocean, etc.

Name of water body: See attachment A, applications may be made to some of the water conveyances shown on the map.

* A map showing the affected areas for items 1 to 3 above may be included.

B. Regional Water Quality Control Board(s) where application areas are located

(REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 5

(List all regions where pesticide application is proposed.)

A map showing the locations of A1-A3 in each Regional Water Board shall be included.

V. PESTICIDE APPLICATION INFORMATION

A. Target Organisms: Vector Larvae Adult Vector

B. Pesticides Used: List name, active ingredients and, if known, degradation by-products

See attachment B

C. Period of Application: Start Date November 1, 2011 End Date February 29, 2016
or until termination

D. Types of Adjuvants Added by the Discharger:

VI. PESTICIDES APPLICATION PLAN

A. Has a Pesticides Application Plan been prepared?*

Yes No

If not, when will it be prepared? _____

* A copy of the PAP shall be included with the NOI.

B. Is the applicator familiar with its contents?

Yes No

VII. NOTIFICATION

Have potentially affected governmental agencies been notified?

Yes No

* If yes, a copy of the notifications shall be attached to the NOI.

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?

Yes NO NA

IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I certify that the provisions of the General Permit, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: Ronald McBride

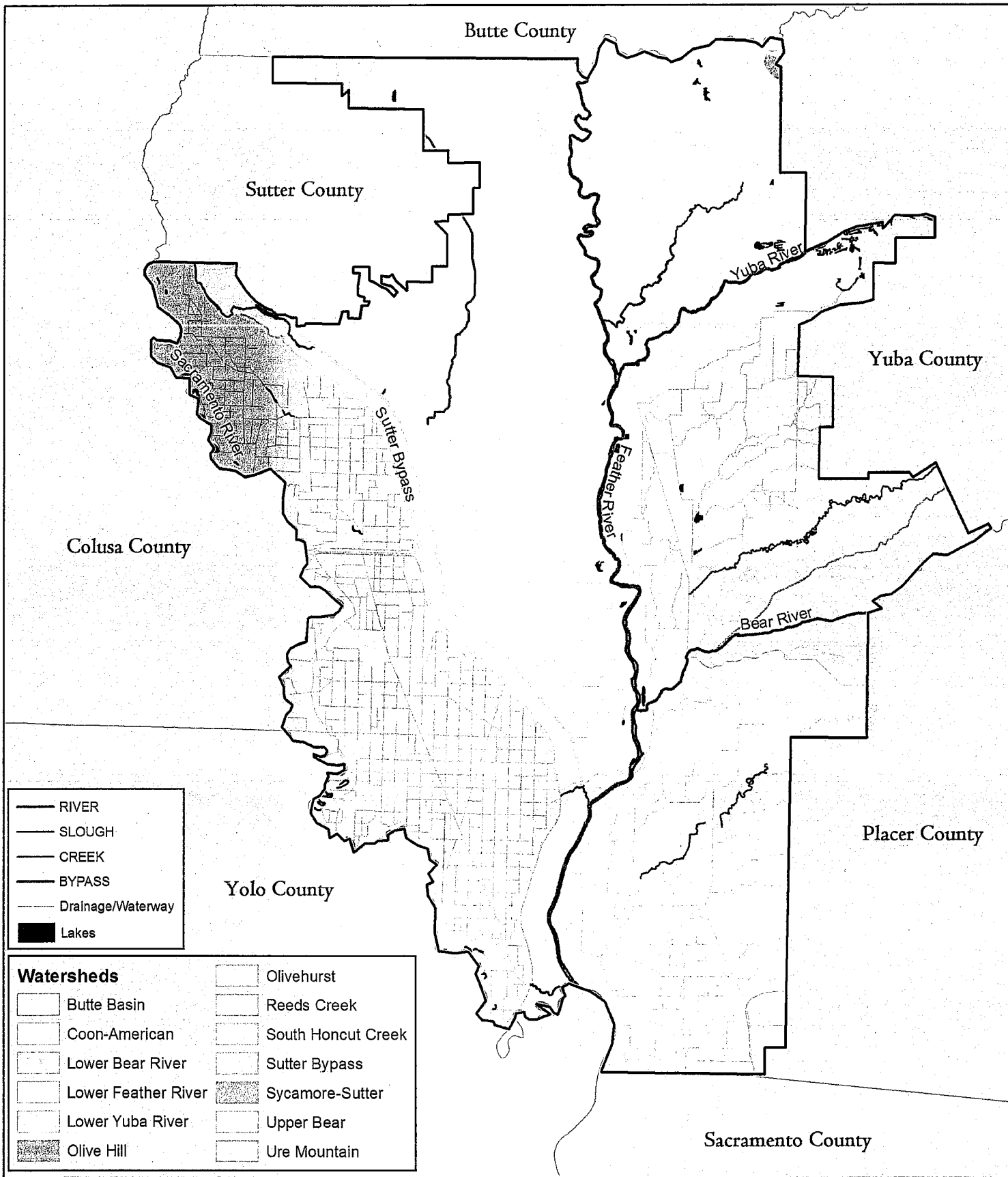
B. Signature: Ronald McBride

Date: 06/20/2011

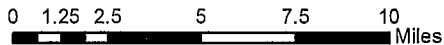
C. Title: Manager

X. FOR STATE WATER BOARD USE ONLY

WDID:	Date NOI Received:	Date NOI Processed:
Case Handler's Initial:	Fee Amount Received: \$	Check #:



ECO-ANALYSTS



1:306,581



PROJECT: Sutter-Yuba MVCDEIR
 MAP TITLE: Watersheds
 MAP DATE: April 7, 2011
 MAP DATA SOURCE(S): CDFG,
 Sutter County Planning Office, ESRI

Attachment B

Larvicides Used by Sutter-Yuba Mosquito and Vector Control District

Name	Active Ingredient
Aquabac xt	Bacillus thuringiensis var. israelensis
Vectobac 12AS	Bacillus thuringiensis var. israelensis
Vectobac G	Bacillus thuringiensis var. israelensis
Vectobac WDG	Bacillus thuringiensis var. israelensis
Aquabac 200 g	Bacillus thuringiensis var. israelensis
Vectobac Technical Powder	Bacillus thuringiensis var. israelensis
Teknar HP-D	Bacillus thuringiensis var. israelensis
Vectolex CG	Bacillus sphaericus
Vectolex WDG	Bacillus sphaericus
Vectolex WSP	Bacillus sphaericus
Spheratax SPH (50G)WSP	Bacillus sphaericus
Spheratax SPH (50G)	Bacillus sphaericus
Vectomax G	Bacillus thuringiensis var. israelensis, Bacillus sphaericus
Vectomax CG	Bacillus thuringiensis var. israelensis, Bacillus sphaericus
Vectomax WSP	Bacillus thuringiensis var. israelensis, Bacillus sphaericus
FourStar Briquets	Bacillus thuringiensis var. israelensis, Bacillus sphaericus
FourStar SBG	Bacillus thuringiensis var. israelensis, Bacillus sphaericus
Altosid XR Briquets	S-methoprene
Altosid Pellets/Altosid WSP	S-methoprene
Altosid ALL	S-methoprene
Altosid ALL Concentrate	S-methoprene
Altosid XR-G	S-methoprene
Altosid SBG	S-methoprene
Mosquito Larvicide GB-1111	Petroleum Oil
BVA 2 Mosquito Larvicide Oil	Mineral Oil
BVA Spray 13	Refined Petroleum Distillate
Agnique MMF	Poly(oxy-1,2-ethanediyl), α -(C ₁₆₋₂₀)branched and linear alkyl)- <i>w</i> -hydroxy
Agnique MMF G	Poly(oxy-1,2-ethanediyl), α -(C ₁₆₋₂₀)branched and linear alkyl)- <i>w</i> -hydroxy
Natular 2EC	Spinosad
Natular G	Spinosad
Natular XRG	Spinosad
Natular XRT	Spinosad

Attachment B – page 2

Adulticides Used by Sutter-Yuba Mosquito and Vector Control District

Name	Active Ingredient
Pyroicide Mosquito Adulticiding Concentrate 7396	Pyrethrins/Piperonyl butoxide, technical
Evergreen Crop Protection EC 60-6	Pyrethrins/Piperonyl butoxide, technical
Pyrenone Crop Spray	Pyrethrins/Piperonyl butoxide, technical
Prentox Pyronyl Crop Spray	Pyrethrins/Piperonyl butoxide, technical
Pyroicide Mosquito Adulticiding Concentrate 7395	Pyrethrins/Piperonyl butoxide, technical
Aquahalt	Pyrethrins/Piperonyl butoxide, technical
Pyrodie Mosquito Adulticide 7453	Pyrethrins/Piperonyl butoxide, technical
Pyrenone 25-5 Public Health Insecticide	Pyrethrins/Piperonyl butoxide, technical
Prentox Pyronyl Oil Concentrate #525	Pyrethrins/Piperonyl butoxide, technical
Prentox Pyronyl Oil Concentrate	Pyrethrins/Piperonyl butoxide, technical
Permanone 31-66	Pyrethrins/Piperonyl butoxide, technical
Aqualuer 20-20	Pyrethrins/Piperonyl butoxide, technical
Kontrol 30-30 Concentrate	Pyrethrins/Piperonyl butoxide, technical
Aqua-Reslin	Pyrethrins/Piperonyl butoxide, technical
Aqua-Kontrol Concentrate	Pyrethrins/Piperonyl butoxide, technical
Kontrol 4-4	Pyrethrins/Piperonyl butoxide, technical
Biomist 4+12	Pyrethrins/Piperonyl butoxide, technical
Permanone RTU 4%	Pyrethrins/Piperonyl butoxide, technical
Prentox Perm-X UL 4-4	Pyrethrins/Piperonyl butoxide, technical
Allpro Evoluer 4-4	Pyrethrins/Piperonyl butoxide, technical
Biomist 4+4	Pyrethrins/Piperonyl butoxide, technical
Kontrol 2-2	Pyrethrins/Piperonyl butoxide, technical
Scourge 18%+54% MF Formula II	Resmethrin/Piperonyl butoxide, technical
Scourge 4%+12% MF Formula II	Resmethrin/Piperonyl butoxide, technical
Anvil 10+10	Sumithrin/Piperonyl butoxide, technical
AquaANVIL	Sumithrin/Piperonyl butoxide, technical
Duet Dual-Action	Prallethrin/Sumithrin/Piperonyl butoxide, technical
Anvil 2+2	Sumithrin/Piperonyl butoxide, technical
Zenivex E20	Etofenprox
Trumpet EC	Naled
Fyfanon	Malathion

PESTICIDE APPLICATION PLAN FOR THE SUTTER-YUBA MOSQUITO & VECTOR CONTROL DISTRICT

The Discharger shall develop a Pesticides Application Plan (PAP) that contains the following elements:

- 1. Description of ALL target areas, if different from the water body of the target area, in to which larvicides and adulticides are being planned to be applied or may be applied to control vectors. The description shall include adjacent areas, if different from the water body of the target areas;**

The Sutter-Yuba Mosquito & Vector Control District (District) is comprised of Sutter and Yuba Counties excluding the Sutter Buttes; Butte Sink; Beale Air Force Base and the Yuba County foothills. See attachment "A" for a map of the District. The District may apply public health pesticides for the control of immature mosquitoes to any site that holds water for more than 96 hours, and may apply adulticides to any location where adult mosquito populations meet treatment thresholds.

- 2. Discussion of the factors influencing the decision to select pesticide applications for mosquito control;**

Please see the Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes.

- 3. Pesticide products or types expected to be used and if known, their degradation by-products, the method in which they are applied, and if applicable, the adjuvants and surfactants used;**

Please see Attachments E and F within NPDES Permit for Biological and Residual Pesticide Discharges to Waters of the U.S. for Vector Control Applications. Products may be applied by hand, truck, backpack, hand can, helicopter, or airplane according to label directions.

- 4. Description of ALL the application areas* and the target areas in the system that are being planned to applied or may be applied. Provide a map showing these areas;**

Any site that holds water for more than 96 hours (4 days) can produce mosquitoes. Source reduction is the District's preferred solution, and whenever possible the District works with property owners to effect long-term solutions to reduce or eliminate the need for continued applications as described in Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes. The typical sources treated by this District include:

* Asterisks indicate terms that are defined in Attachment A of the NPDES Permit for Vector Control

Agricultural sources such as dairies, ditches, drains, irrigated pastures, rice fields and seepage. Urban and sub-urban sources such as: bird baths, cemetery vases, clogged rain gutters, decorative ponds and fountains, ornamental and/or Koi ponds, poorly designed or damaged landscape irrigation systems, tires, and unmaintained swimming pools and spas. Managed wetland sources such as: duck clubs, Sutter National Wildlife Refuge, state wildlife areas including Gray Lodge Wildlife Area and wetlands created for mitigation.

5. Other control methods used (alternatives) and their limitations;

With any source of mosquitoes or other vectors, the District's first goal is to look for ways to eliminate the source, or if that is not possible, for ways to reduce the potential for vectors. The most commonly used methods and their limitations are included in the Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes. Specific methods used by the District include stocking mosquitofish (*Gambusia affinis*), educating residents that mosquitoes develop in standing water and encouraging them to remove sources of standing water on their property, and working with property owners to find long-term water management strategies that meet their needs while minimizing the need for public health pesticide applications.

The District raises and over-winters mosquitofish at a 20 acre aquaculture facility in Nicolaus, California. Approximately two million mosquitofish are placed into mosquito sources each year.

The District also has a comprehensive public outreach and education program. We utilize print media with direct mailings, paid newspaper advertisements. Public service announcements are placed on radio, in newspapers and on billboards. Informational handouts are made available to the public at various venues. Staff makes numerous presentations to public schools, service organizations and workplaces. Personnel also work an informational booth at the Yuba Sutter Fair and numerous other public events.

The District diligently identifies mosquito sources on private and public property and develops Memorandums Of Understanding (MOU) to mitigate mosquito breeding. MOUs include specific BMPs utilizing Integrated Mosquito Management (IVM).

6. How much product is needed and how this amounts was determined;

The need to apply product is determined by surveillance. Actual use varies annually depending on the mosquito activity. The pesticide amounts presented below were taken from the Sutter-Yuba Mosquito & Vector Control District's 2010 PUR as an estimate of pesticide use in 2011. Other public health pesticides in addition to those listed below may be used as part of the District's best management practices.

2010 ANNUAL PESTICIDE USE REPORT RECORDS FOR SUTTER YUBA MVCD

COUNTY	LIC NO	CD	REG NUM	PRODUCT NAME	AMT USED	UNIT MEASURE
sutter	5101593	50	53263-28	Agnique MMF	66.71251	GAL
sutter	5101593	50	53263-30	Agnique MMF-G	2809	LB
sutter	5101593	50	2724-448	Altosid Pellets	2303.438	LB

sutter	5101593	50	2724-489	Altosid SBG	9711.999	LB
sutter	5101593	50	2724-421	Altosid XR Briquets	56.56625	LB
sutter	5101593	50	2724-451	Altosid XR-G	369.9375	LB
sutter	5101593	50	1021-1687-8329	Anvil 2+2	1.65625	GAL
sutter	5101593	50	1021-1688-8329	Anvil 10+10	751.4899	GAL
sutter	5101593	50	1021-1803-8329	Aquahalt	306.1138	GAL
sutter	5101593	50	2329-35	Biomist 4+4	75.15626	GAL
sutter	5101593	50	37100-8-400	Dimilin 25W	0.1875	LB
sutter	5101593	50	279-3062	Dragnet	28.48632	GAL
sutter	5101593	50	1021-1795-8329	Duet	30.44688	GAL
sutter	5101593	50	34704-423-65783	Dursban 2 Coated Granules	21	LB
sutter	5101593	50	67760-34	Fyfanon	18.03125	GAL
sutter	5101593	50	8329-72	MosqLarv GB-1111	220.08	GAL
sutter	5101593	50	432-1050	Pyrenone 25-5	0.02281	GAL
sutter	5101593	50	1021-1569	Pyrocide Mosq.Adult.	2.64852	GAL
sutter	5101593	50	5481-481	Trumpet	110.5234	GAL
sutter	5101593	50	73049-38-AA	Vectobac 12AS	4575.234	GAL
sutter	5101593	50	73049-10	Vectobac G	1888	LB
sutter	5101593	50	73049-20	VectoLex CG	9.46875	LB
sutter	5101593	50	73049-429	VectoMax CG	22	LB
sutter	5101593	50	2724-791	Zenivex E20	0.45313	GAL

COUNTY	LIC NO	CD	REG NUM	PRODUCT NAME	AMT USED	UNIT MEASURE
yuba	5800468	50	53263-28	Agnique MMF	95.1179	GAL
yuba	5800468	50	2724-448	Altosid Pellets	928	LB
yuba	5800468	50	2724-421	Altosid XR Briquets	118.625	LB
yuba	5800468	50	1021-1688-8329	Anvil 10+10	167.7305	GAL
yuba	5800468	50	1021-1803-8329	Aquahalt	333.25	GAL
yuba	5800468	50	2329-35	Biomist 4+4	171.6491	GAL
yuba	5800468	50	37100-8-400	Dimilin 25W	3.71877	LB
yuba	5800468	50	279-3062	Dragnet	8.94533	GAL
yuba	5800468	50	1021-1795-8329	Duet	58.83094	GAL
yuba	5800468	50	67760-34	Fyfanon	1.875	GAL
yuba	5800468	50	8329-72	MosqLarv GB-1111	213.3047	GAL
yuba	5800468	50	1021-1569	Pyrocide Mosq.Adult.	0.26375	GAL
yuba	5800468	50	5481-481	Trumpet	125.1328	GAL
yuba	5800468	50	73049-38-AA	Vectobac 12AS	1336.266	GAL
yuba	5800468	50	73049-20	VectoLex CG	8.625	LB

7. Representative monitoring locations* and the justification for selecting these monitoring locations

Please see the MVCAC NPDES Coalition Monitoring Plan

8. Evaluation of available BMPs to determine if there are feasible alternatives to the selected pesticide application project that could reduce potential water quality impacts;

Please see the Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes.

9. Description of the BMPs to be implemented. The BMPs shall include at a minimum:

The District's BMPs are described in the Best Management Practices for Mosquito Control In California, the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes and in the California Mosquito-borne Virus Surveillance and Response Plan. Specific elements have been highlighted below under items a-f.

a. measures to prevent pesticide spill;

All pesticide applicators receive annual spill prevention and response training. District employees ensure daily that application equipment is in proper working order. Spill mitigation devices are placed in all vehicles and pesticide storage areas.

b. measures to ensure that only a minimum and consistent amount is used

Application equipment is calibrated at least annually as required by the Department of Pesticide Regulations (DPR) and the terms of a cooperative agreement with the California Department of Public Health (CDPH).

c. a plan to educate Coalition's or Discharger's staff and pesticide applicator on any potential adverse effects to waters of the U.S. from the pesticide application;

This will be included in our pesticide applicators annual pesticide application and safety training, continuing education programs, and/or regional NPDES Permit training programs.

d. descriptions of specific BMPs for each application mode, e.g. aerial, truck, hand, etc.;

The Sutter-Yuba Mosquito & Vector Control District calibrates truck-mounted and handheld larviciding equipment each year to meet application specifications. Supervisors review application records daily to ensure appropriate amounts of material are being used. Ultra-low volume (ULV) application equipment is calibrated for output and droplet size to meet label requirements. Aerial larviciding equipment is calibrated by the Contractor. Aerial adulticide equipment is calibrated regularly and droplet size will be monitored by the District to ensure droplets meet label requirements. Airplanes used in urban ULV adulticide applications and the primary airplane used for rural ULV adulticide application is equipped with advanced guidance and drift management equipment to ensure the best available technology is being used to place product in the intended area. If a secondary airplane is used in rural ULV applications it will be equipped with an advanced guidance system.

e. descriptions of specific BMPs for each pesticide product used; and

Please see the Best Management Practices for Mosquito Control in California for general pesticide application BMPs, and the current approved pesticide labels for application BMPs for specific products.

- f. **Descriptions of specific BMPs for each type of environmental setting (agricultural, urban, and wetland).**

Please see the Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes.

- 10. Identification of the problem. Prior to first pesticide application covered under this General Permit that will result in a discharge of biological and residual pesticides to waters of the US, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the Discharger must do the following for each vector management area:**

- a. **If applicable, establish densities for larval and adult vector populations to serve as action threshold(s) for implementing pest management strategies;**

The Sutter-Yuba Mosquito & Vector Control District staff only apply pesticides to sources of mosquitoes that represent imminent threats to public health or quality of life. The presence of any mosquito may necessitate treatment, however higher thresholds may be applied depending on the District's resources, disease activity, or local needs. Treatment thresholds are based on a combination of one or more of the following criteria:

- Mosquito species present
- Mosquito stage of development
- Pest, nuisance, or disease potential
- Disease activity
- Mosquito abundance
- Flight range
- Proximity to populated areas
- Size of source
- Presence/absence of natural enemies or predators
- Presence of sensitive/endangered species or habitats.

- b. **Identify target vector species to develop species-specific pest management strategies based on developmental and behavioral considerations for each species;**

Please see the Best Management Practices for Mosquito Control in California, Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes and the California Mosquito-borne Virus Surveillance and Response Plan.

- c. **Identify known breeding areas for source reduction, larval control program, and habitat management; and**

Any site that holds water for more than 96 hours (4 days) can produce mosquitoes. Source reduction is the District's preferred solution, and whenever possible the

District works with property owners to implement long-term solutions to reduce or eliminate the need for continued applications as described in Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes.

d. Analyze existing surveillance data to identify new or unidentified sources of vector problems as well as areas that have recurring vector problems.

This is included in the Best Management Practices for Mosquito Control in California and the California Mosquito-borne Virus Surveillance and Response Plan that the Districts uses. The District continually collects adult and larval mosquito surveillance data, dead bird reports, and sentinel chicken test results and uses these data to guide mosquito control activities.

11. Examination of Alternatives. Dischargers shall continue to examine alternatives to pesticide use in order to reduce the need for applying larvicides that contain temephos and for spraying adulticides. Such methods include:

a. Evaluating the following management options, in which the impact to water quality, impact to non-target organisms, vector resistance, feasibility, and cost effectiveness should be considered:

- No action
- Prevention
- Mechanical or physical methods
- Cultural methods
- Biological control agents
- Pesticides

If there are no alternatives to pesticides, dischargers shall use the least amount of pesticide necessary to effectively control the target pest.

The Sutter-Yuba Mosquito & Vector Control District's uses the principles and practices of integrated vector management (IVM) as described on pages 26 and 27 of Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes. As stated in item #10 above, locations where vectors may exist are assessed, and the potential for using alternatives to pesticides is determined on a case-by-case basis. Commonly considered alternatives include: 1) Eliminate artificial sources of standing water; 2) Ensure temporary sources of surface water drain within four days (96 hours) to prevent adult mosquitoes from developing; 3) Control plant growth in ponds, ditches, and shallow wetlands; 4) Design facilities and water conveyance and/or holding structures to minimize the potential for producing mosquitoes; and 5) Use appropriate biological control methods that are available. Additional alternatives to using pesticides for managing mosquitoes are listed on pages 4-19 of the Best Management Practices for Mosquito Control in California and the Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes.

Implementing preferred alternatives depends a variety of factors including availability of agency resources, cooperation with stakeholders, coordination with other regulatory agencies, and the efficacy of the alternative. If a pesticide-free alternative does not sufficiently reduce the risk to public health, pesticides are considered, beginning with the least amount necessary to effectively control the target vector.

b. Applying pesticides only when vectors are present at a level that will constitute a nuisance.

The Sutter-Yuba Mosquito & Vector Control District follows an existing integrated vector management (IVM) program which includes practices described in the California Mosquito-borne Virus Surveillance and Response Plan, Sutter-Yuba Mosquito & Vector Control District Best Management Practices To Reduce Mosquitoes and the Best Management Practices for Mosquito Control in California.

A “nuisance” is specifically defined in California Health and Safety Code (HSC) §2002(j). This definition allows vector control agencies to address situations where even a low level of vectors may pose a substantial threat to public health. In practice, the definition of a “nuisance” is generally only part of a decision to apply pesticides to areas covered under this permit. As summarized in the California Mosquito-borne Virus Surveillance and Response Plan, the overall risk to the public when vectors and/or vector-borne disease are present is used to select an available and appropriate material, rate, and application method to address that risk in the context of our IVM program.

The District does have established treatment thresholds for the Sutter National Wildlife Refuge. These thresholds are included in attachment “B”.

12. Correct Use of Pesticides

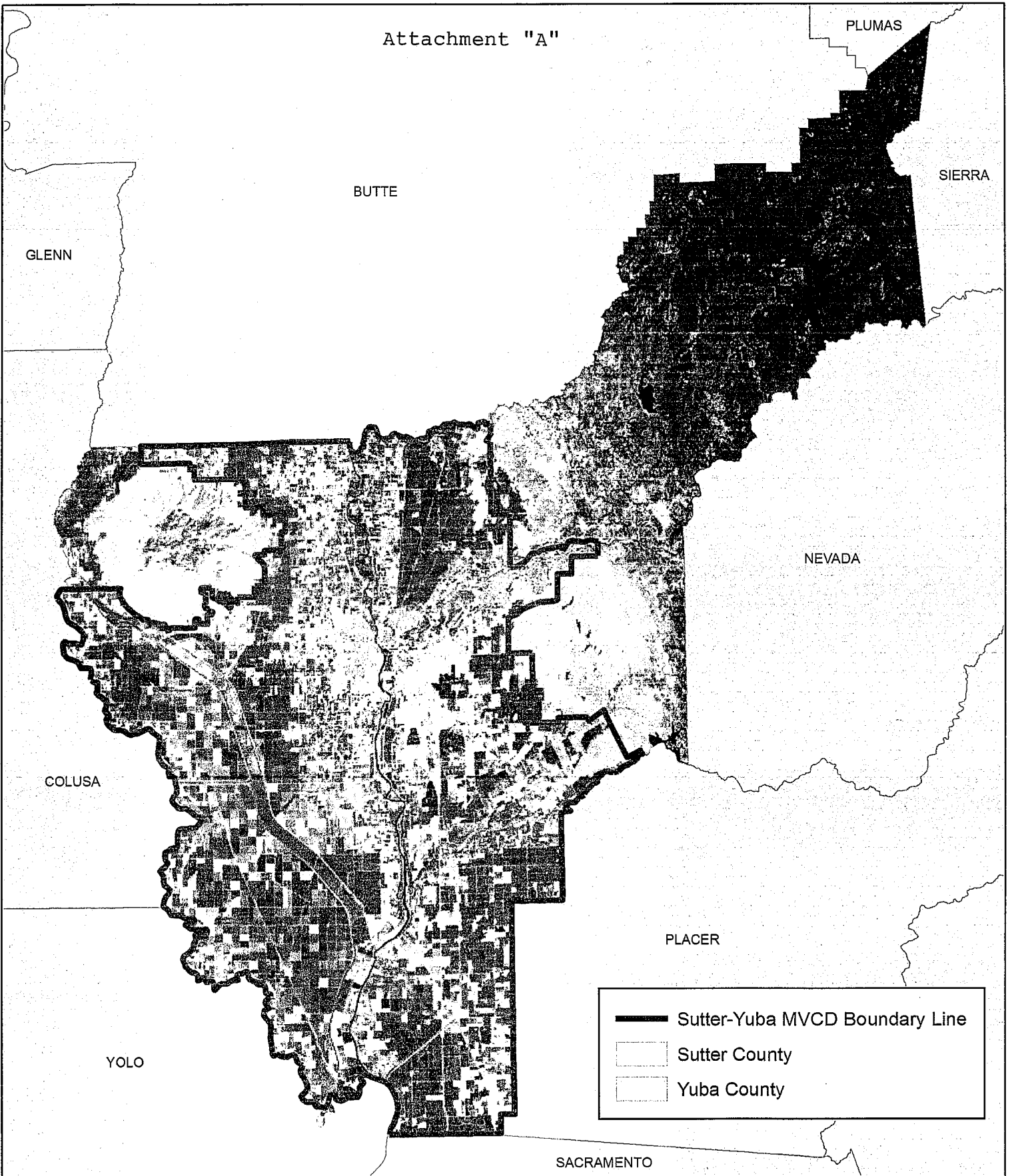
Coalition’s or Discharger’s use of pesticides must ensure that all reasonable precautions are taken to minimize the impacts caused by pesticide applications. Reasonable precautions include using the right spraying techniques and equipment, taking account of weather conditions and the need to protect the environment.

This is an existing practice of the Sutter-Yuba Mosquito & Vector Control District, and is required to comply with the Department of Pesticide Regulation’s (DPR) requirements and the terms of our California Department of Public Health (CDPH) Cooperative Agreement. All pesticide applicators receive annual safety and spill training in addition to their regular continuing education.

13. If applicable, specify a website where public notices, required in Section VIII.B, may be found.

The District’s website can be found at: www.sutter-yubamvcd.org.

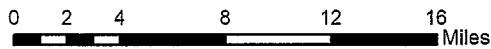
Attachment "A"



— Sutter-Yuba MVCD Boundary Line
- - - Sutter County
... Yuba County



ECO-ANALYSTS



1:445,000



PROJECT: Sutter-Yuba MVCD EIR
MAP TITLE: Location Map
MAP DATE: 2/24/2011
MAP DATA SOURCE(S): Sutter Yuba
MVCD, ESRI Online

Table 12. Action thresholds for larvicide, pupacide, and adulticide applications on Refuges within the Complex.

Refuge	Distance From Nearest Urban Area	Treatment Thresholds ¹					NJLT Index for <i>C. tarsalis</i> ⁵
		Larvicide		Pupacide ²		Adulticide	
		Dipper ³	nt ⁶	Dipper	<i>Aedes</i> sp. Landing Count ⁴		
Sacramento	6 miles south of Willows		nt ⁶	nt	nt	60 ⁷	
Delevan	4 miles east of Maxwell		nt	nt	nt	40 ⁷	
Colusa	1 mile west of Colusa	2/2		10/10	5	5/20	
Sutter	3 miles south of Sutter	2/2		10/10	10	5/20	
Butte Sink	3.5 miles northeast of Colusa	2/2		10/10	10	no trap present	
Llano Seco Unit	1.5 miles southwest of Dayton	2/2		10/10	5	5/20	

¹First number is during a documented public health threat; second number is outside of a documented public health threat.
²Refers specifically to GB-1111; used under rare circumstances where pupae have accumulated in abundance in discrete areas (i.e. windrows); would be conducted in consultation with Refuge staff to avoid areas with significant numbers of young duck broods (Miles et al. 2002).
³ Average number per dip.
⁴ Average number landing per pant leg per minute.
⁵ Per trap night, based on weekly index of adult females.
⁶ No threshold established; not applicable at this time.
⁷ Only during an existing human health threat or emergency.

*This table is subject to change based on current conditions or changes in USFWS national policy.

**SUTTER-YUBA MOSQUITO
& VECTOR CONTROL DISTRICT'S**

**BEST MANAGEMENT PRACTICES
TO REDUCE MOSQUITOES**



BEST MANAGEMENT PRACTICES TO REDUCE MOSQUITOES

The Best Management Practices (BMPs) contained in this manual are assembled from a number of sources, including scientific literature, state and inter-agency documents, and experienced vector control professionals. The intended use of this document is to provide general guidance, not site-specific requirements. BMPs that are most applicable to a specific mosquito-breeding source may be selected from the list and incorporated into a specific BMP Implementation Plan in consultation with the District personnel.

TABLE OF CONTENTS

BMP IMPLEMENTATION POLICIES.....	1
SIGNIFICANT MOSQUITO-BREEDING SOURCES.....	4
BMP IMPLEMENTATION PLAN.....	5
REIMBURSEMENT FOR CONTROL COSTS.....	5
PROCESS OF APPEALS.....	6
PROCESS TO IMPLEMENT BMP PLAN.....	7
THE BMP PROCESS FLOWCHART.....	10
MOSQUITO BIOLOGY AND ASSOCIATED BREEDING HABITATS.....	11
• STANDING-WATER MOSQUITOES.....	12
• FLOODWATER MOSQUITOES.....	13
• CONTAINER MOSQUITOES.....	14
IRRIGATION AND DRAINAGE OF AGRICULTURAL SOURCES.....	16
BMPs AIMED TO REDUCE MOSQUITO BREEDING IN AGRICULTURAL SETTINGS.....	18
• DITCHES AND DRAINS.....	18
• IRRIGATED PASTURES.....	18
DAIRIES.....	20
BMPs AIMED TO REDUCE MOSQUITO BREEDING IN DAIRIES.....	21
RICE FIELDS.....	22
BMPs AIMED TO REDUCE MOSQUITO-BREEDING IN RICE FIELDS.....	24
STORMWATER SYSTEMS.....	26
BMPs AIMED TO REDUCE MOSQUITO-BREEDING IN STORMWATER SYSTEMS.....	28

MANAGED WETLANDS.....31

BMPS AIMED TO REDUCE MOSQUITO-BREEDING IN MANAGED WETLANDS.....33

- WETLAND DESIGN AND MAINTENANCE33
- WETLAND VEGETATION MANAGEMENT.....34
- WETLAND WATER MANAGEMENT34
- COORDINATION WITH DISTRICT.....36

URBAN AND SUBURBAN MOSQUITO-BREEDING SOURCES.....37

BMPS AIMED TO REDUCE MOSQUITO-BREEDING IN URBAN AND SUBURBAN SOURCES.....40

- URBAN AND SUBURBAN RESIDENTIAL AREAS.....40
- TIRE STORAGE.41
- CEMETERY VASES.41

REFERENCES.42

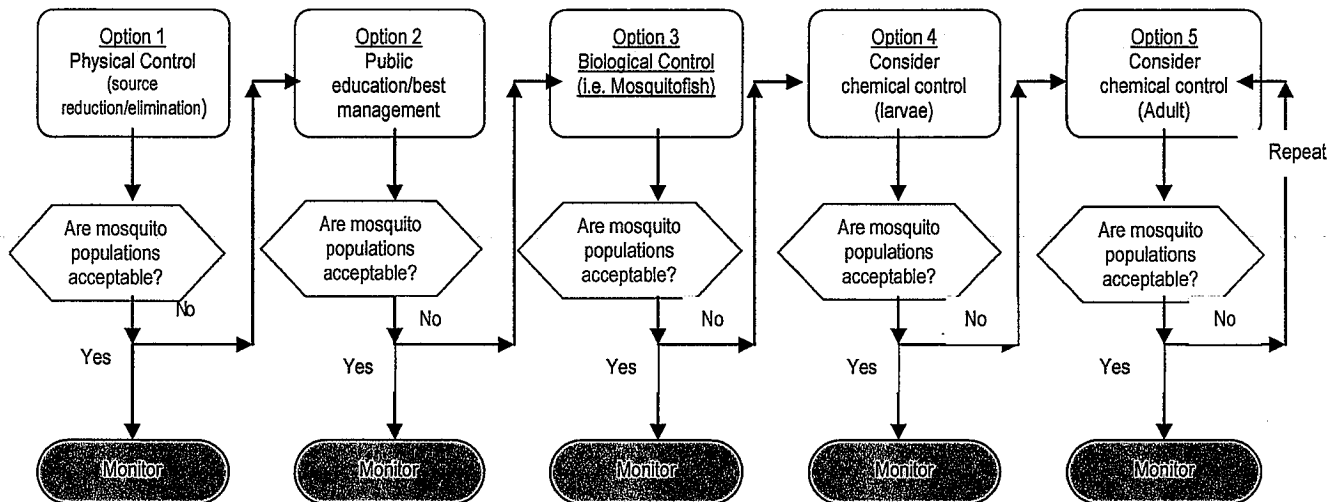
BMP IMPLEMENTATION POLICIES

INTRODUCTION

The Sutter-Yuba Mosquito & Vector Control District (District) is aware that adjusting land management practices can reduce mosquito populations, thereby lowering mosquito control costs, reducing the amount of pesticide used in mosquito control applications, helping to protect the public's health, and contributing to the District's Integrated Mosquito Management (IMM) approach to mosquito and vector control.

IMM is an effective and environmentally sensitive approach to mosquito management that relies on a combination of common-sense practices. The District's IMM program uses current, comprehensive information on the life cycles of mosquitoes and their interaction with the environment. This information is used to manage mosquito nuisance and public health threats by the most economical means and with the least possible hazard to people, property, and the environment. The District's IMM includes vector surveillance, source reduction, manipulation and/or elimination, best management practices, public education, biological control, chemical control, and monitoring.

Integrated Mosquito Management (IMM) Program



There are four different types of mosquito control methods practiced by the District. The first is source reduction, manipulation, and/or elimination, which is a physical control method. Physical control is an environmental manipulation that results in the reduction or elimination of mosquito development sites. Biological mosquito control uses biological agents to reduce larval mosquito populations. The third control method is the use of federal- and state-registered pesticides to control mosquito populations. Two types of pesticides are utilized: adulticides, which kill adult mosquitoes, and larvicides, which are designed to kill immature aquatic-stage mosquitoes (larvae) or inhibit development to adult emergence. Cultural control is the fourth method utilized by the District. Cultural control is designed to change the behavior of the county's residents through public education and outreach so that their actions prevent mosquitoes. Each

method of control is designed to eliminate or minimize mosquito-breeding sites, reduce mosquito populations, and reduce transmission of vector-borne disease.

The District is continually striving to enhance its efforts to control mosquitoes effectively by physical, biological, and cultural means, lessening dependency on chemical control. With the adoption of these policies and procedures, this goal can be achieved. This manual includes the District's guidelines for land management practices that provide landowners and land managers techniques to address most mosquito-breeding problems that may be identified by the District.

The BMPs in this manual can reduce mosquito populations by several methods, including: reducing and/or eliminating standing water that serves as mosquito-breeding sources, increasing the efficacy of biological controls such as mosquitofish, increasing the efficacy of chemical controls, and improving access for mosquito control operations. Not all BMPs included in this manual will apply equally to all mosquito-breeding sources, but all BMPs are to be a starting point in the cooperative development of site-specific BMP implementation plans that will address the identified mosquito-breeding source(s).

The District recommends that those responsible for creating large mosquito populations by possessing a significant mosquito-breeding source on the identified property develop and implement a cooperative BMP plan with the District to avoid the need for formal enforcement actions authorized under the California Health and Safety Code. Under the California Health and Safety Code, section 2061, mosquito and vector control districts may legally abate a public health nuisance defined as "Any water that is a breeding place for vectors" and "Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors." Abatement can result in civil penalties of up to \$1,000.00 per day for each day of such violation and the recovery of costs for District activities to control the mosquitoes from a source. This includes sources outside the District boundaries that produce mosquitoes that then fly into the District.

Some circumstances require the District to utilize the California Health and Safety Code to ensure the public's safety and to carry out its responsibilities, but due to past experiences, the District believes that a cooperative approach leads to a more effective and long-lasting relationship, which, in turn, leads to the overall reduction of mosquitoes and mosquito-breeding sources.

BMP implementation policies in this manual are designed to address significant mosquito-breeding sites including, but not limited to: residential properties, commercial properties, industrial properties, public properties, cemeteries, wastewater facilities, storm water facilities, and agricultural production such as rice, orchards, row crops, pastures, ditches, managed wetlands, and duck clubs. Due to management practices that promote favorable habitat for mosquito production, many of the above listed properties and/or facilities produce significant populations of mosquitoes, which pose a public health nuisance and/or public health risk.

The policies in this manual are designed to address the most significant mosquito-breeding problems throughout the District. Mosquito-breeding sources defined as Significant Mosquito-Breeding Sources will be addressed according to the following policies and procedures. Mosquito-breeding sources that do not meet the criteria as a Significant Mosquito-Breeding Source will not be held accountable to the policies and procedures in this manual; however, use of this manual provide an opportunity to the landowner/land manager to take a proactive approach to mosquito problems and to avoid a property's becoming a significant mosquito-breeding source.

If the adoption and implementation of a BMP creates a significant economic hardship or causes technical difficulties, the District may elect to offer assistance in the form of equipment, labor, technical advice and/or other resources. Assistance will be considered and offered on a case-by-case basis and is not to be considered a guarantee.

SIGNIFICANT MOSQUITO-BREEDING SOURCES

The following criteria will identify and define a Significant Mosquito-Breeding Source:

- Mosquito production exceeds District-adopted treatment thresholds;
- Mosquito production exceeds that of a similar source in a similar land use situation;
- Increased control costs are incurred by the District due to the management practices;
- Mosquito production is in close proximity to a populated area;

As defined by the California Health and Safety Code, a Significant Mosquito-Breeding Source would be considered a public nuisance if left untreated and may be subject to civil penalties of up to \$1,000.00 a day.

Adult and larval mosquito surveillance data will be gathered before and after the implementation of the BMPs Plan to measure the effectiveness of the program. If current sampling methods and existing surveillance data are not sufficient to determine the effectiveness of the particular BMP, a site-specific monitoring plan will be created to evaluate the Significant Mosquito-Breeding Source's implemented BMP.

When evaluating a Significant Mosquito-Breeding Source as defined above, the District will evaluate other factors such as the current level of vector-borne disease, mosquito species being produced, and the efficacy of available control options. Identified Significant Mosquito-Breeding Sources that are in close proximity to populated areas and/or have the highest potential to reduce mosquito production will be selected to adopt a BMP implementation plan compliant with this manual.

Many land management practices can contribute to increased mosquito production. Some of the management practices are, but are not limited to: lack of emergent vegetation control, lack of trash and debris removal, lack of proper maintenance to ensure facility or structural operation as design indicates, poor water management, poor condition of water conveyance or drainage structures, lack of adequate refuge for biological control populations, practices that deny or obstruct District access to the source, and the lack of notification of land management practices that would affect mosquito production or mosquito control operations.

BMP IMPLEMENTATION PLAN

If a mosquito-breeding source is located and meets the criteria as a Significant Mosquito-Breeding Source, the District will develop and present a draft BMP Implementation Plan to the responsible landowner and/or manager, proposing the course(s) of action(s) based on one or more BMPs that, if implemented, will reduce or eliminate the mosquito-breeding source. If appropriate, the District will consult with state and federal biologists and/or other professionals to determine if the BMP being proposed is adequate and environmentally sound.

The draft BMP Implementation Plan will contain, but is not limited to, the following:

- Identification of a Significant Mosquito-Breeding Source
- Justification for the proposed and requested actions
- Clear and precise description of the proposed BMP(s)
- Timing of implementation and specific guidance of proposed BMP(s)
- District resource(s) available to assist with BMP implementation
- Assessment and surveillance method(s)

To achieve a mutually agreeable BMP Plan, the property owner/land manager will have the opportunity to review and comment on the proposed draft plan. Reasonable adjustments can and may be negotiated between the responsible property owner/land manager and the District during the review process. A reasonable time limit will be allowed during the negotiating process, at which time the District will finalize any and all unresolved issues. The time limit itself is subject to an extension if all parties mutually agree and reasonable cause is provided. If the responsible party is unwilling to accept the terms of the cooperative process upon conclusion of the review period, the District may be forced to pursue formal abatement proceedings.

REIMBURSEMENT FOR CONTROL COSTS

The District is authorized by the California Health and Safety Code to recover treatment costs for mosquito control operations. Since most mosquito-treated properties in the District pay for a "base" level of mosquito control through property taxes, the District would consider charging for treatment costs that are above and beyond the normal level of treatment for mosquito control on mosquito-breeding sources with similar land use. Since the primary goal for the creation and use of this BMP manual is to lead to the reduction of pesticide use, the District would only consider accepting charges for additional treatment in lieu of BMPs on a case-by-case basis for a limited period of time. As new BMPs are developed and efficacy of existing BMPs are researched further, the expectation would be that the charge for treatment portions of the BMP Plans would be replaced by non-pesticide-based long-term mosquito management plans.

PROCESS OF APPEALS

The responsible landowner/property manager may submit comments in writing to the Sutter-Yuba Mosquito & Vector Control District Board of Trustees before the implementation deadline of the Draft BMP Plan. Upon review, the Board of Trustees will issue a determination, which may include no change in the content of the draft BMP Plan, an extension of the implementation deadline, a waiver of reimbursement fees, or other appropriate action. If the responsible landowner/property manager is a state agency, appeals may be made to the California Department of Public Health pursuant to the California Health and Safety Code.

PROCESS TO IMPLEMENT BMP PLAN

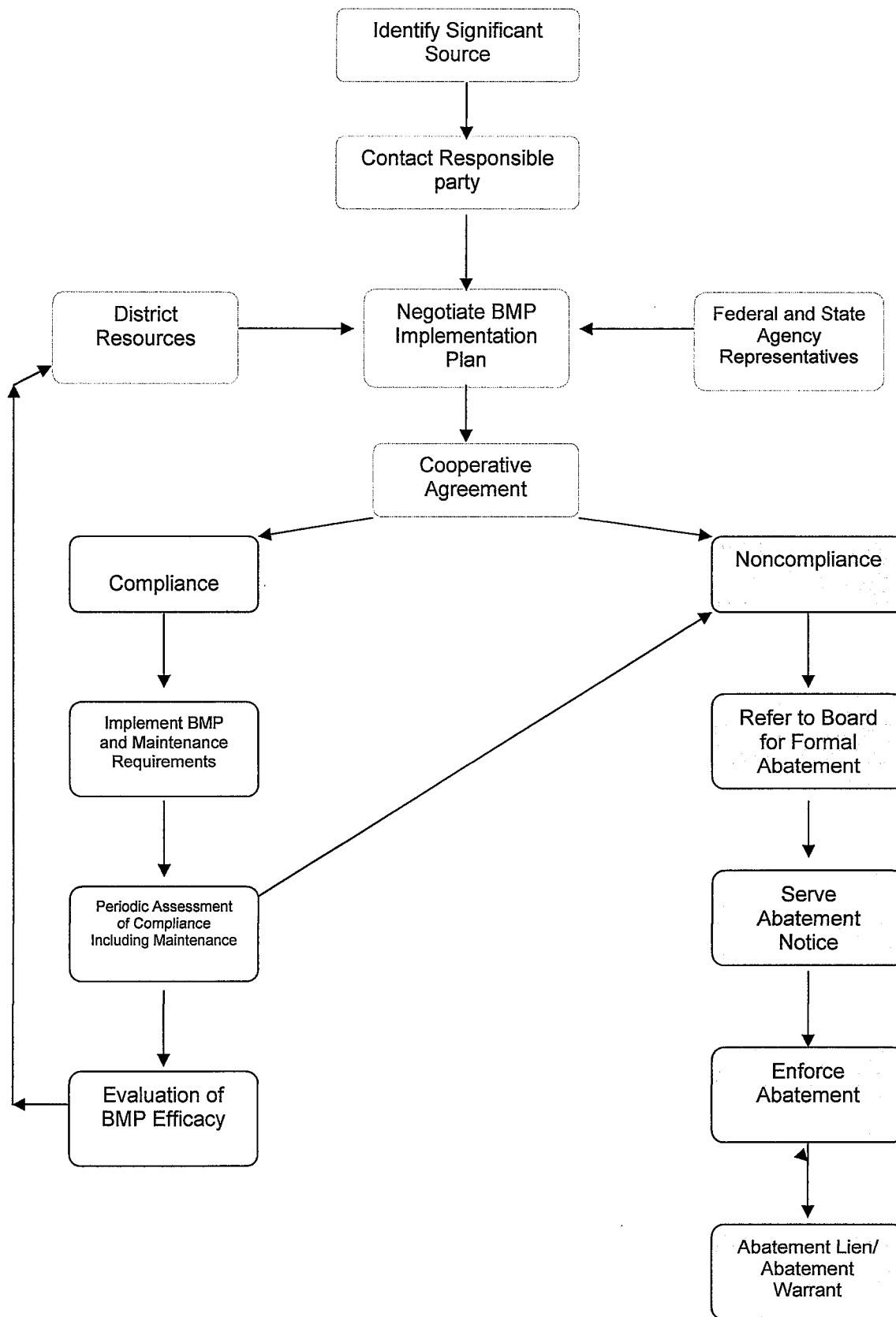
Below is a chronological list of progression that will lead to the creation of a BMP Plan for identified properties that meet the criteria for a Significant Mosquito-Breeding Source.

1. **Identification of a Significant Mosquito-Breeding Source**-The District will identify a significant Mosquito-Breeding Source based on the following criteria:
 - Mosquito production exceeds District treatment thresholds.
 - Mosquito production exceeds that of a similar source in a similar land use situation.
 - Increased control costs are incurred by the District due to the management practices.
 - Mosquito production is in close proximity to a populated area.
 - Mosquito production is on land where land management practices could be modified to reduce high populations of mosquitoes and future mosquito production.
2. **Contact responsible landowner** – The District will contact the responsible landowner of properties in Sutter and Yuba Counties that have been identified as Significant Mosquito-Breeding Source that, if untreated, would become a public nuisance (California Health and Safety Code section 2061) or a threat to public health. A draft BMP Plan will be provided to the responsible landowner that will include an explanation of why the site was identified as a Significant Mosquito-Breeding Source, including mosquito surveillance data and the management practices necessary to reduce mosquito production.
3. **Negotiate draft BMP Plan** – District staff will work with the responsible landowner to achieve a mutually agreeable course of action to address the Significant Mosquito-Breeding Source. During this stage in the process, specific BMPs, implementation timelines, maintenance requirements, and monitoring plans will be addressed and negotiated. A defined negotiation timeline will be designated at the start of this process.
4. **Acquire additional resources** – Resources may be made available to assist the responsible landowner to comply with the BMP requirements. If District resources are utilized, maintenance requirements will be specified in the cooperative agreement. This agreement will contain the name of the landowner utilizing the resource, location of the property, description of work being performed, the cost of work, if any, to be paid by the responsible landowner, and requirements for maintenance to be performed by landowner.
5. **Coordination with other regulatory agencies** – Other local, state, federal, and conservation agencies may be brought into the negotiating process to avoid any potential regulatory conflicts with the draft BMP Plan.

6. **Cooperative agreement** – The District will generate a cooperative agreement to formalize the relationship between the responsible landowner and the District, specifying the terms agreed upon in the BMP Plan. The cooperative agreement will also state the consequences of noncompliance with the BMP Plan under the California Health and Safety Code.
7. **Implementation of BMP Plan and monitoring** – To ensure compliance and continued maintenance, the District will continually monitor the property after successful completion and implementation of the BMP. If reasonable mosquito control is not achieved through the initial BMP Plan, the District reserves the right to renegotiate the BMP Plan at any time mosquito production is not reduced. If this happens, the process would return to step #2 (above). No additional charges or penalties will be assessed to the responsible landowner if the party is still compliant with the terms of the cooperative agreement.
8. **Evaluation of BMP efficacy to reduce mosquitoes** – The District will continually evaluate each BMP Plan to assess the efficacy and ensure that the BMPs are meeting the needs of the responsible landowner and the District. Based on the evaluation, either party may initiate a review of the BMP plan pursuant to the terms of the cooperative agreement. A mosquito management plan aimed at reducing mosquito populations requires regular assessments and adaptive management to address changing conditions and/or unforeseen effects.
9. **Formal abatement process** – If the responsible landowner of property that has been identified as a Significant Mosquito-Breeding Source does not take corrective action or does not provide reasonable explanation for the continued lack of compliance with the cooperative agreement, the case may be brought to the Sutter-Yuba Mosquito & Vector Control District Board of Trustees to begin the formal abatement process as defined in the California Health and Safety Code, section 2061.
10. **Serve abatement notice** – Under direction of the District Board of Trustees, the responsible landowner will be served an abatement notice directing the landowner to comply with the cooperative agreement within the specified timeframe. Noncompliant landowners can be fined civil penalties of up to \$1,000.00 per day for each day while in non-compliance and the recovery costs for District activities to control mosquitoes from a source, pursuant to the California Health and Safety Code, sections 2061 and 2063.
11. **Inform responsible landowner** - Before complying with the requirements of the notice, the owner may appear at a hearing of the District Board of Trustees at a time and place specified in the notice. The District Board of Trustees shall accept written and oral testimony from the landowner and other persons. At the close of the hearing, the District Board of Trustees shall find, based on substantial evidence in the record, whether a public nuisance exists on the property.

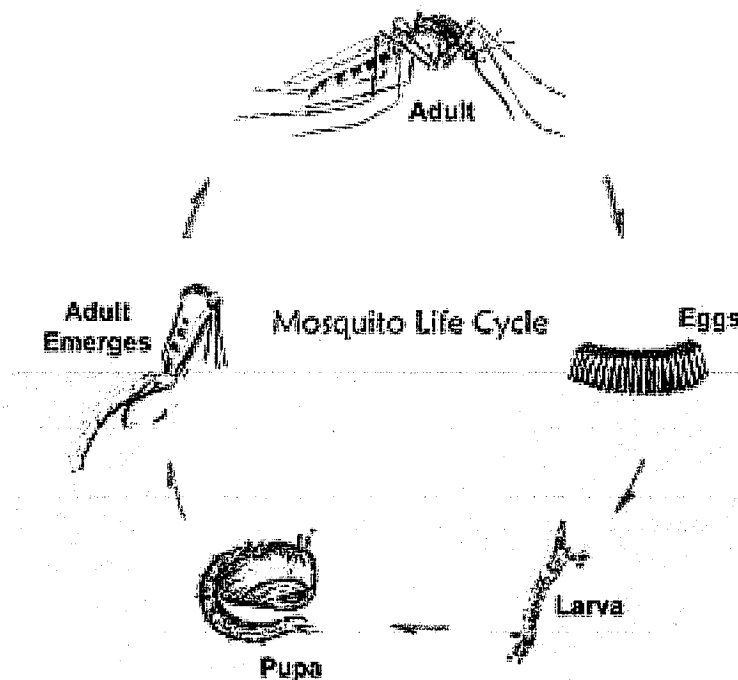
12. **Enforcement of abatement** – Under direction of the District Board of Trustees, civil penalties and treatment costs not paid within 60 days will be collected “at the same time and in the same manner as ordinary county taxes and shall be subject to the same procedure and sale in case of delinquency as are provided for ordinary county taxes.” California Health and Safety Code, section 2065(b).
13. **Additional abatement actions** – Under direction of the District Board of Trustees and/or District Manager, other measures such as an abatement warrant or abatement lien may be imposed pursuant to the California Health and Safety Code.

THE BMP PROCESS FLOWCHART



MOSQUITO BIOLOGY AND ASSOCIATED BREEDING HABITATS

There are over 3,000 mosquito species in the world, and more than 50 have been identified in California, half of which are commonly found throughout Sutter and Yuba Counties. All mosquitoes that bite humans are capable of transmitting disease to them. Some species are more competent vectors than others. Additionally, new mosquito-vectored diseases are being introduced into the United States as was West Nile virus in 1999. Several species in the District are of particular public health concern, including *Culex tarsalis*, *Culex pipiens*, *Aedes melanimon*, *Aedes sierrensis*, and *Anopheles freeborni*. It is important to understand that all mosquito species have different habitat requirements and behaviors that affect their ability to transmit disease, bite and feed on humans, and be controlled by a specific BMP.



As shown above, all mosquitoes share a similar life cycle representing complete metamorphosis. The mosquito life cycle is best described as a two-stage life cycle, which includes the aquatic stage (larvae and pupae) and the aerial stage (adults). Most Best Management Practices (BMPs) aimed at reducing mosquito populations focus on managing the aquatic stages of the mosquito by creating conditions less favorable for mosquito development or more advantageous for biological control agents such as the mosquitofish (*Gambusia affinis*). This usually involves manipulating the amount or timing of standing water, decreasing the amount of vegetation in and/or around standing water, and creating a situation where natural or introduced predators can consume the mosquito larvae. Since each species of mosquitoes has different habitat requirements, it

is vital to understand which mosquitoes favor which habitats to realize how a particular BMP is designed to work, thereby reducing mosquito production.

To understand the design of different BMPs, it is useful to think of mosquitoes belonging to one of three categories: standing-water mosquitoes, floodwater mosquitoes, and container mosquitoes. BMPs designed for the reduction of standing-water mosquitoes may not work or be applicable to floodwater mosquitoes and vice versa. Below is a list of each of the three categories of mosquitoes, the mosquitoes of concern commonly found in the District, and common BMPs aimed at the reduction of those mosquitoes.

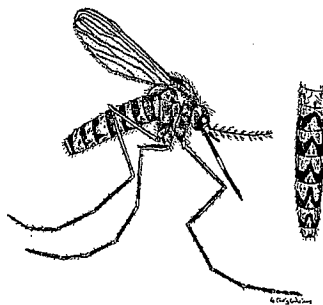
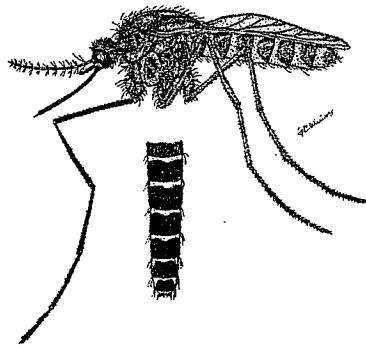
1. **Standing-Water Mosquitoes** prefer still water commonly found in ponds, rice fields, lakes, unmaintained swimming pools, etc.

Mosquito species of concern commonly found in standing-water sources:

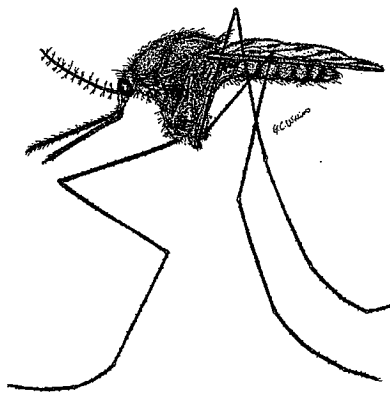
The Northern House Mosquito (*Culex pipiens*) is a major vector of West Nile virus (WNV) and can vector Saint Louis encephalitis (SLE) and the Western equine encephalomyelitis (WEE). *Culex pipiens* is an indoor mosquito that breeds primarily in polluted water sources. They are found in ponds, roadside ditches, artificial containers, storm drains, wastewater ponds, sumps, septic tanks, fountains, birdbaths, and un-maintained swimming pools. Birds are their principal blood meal, but they will attack humans and invade their homes. *Culex pipiens* usually breeds in the early spring to late fall in the District. This mosquito is crepuscular, feeding at dawn and dusk. During the summer and fall months or when

populations are high, females readily enter residences, feeding on occupants after dark while they sleep. The life cycle can be completed in 10 to 23 days depending on environmental conditions.

The Encephalitis Mosquito (*Culex tarsalis*) is the primary vector of West Nile virus (WNV), Saint Louis encephalitis (SLE), and the Western equine encephalomyelitis (WEE). *Culex tarsalis* breeds in a variety of aquatic habitats ranging from clean to polluted water sources, including, but not limited to: flooded agricultural lands, ditches, manmade containers, ponds, and urban sources. In the District, this mosquito breeds yearround and prefers to feed on birds but does readily attack humans, horses, and cattle. This species is crepuscular, feeding at dusk and dawn. The life cycle can be completed in 10 to 23 days depending on environmental conditions.



The Western Malaria Mosquito (*Anopheles freeborni*) is one of the District's most abundant pests and the primary vector of malaria. Larvae prefer clear, fresh water in sunlit or partially shaded pools. This mosquito is most commonly found in rice fields, duck clubs, wetlands, rain pools, vernal pools, and roadside ditches with grass. *Anopheles freeborni* are an aggressive mosquito, commonly feed on mammals or humans, and are most active at dawn and dusk. This species will day-rest in large numbers in shady, cool areas around residences and buildings in the late summer and fall. The life cycle can be completed in 14 to 23 days depending on environmental conditions.

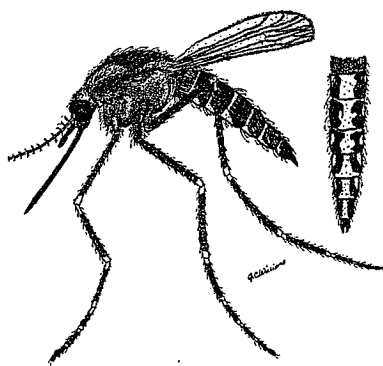


Common BMPs to reduce standing-water mosquitoes:

- a. Drain any and all standing water.
- b. Reduce or eliminate emergent vegetation in and along the edges of water.
- c. Maintain water level to encourage natural predators or biological control agents.
- d. Contact the District to coordinate mosquito prevention with other mosquito control operations such as chemical and biological control.

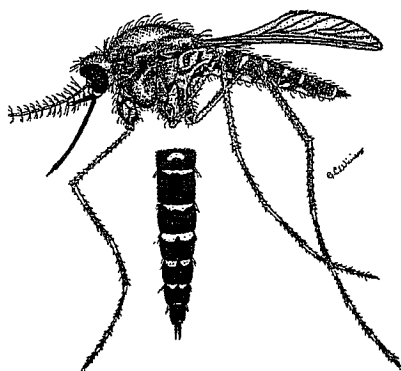
2. **Floodwater Mosquitoes** commonly lay their eggs on moist soil or the base of grasses. When the eggs become submerged as in a seasonal wetland, duck club, irrigated pasture, or flood plane, the eggs hatch.

Mosquito species of concern commonly found in floodwater sources:



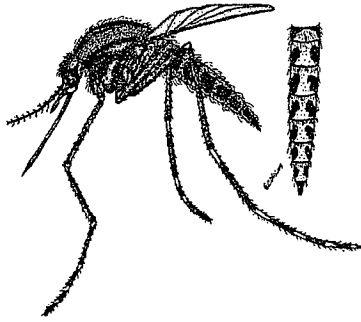
Wetlands Mosquito (*Aedes melanimon*) is not only a major pest within twenty miles of its larval breeding sources but is a vector of West Nile virus (WNV) and has been implicated as a secondary vector of Western equine encephalomyelitis (WEE) in the Central and Sacramento Valleys. This species is most commonly found in intermittently flooded areas such as irrigated pastures, duck clubs, and wildlife refuges. *Aedes melanimon* are day-biters that are very aggressive and readily feed on mammals and humans. This species has a relatively short life cycle, which can be completed

in four to 10 days depending on environmental conditions.



Riparian Woodland Mosquito (*Aedes vexans*) is a secondary vector for canine heartworm and is a severe outdoor nuisance that is extremely aggressive. It is common in irrigated pastures, orchard drainage, duck clubs, and woodland watercourse pools. They feed primarily on mammals and typically seek blood meals at

dawn and dusk, but will feed all day. This mosquito is most active in early spring through late fall. The life cycle can be completed in 5.5 to 25 days depending on environmental conditions.



Irrigated Pasture Mosquito (*Aedes nigromaculis*) is a mosquito species that is a secondary or suspected vector of Western equine encephalomyelitis (WEE) and California group encephalitis. It is commonly found in agricultural sources, especially pastures, wetlands, duck clubs, orchards, and field drains. This mosquito is extremely aggressive and is most active in the spring through fall, feeding on mammals in the days and evenings. This species has a relatively short life cycle, which can be completed in

three to 10 days depending on environmental conditions.

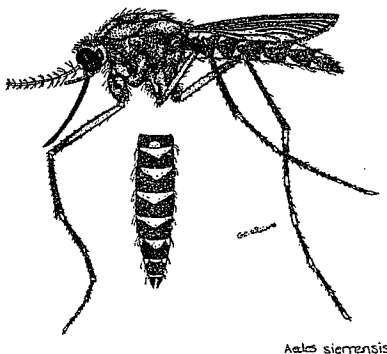
Common BMPs to reduce floodwater mosquitoes:

- a. Flood/irrigate when air temperatures are low and do not encourage rapid mosquito development.
- b. Reduce or eliminate emergent vegetation by disking or mowing (remove debris).
- c. Put water on rapidly and drain rapidly so mosquitoes cannot develop.
- d. Contact the District to coordinate mosquito prevention with other mosquito control operations such as chemical and biological control.

3. **Container Mosquitoes** prefer contained areas of water such as tree holes, buckets, tires, bird baths, fountains, unmaintained swimming pools, rain gutters with clogged downspouts, etc. Many times, standing-water mosquitoes such as the Northern House Mosquito (*Culex pipiens*) and the Encephalitis Mosquito (*Culex tarsalis*) will also breed and develop in container sources.

Mosquito species of concern commonly found in container sources:

Refer to *Culex pipiens* and *Culex tarsalis* above for references as container mosquitoes.



The Western Treehole Mosquito (*Aedes sierrensis*) is a major nuisance mosquito usually associated with the foothill regions in Yuba County but routinely identified in some Valley areas. This mosquito is the primary vector of dog heartworm. Larvae are generally found in treeholes and containers that have a lot of leafy material. Eggs hatch with the initial fall rains and overwinter as larvae. This species of mosquito is a very small, aggressive mosquito; that usually surfaces in early spring and is active into the summer months. *Aedes sierrensis* is a vicious biter of humans and other large mammals. The

life cycle can be completed in 15 days or may require months depending on environmental conditions.

Asian Tiger Mosquito (*Aedes albopictus*) has not been established in California yet but is an aggressive exotic species that has invaded the eastern and southern United States. Over the past ten years, there have been several cases where this species was found in cargo containers in port areas of Los Angeles and San Francisco. This container-breeding mosquito is of serious concern because of its potential to vector diseases such as Rift Valley Fever, Chikungunya virus, dengue fever, and yellow fever. If *Aedes albopictus* becomes established in California, the need for effective mosquito control practices will be even greater to protect public health. *Aedes albopictus* is an aggressive day-biter that is active in spring, summer, and fall.

Common BMPs to reduce container mosquitoes:

- a. Drain containers of all standing water.
- b. Cover, overturn, or create drainage holes that prevent water from standing in containers.
- c. Identify and prevent sprinklers or other sources of water from refilling containers.
- d. Contact the District to coordinate mosquito prevention with other mosquito control operations such as chemical and biological control.

IRRIGATION AND DRAINAGE OF AGRICULTURAL SOURCES

The BMPs contained in this manual are assembled from a number of sources including scientific literature, state and inter-agency documents, and experienced vector control professionals. The intended use of this document is to provide general guidance, not site-specific requirements. BMPs that are most applicable to a specific mosquito-breeding source may be selected from the list and incorporated into a specific BMP Implementation Plan for a specific mosquito-breeding source in consultation with District personnel.

Common Mosquito-Breeding Sites

- Irrigated pastures
- Low areas caused by improper grading
- Broken or leaky irrigation pipes and/or valves
- Vegetated ditches
- Seepage or flooding of fallow fields
- Blocked ditches and/or culverts
- Irrigation tail water return sumps
- Flooded orchards with soil compacted by equipment



Common Mosquito Species Identified in Above Listed Sites

- Clean standing-water sources: *Culex tarsalis* & *Anopheles freeborni*
- Water that is moderately to highly organic: *Culex pipiens* & *Culex tarsalis*
- Seasonally flooded areas: *Aedes nigromaculis*, *Aedes melanimon* and *Aedes vexans*

Special Concerns

The District is committed to working with agricultural growers to implement mosquito control practices that coincide with agricultural practices and minimize the impact on grower economics or yields of crops. Agricultural practices vary among growers, locations, and conventional or organic production methods. Pesticide regulations can affect the ability to use chemical control products. The following BMPs to reduce mosquito breeding are offered as tools to balance the economic and agronomic requirements of growers and landowners with the need for effective mosquito control.

General Practices to Reduce Mosquito Breeding

1. Prevent or eliminate unnecessary standing water that remains for more than 72 hours during mosquito season. Mosquito season starts when the weather warms and it ends when the weather cools. The typical season for the District is May through October.
2. Maintain access for District staff to monitor and treat mosquito-breeding sources.
3. Minimize emergent vegetation and surface debris on water.
4. Contact the District for technical guidance and/or assistance in implementing BMPs to reduce mosquito breeding.

BMPS AIMED TO REDUCE MOSQUITO-BREEDING IN AGRICULTURAL SETTINGS

DITCHES AND DRAINS

- DD-1. Construct or improve ditches with at least 2:1 slopes and a minimum of a four foot bottom. Consider a 3:1 slope or greater to discourage burrowing animal damage and potential seepage problems and to prevent unwanted vegetation growth. Other designs may be approved by the District based on special circumstances.
- DD-2. Keep ditches clean and well maintained. Periodically remove accumulated sediment and vegetation. Maintain ditch grade to prevent areas of standing water.
- DD-3. Design irrigation systems to use water efficiently and drain completely to avoid standing water.

IRRIGATED PASTURES

- IP-1. Grade field to achieve efficient use of irrigation water. Use NRCS guidelines for irrigated pastures. Initial laser leveling and periodic maintenance to repair damaged areas are needed to maintain efficient water flow (Lawler and Lanzaro, 2005).
- IP-2. Irrigate only as frequently as is needed to maintain proper soil moisture. Check soil moisture regularly until you know how your pasture behaves (Lawler and Lanzaro, 2005).
- IP-3. Do not overfertilize. Excess fertilizers can leach into irrigation tail water, making mosquito production more likely in ditches or further downstream (Lawler and Lanzaro, 2005).
- IP-4. Apply only enough water to wet the soil to the depth of rooting (Lawler and Lanzaro, 2005).
- IP-5. Drain excess water from the pasture within 24 hours following each irrigation. This prevents scalding and reduces the number of weeds in the pasture. Good check slopes are needed to achieve drainage. A drainage ditch may be used to remove water from the lower end of the field (Lawler and Lanzaro, 2005).
- IP-6. Inspect fields for drainage and broken checks to see whether re-leveling or reconstruction of levees is needed. Small, low areas that hold water can be filled and replanted by hand. Broken checks create cross-leakage that provides habitat for mosquitoes (Lawler and Lanzaro, 2005).

IP-7. Keep animals off the pasture while the soil is soft. An ideal mosquito habitat is created in irrigated pastures when water collects in hoofprints of livestock that were run on wet fields or left in the field during irrigation. Keeping animals off wet fields until soil stiffens also protects the roots of forage crop and prevents soil compaction that interferes with plant growth (Lawler and Lanzaro, 2005).

IP-8. Divide pastures into a number of smaller fields so that animals can be rotated from one field to another. This allows fields to dry between irrigations and provides a sufficient growth period between grazing. It also prevents hoof damage (pugging), increases production from irrigated pastures, and helps improve water penetration into the soil by promoting a better root system (Lawler and Lanzaro, 2005).

DAIRIES

Common Mosquito-Breeding Sites

- Wastewater lagoons
- Animal washing areas
- Drain ditches
- Sumps/ponds
- Watering troughs
- Irrigated pastures
- Irrigated crops

Common Mosquito Species Identified in Above-Listed Sites

- Clean standing-water sources: *Culex tarsalis*
- Nutrient-rich water sources: *Culex pipiens* & *Culex stigmatosoma*

Special Concerns

Dairy and associated agricultural practices vary; however, these practices need to take into account mosquito and vector control issues. The BMPs for mosquito reduction below offer options to balance the requirements of dairy operators with the need for effective mosquito control. The District is committed to working with dairy operators to implement mosquito control practices that are effective and have the least possible impact on the economics and operation of the dairy.

General Practices to Reduce Mosquito Breeding

1. Prevent or eliminate unnecessary standing water that remains for more than 72 hours during mosquito season. Mosquito season starts when the weather warms, and it ends when the weather cools. The typical season for the District is May through October.
2. Maintain access for District staff to monitor and treat mosquito-breeding sources.
3. Minimize emergent vegetation and surface debris on the water.
4. Contact the District for technical guidance and/or assistance in implementing BMPs to reduce mosquito breeding.

BMPS AIMED TO REDUCE MOSQUITO-BREEDING IN DAIRIES

- DA-1. Wastewater holding ponds should not exceed 150' in width.
- DA-2. Maintain paths and/or roads of adequate width to allow safe passage of vector control equipment. Paths and/or roads should surround all holding ponds. This includes keeping the lanes clear of any materials or equipment (e.g., trees, calf pens, hay stacks, silage, tires, equipment, etc.).
- DA-3. If fencing is used around holding ponds, it should be placed on the outside of the paths and/or roads, with gates provided for vehicle access.
- DA-4. All interior banks of the holding ponds should have a grade of at least 2:1.
- DA-5. An effective solids separation system should be utilized, such as a mechanical separator or two or more solids separator ponds. If ponds are used, they should not exceed sixty feet in surface width.
- DA-6. If two or more ponds are used as drainage and/or solid separators, the landowner/manager must coordinate with the District to propose a management plan to coordinate the use of these ponds. Such a plan will include vegetation management, coordinated pond drying, and solids removal.
- DA-7. Drainage lines should never bypass the separator ponds, except those that provide for normal corral runoff and do not contain solids. All drain inlets must be sufficiently graded to prevent solids accumulation.
- DA-8. Floating debris should be eliminated on all ponds; mechanical agitators may be used to break up crusts.
- DA-9. Vegetation should be controlled regularly to prevent emergent vegetation and barriers to access. This includes access paths and/or roads, interior pond embankments and any weed growth that might become established within the pond surface. An approved vegetation management plan should be on file with the District.
- DA-10. Dairy wastewater discharged for irrigation purposes should be managed so that it does not remain for more than 72 hours.
- DA-11. All structures and water management practices should meet current California Regional Water Quality Control Board requirements (Creedon, 2006).
- DA-12. Tire sidewalls or other objects that will not hold water should be used to hold down tarps (e.g., on silage piles). Whole tires or other water-holding objects should be replaced.

RICE FIELDS



Common Mosquito-Breeding Sites

Flooded rice fields can always support the development of mosquitoes. As the rice stand develops and grows denser, the production of mosquitoes tends to increase while the ability for chemical control agents to penetrate the canopy decreases.

Organic rice production limits the chemical control materials available, so additional attention to BMPs is critical.

- Leaky levees
- Weedy borrow pits and field borders
- Irrigation and drain ditches
- Post-harvest reflooded rice for organic decomposition

Common Mosquito Species Identified in Above Listed Sites

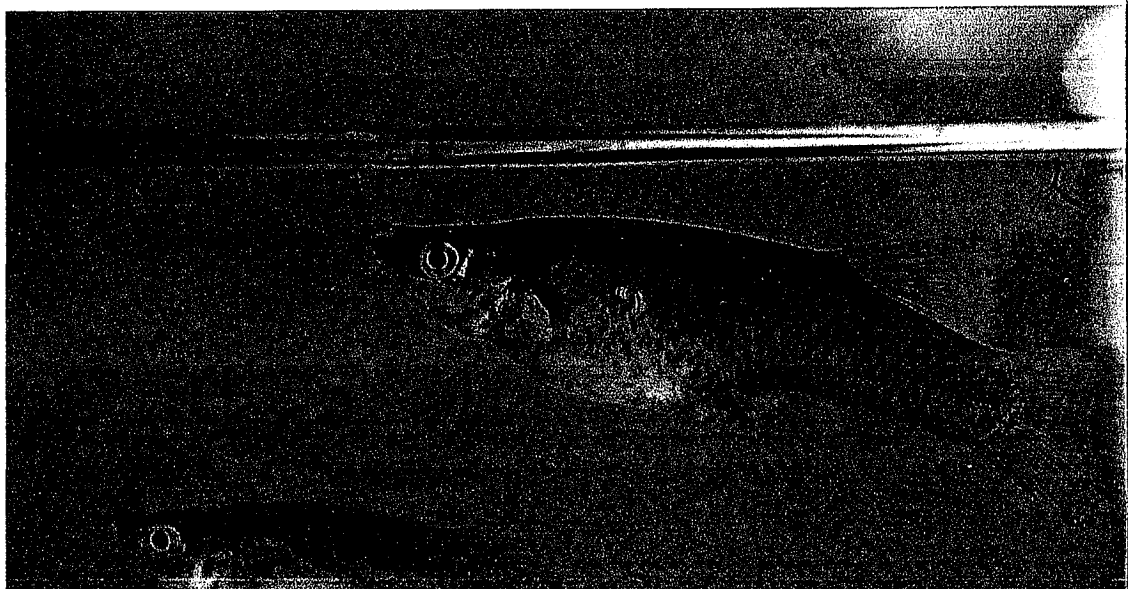
- *Culex tarsalis*
- *Anopheles* species
- *Aedes melanimon* & *Culiseta inornata* (post-harvest reflood)

Special Concerns

Agricultural practices vary among growers, locations, and conventional or organic production methods. Also, local differences in environmental conditions may affect mosquito production from field to field. The BMPs below try to balance the economic and agronomic requirements of the growers and landowners with the need for effective mosquito control. The District is committed to continued work with growers, the California Rice Commission and other stakeholders to develop and implement mosquito control practices that coordinate with standard rice production practices and minimize the impact on the economics or yields of the crop.

The need for close cooperation with all rice growers is important, but it is especially important with growers who produce organic rice. At this time, there are only two available mosquito larvicides for organic rice, which leaves biological control (mosquitofish), physical control (weed control) and cultural control (water management) as the only remaining mosquito management tools. Because proper timing and planning is essential for an effective IMM program, the District asks organic rice growers for an added level of commitment to addressing mosquito control issues in a cooperative manner.

Mosquitofish



BMPS AIMED TO REDUCE MOSQUITO-BREEDING IN RICE FIELDS

Conventional Rice Production

- RI-1. Wherever feasible, maintain stable water level during mosquito season by ensuring constant flow of water into pond or rice fields to reduce water fluctuation due to evaporation, transpiration, outflow, and seepage (Lawler and Lanzaro, 2005).
- RI-2. Inspect and repair levees to minimize seepage (Lanzaro and Lawler, 2005; Lawler, 2005).
- RI-3. Drain and eliminate borrow pits and seepage areas external to the fields (Lanzaro and Lawler, 2005; Lawler, 2005).
- RI-4. Wherever feasible, maintain at least 4"-6" of water in the rice field after rice seedlings have begun to stand upright. Planned drainages should be coordinated with the District. If an unplanned drainage is necessary, notify the District as soon as possible to coordinate restocking of mosquitofish or to use alternative mosquito control measures.
- RI-5. Wherever feasible, control vegetation on the outer most portions of field levees and checks, specifically where they interface with standing water (Lanzaro and Lawler, 2005; Lawler, 2005).
- RI-6. Control algae and weed growth as effectively as possible (Lawler, 2005).
- RI-7. Communicate frequently with the District regarding your crop management activities. For example: draw-down of water levels, except drainage for harvest; any drainage of fields to fallow fields; initiation of post-harvest flooding for straw management or habitat objectives.
- RI-8. Design fields with sufficient borrow pits along each internal levee to promote efficient drainage, and provide refuge for mosquitofish during low water.
- RI-9. Notify the District prior to any pyrethroid insecticide applications to rice fields stocked with mosquitofish. The pyrethroid insecticides that can be applied to rice fields include lambda cyhalothrin (Warrior® Insecticide, Karate® Insecticide) or s-cypermethrin (Mustang® Insecticide) (Lanzaro and Lawler, 2005; Lawler, 2005).
- RI-10. Notify the District 14 days prior to any propanil application due to interaction with some organophosphate insecticides the District may apply to the rice field.

Organic Rice Production (Includes Fulfilling Required BMPs RI-1 to RI-10)

RI-11. Post-harvest rice field reflooding for organic decomposition should commence after seasonal temperatures have cooled substantially so that field conditions are not conducive to mosquito production. This is generally after October 1st.

RI-12. Wherever feasible, maintain borrow pits (12"-18" deep) on both sides of each check throughout rice fields to provide refuge for mosquitofish during low water periods.

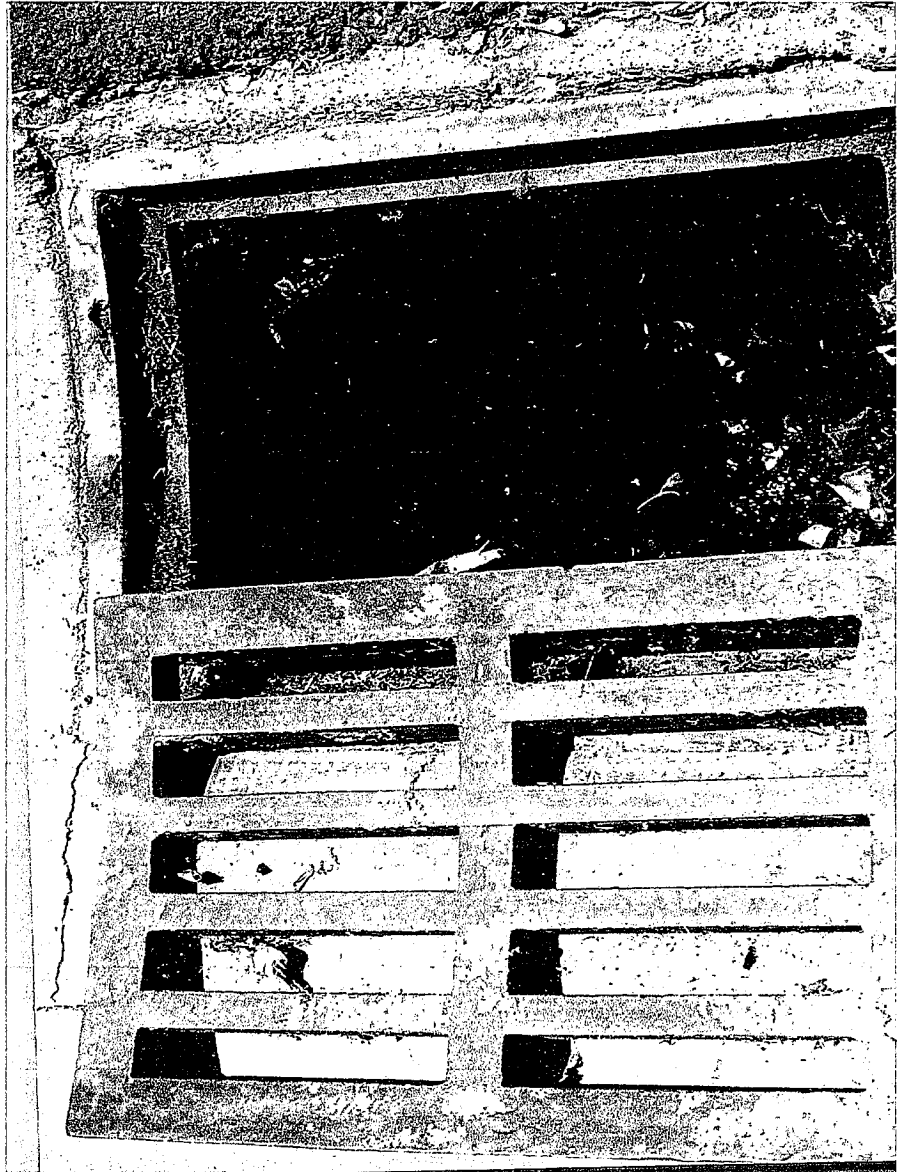
STORM-WATER SYSTEMS

Common Mosquito-Breeding Sites

- Detention/retention basins/ponds
- Treatment wetlands
- Catch basins/storm drains
- Underground water storage devices
- Combined sewer systems
- Clogged sediment screens
- Blocked culverts
- Roadside ditches
- Beaver dams

Common Mosquito Species Identified in Above Listed Sites

- Above-ground/clean-water sources: *Culex tarsalis*
- Underground/polluted or nutrient-rich water: *Culex pipiens*



Storm Water Drain

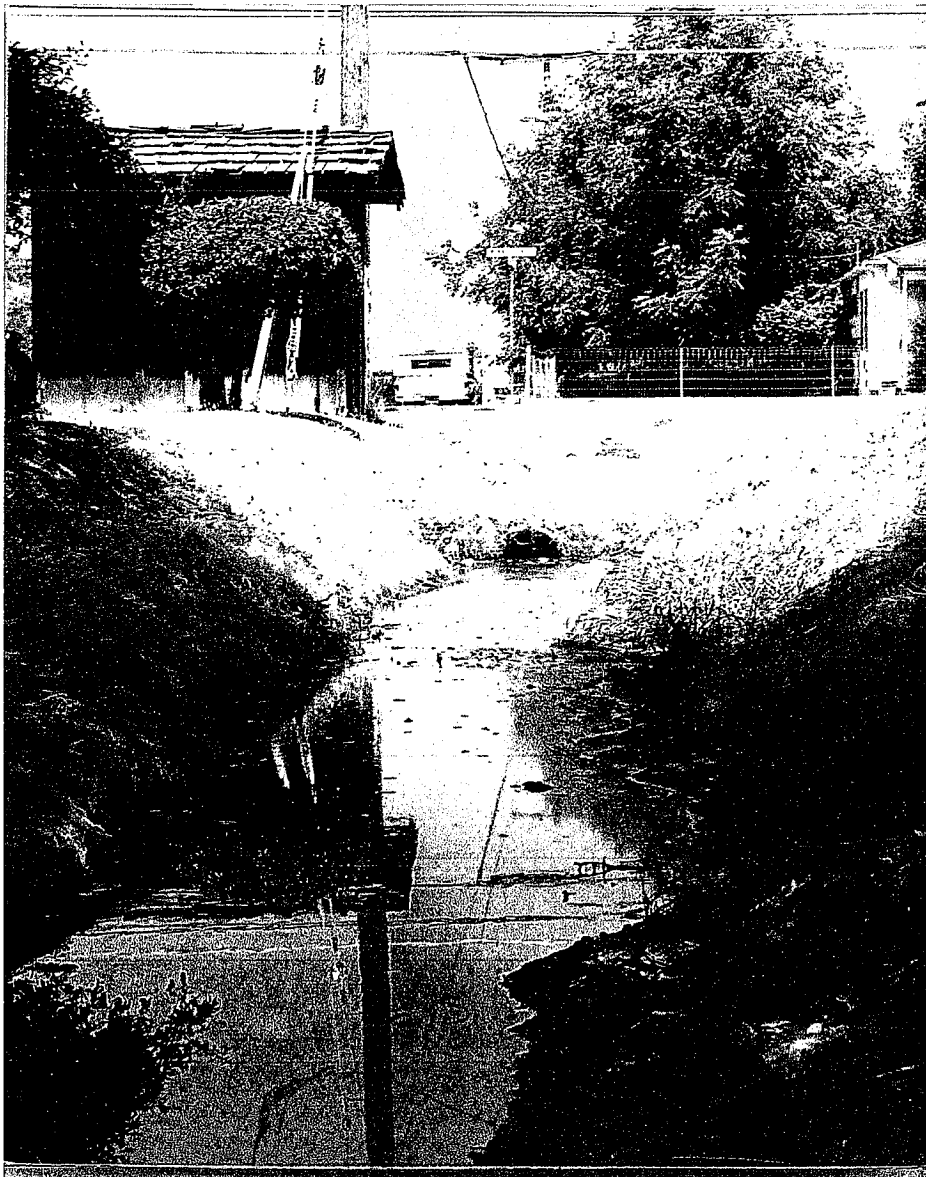
Special Concerns

The National Pollution Discharge Elimination System (NPDES) permit requirements have established a new emphasis on storm-water handling. Storm-water facilities are often ideal mosquito-development sites and support large populations of vectors of diseases such as West Nile virus in close proximity to urban and residential areas. It is critical to consider mosquito production in storm-water structures at the planning stages of new development and to identify appropriate actions to address mosquito problems in

existing facilities. Coordination with the NPDES program will be critical in the success of this endeavor.

General Practices to Reduce Mosquito Breeding

1. Prevent or eliminate unnecessary standing water that stands for more than 72 hours during mosquito season. Mosquito season starts when the weather warms, and it ends when the weather cools. The typical season for the District is May through October.
2. Maintain access for District staff to monitor and treat mosquito-breeding sources.
3. Minimize emergent vegetation and surface debris on the water.
4. Contact the District for technical guidance and/or assistance in implementing BMPs to reduce mosquito-breeding.



BMPS AIMED TO REDUCE MOSQUITO-BREEDING IN STORM-WATER SYSTEMS

Aboveground Storm-Water Structures (Retention Detention Ponds, Storm-Water Ponds)

- SW-1. Build shoreline perimeters as steep and uniform as practicable to discourage dense plant growth (Metzger, 2004).
- SW-2. Whenever possible, maintain storm water ponds and wetlands at depths in excess of four feet (1.2m) to limit the spread of invasive emergent vegetation such as cattails (*Typha* spp.) (Kwasny et al., 2004; Metzger, 2004).
- SW-3. Eliminate floating vegetation conducive to mosquito production (e.g., water hyacinth, *Eichhornia* spp., duckweed *Lemna* and *Spirodela* spp., and filamentous algal mats) (Metzger, 2004).
- SW-4. Perform routine maintenance to reduce emergent plant densities to facilitate the ability of mosquito predators (i.e., mosquitofish) to move throughout vegetated areas (Metzger, 2004).
- SW-5. Make shorelines accessible to maintenance and vector control crews for periodic maintenance, control, and removal of emergent vegetation, as well as for routine mosquito monitoring and abatement procedures, if necessary (Metzger, 2004).
- SW-6. Design and obtain necessary approvals for all storm-water ponds and wetlands to allow for complete draining when needed (Metzger, 2004).
- SW-7. The effective swath width of most backpack or truck-mounted larvicide sprayers is approximately 20 feet (6m) on a windless day. Because of these equipment limitations, all-weather road access (with provisions for turning a full-size work vehicle) should be provided along at least one side of large aboveground structures that are less than 25 feet (7.5m) wide (Metzger, 2004).
- SW-8. Access roads should be built as close to the shoreline as possible. Vegetation or other obstacles should not be permitted between the access road and the storm-water treatment device that might obstruct the path of larvicides to the water (Metzger, 2004).
- SW-9. Vegetation should be controlled (by removal, thinning, or mowing) periodically to prevent barriers to access (Metzger, 2004).
- SW-10. Design structures so they do not hold standing water for more than 72 hours. Special attention to groundwater depth is essential (Metzger, 2004).

- SW-11. Use the hydraulic grade line of the site to select a treatment BMP that allows water to flow by gravity through the structure. Pumps are not recommended because they are subject to failure and often require sumps that hold water (Metzger, 2004).
- SW-12. Avoid the use of loose riprap or concrete depressions that may hold standing water (Metzger, 2004).
- SW-13. Avoid barriers, diversions, or flow spreaders that may retain standing water (Metzger, 2004).
- SW-14. Use concrete or liners in shallow areas to discourage unwanted plant growth where vegetation is not necessary (Metzger, 2004).
- SW-15. Where feasible, compartmentalize managed treatment wetlands so that the maximum width of ponds does not exceed two times the effective distance (40 feet [12m]) of land-based application technologies for mosquito control agents (Walton, 2003).
- SW-16. Incorporate features that prevent or reduce the possibility of clogged discharge orifices (e.g., debris screens). The use of weep holes is not recommended due to rapid clogging (Metzger, 2004).
- SW-17. Design distribution piping and containment basins with adequate slopes to drain fully and prevent standing water. The design slope should take into consideration buildup of sediment between maintenance periods. Compaction during grading may also be needed to avoid slumping and settling (Metzger, 2004).
- SW-18. Catch basins, drop inlets, storm drains, and other structures originally designed to not hold water should be regularly checked and maintained to function as designed.
- SW-19. Basins designed to be dry but remaining wet should be corrected by retrofit, replacement, repair, or more frequent maintenance.
- SW-20. Coordinate cleaning of catch basins, drop inlets, or storm drains with mosquito treatment operations.
- SW-21. Enforce the prompt removal of silt screens installed during construction when no longer needed to protect water quality.

Underground Storm-Water Structures (Drain Inlets, Sumps, Vaults, Catch Basins)

- SW-22. Completely seal structures that retain water permanently or longer than 72 hours to prevent entry of adult mosquitoes (Metzger, 2004).

SW-23. Storm-water structures utilizing covers should be tight-fitting with maximum allowable gaps or 1/16-inch (2mm) holes to exclude entry of adult mosquitoes (Metzger, 2004).

SW-24. If the sump, vault, or basin is sealed against mosquitoes, with the exception of the inlet and outlet submerge the inlet and outlet completely to reduce the available surface area of water for mosquito egg-laying (female mosquitoes can fly through pipes) (Metzger, 2004).

SW-25. Design structures with the appropriate pumping, piping, valves, or other necessary equipment to allow for easy dewatering of the unit when necessary (Metzger, 2004).

SW-26. Coordinate with the District catch-basin cleaning performed between May and October. Mosquito larval control products such as briquets or strips may have to be reapplied.

MANAGED WETLANDS



Wildlife Refuge

Common Mosquito-Breeding Sites

- Permanent wetlands for habitat or species conservation
- Constructed vernal pools and other wetlands
- Seasonal wetlands
- Duck clubs

Common Mosquito Species Identified in Above Listed Sites

- Permanent wetlands and duck clubs: *Culex tarsalis*, *Culex erythrothorax* & *Anopheles freeborni*
- Seasonal wetlands and duck clubs: *Aedes melanimon*

Special Concerns

Managed wetlands are being built and restored across northern California. Each varies depending on the habitat, water quality, and recreational, economic, and other management goals, and may be subject to additional regulations including state and federal conservation easements and management plans. BMPs aimed at the reduction of mosquito breeding attempt to balance the management goals of land managers,

landowners, and other regulatory agencies with the need for effective mosquito control. The District is committed to working with wetland managers and state and federal agencies to implement mosquito control practices in a cooperative manner.

General Practices to Reduce Mosquito Breeding

1. Prevent or eliminate unnecessary standing water that stands for more than 72 hours during mosquito season. Mosquito season starts when the weather warms, and it ends when the weather cools.
2. Maintain access for District staff to monitor and treat mosquito-breeding sources.
3. Minimize emergent vegetation and surface debris on the water.
4. Contact the District for technical guidance and/or assistance in implementing BMPs to reduce mosquito breeding.

BMPs AIMED TO REDUCE MOSQUITO BREEDING IN MANAGED WETLANDS

Wetland Design and Maintenance

- MW-1. Maintain all open ditches by periodically removing trash, silt, and vegetation to maintain efficient water delivery and drainage (Kwasny et al., 2004).
- MW-2. Provide reasonable access on existing roads and levees to allow mosquito abatement technicians access for monitoring, abatement, and implementation of BMPs. Make shorelines of natural, agricultural, and constructed water bodies accessible to maintenance and vector control crews for periodic maintenance, control, and removal of emergent vegetation, as well as for routine mosquito monitoring and abatement procedures (Kwasny et al., 2004).
- MW-3. Inspect, repair, and clean water control structures of debris. Remove silt and vegetation build-up in front of structures that impedes drainage or water flow. Completely close, board or mud-up controls to prevent unnecessary water seepage, except where water circulation is necessary (Kwasny et al., 2004).
- MW-4. Perform regular pump efficiency testing and make any necessary repairs to maximize output (Kwasny et al., 2004).
- MW-5. Construct, improve, or maintain ditches with 2:1 slopes and a minimum 4-foot bottom. Consider a 3:1 slope or greater to discourage burrowing animal damage, potential seepage problems, and unwanted vegetation growth (Kwasny et al., 2004). Other designs may be approved by the District depending on special circumstances.
- MW-6. Construct, improve, or maintain levees to a quality standard that ensures stability and prevents unwanted seepage. Ideally build levees with >3:1 slopes and >80% compaction; consider >5:1 slope or greater in areas prone to overland flooding and levee erosion (Kwasny et al., 2004).
- MW-7. Ensure that adequately-sized water control structures are in place. Increase size and number of water control structures if necessary to allow for complete draw-down and rapid flooding (Kwasny et al., 2004; Walton, 2003).
- MW-8. Inspect and repair levees at least annually (Kwasny et al., 2004).
- MW-9. Design managed wetland projects to include independent inlets and outlets for each wetland unit (Kwasny et al., 2004).
- MW-10. Construct or enhance swales so they are sloped from inlet to outlet and allow the majority of the wetland to be drawn down (Kwasny et al., 2004).

- MW-11. Install cross-levees to facilitate more rapid irrigation and flood-up. Build “underwater” levees that isolate irrigation water during the spring but can be overtopped during fall and winter flooding (Kwasny et al., 2004).
- MW-12. Excavate deep channels or basins to maintain permanent water areas (> 2.5 feet deep) within a portion of seasonal managed wetlands. This provides year-round habitat for mosquito predators, which can inoculate seasonal wetlands when they are irrigated or flooded (Kwasny et al., 2004).
- MW-13. Maintain separate permanent water reservoir that conveys water to seasonal wetlands. This provides year-round habitat for mosquito predators which can inoculate seasonal wetlands when they are irrigated or flooded (Kwasny et al., 2004).
- MW-14. Encourage populations of insectivorous birds (e.g., swallows) and bats by preserving nesting and roosting areas (Kwasny et al., 2004).

Wetland Vegetation Management

- MW-15. Control floating vegetation conducive to mosquito production (i.e., water hyacinth, water primrose, parrot’s feather *Eichhornia* spp., duckweed *Lemna* and *Spirodela* spp., and filamentous algal mats) (Metzger, 2004).
- MW-16. Perform routine maintenance to reduce problematic emergent plant densities to facilitate the ability of mosquito predators (i.e., fish) to move throughout vegetated areas and to allow good penetration of chemical control agents (Kwasny et al., 2004).

Wetland Water Management

- MW-17. Maintain stable water level during mosquito season by ensuring constant flow of water into pond or wetland to reduce water fluctuation due to evaporation, transpiration, outflow, and seepage (Kwasny et al., 2004; Walton, 2003).
- MW-18. Flood managed wetlands with water sources containing mosquitofish or other invertebrate predators. Water from permanent ponds can be used to introduce mosquito predators passively (Kwasny et al., 2004).
- MW-19. Rapidly irrigate wetlands, keeping the time water enters the pond to complete drawdown between four and 10 days (Kwasny et al., 2004).
- MW-20. Extended duration irrigations (generally 14-17 days) may be considered for weed control (e.g. cocklebur). Additional measures to offset the potential for increased mosquito production may be needed.
- MW-21. Delay fall flooding to avoid increasing late-season mosquito production. (Kwasny et al., 2004).

- MW-22. Implement additional BMPs for wetlands that need to be flooded earlier than recommended in the fall. The wetlands targeted for early fall flooding should not be near urban centers and should not have a history of heavy mosquito production (Kwasny et al., 2004). Additionally, choose wetlands that have a history of low mosquito production.
- MW-23. Flood managed wetland unit as fast as possible. Coordinate flooding with neighbors or water district to maximize flood-up rate (Kwasny et al., 2004).
- MW-24. Encourage water circulation by providing a constant flow of water equal to discharge at drain structure (Kwasny et al., 2004).
- MW-25. Flood managed wetland as deep as possible at initial flood-up (18-24"). Shallow water levels can be maintained outside of the mosquito breeding season. (Kwasny et al., 2004).
- MW-26. Drain irrigation water into ditches or other water bodies with abundant mosquito predators. Prevent free flooding into fallow or dry fields (Kwasny et al., 2004).
- MW-27. Use a flood-drain-flood regime to control floodwater mosquitoes. Flood wetland to hatch larvae in the pond. Drain wetland to borrow or other ditch where larvae can be easily treated, drowned in moving water, or consumed by predators. Immediately reflood wetland. (Kwasny et al., 2004). Note: This water management regime should be used only when it does not conflict with water quality regulations.
- MW-28. Evaluate necessity of irrigation, especially multiple irrigations, based on spring habitat conditions and plant growth. Reduce number and duration of irrigations when feasible (Kwasny et al., 2004).
- MW-29. Where feasible, drawdown managed wetland in late March or early April. Irrigate in late April or early May when weather is cooler and mosquitoes are less of a problem (Kwasny et al., 2004).
- MW-30. Irrigate managed wetland before soil completely dries to prevent soil cracking between spring drawdown and irrigation (Kwasny et al., 2004).
- MW-31. Stock managed wetlands, especially brood ponds or permanent wetlands, with mosquitofish or encourage habitat for naturalized populations. Utilize water sources with mosquitofish to transport predators passively to newly flooded habitats (Kwasny et al., 2004).
- MW-32. Maintain permanent or semipermanent water where mosquito predators can develop and be maintained. Discourage use of broad spectrum pesticides (Kwasny et al., 2004).

MW-33. Where feasible, have an emergency plan that provides for immediate drainage into acceptable areas if a public health emergency occurs (Walton, 2003).

MW-34. Minimize fluctuations in water level to prevent large areas of intermittently flooded substrate or isolated pools from being created, particularly during mosquito season, which can start as early as March and extend through October depending on weather (Kwasny et al., 2004).

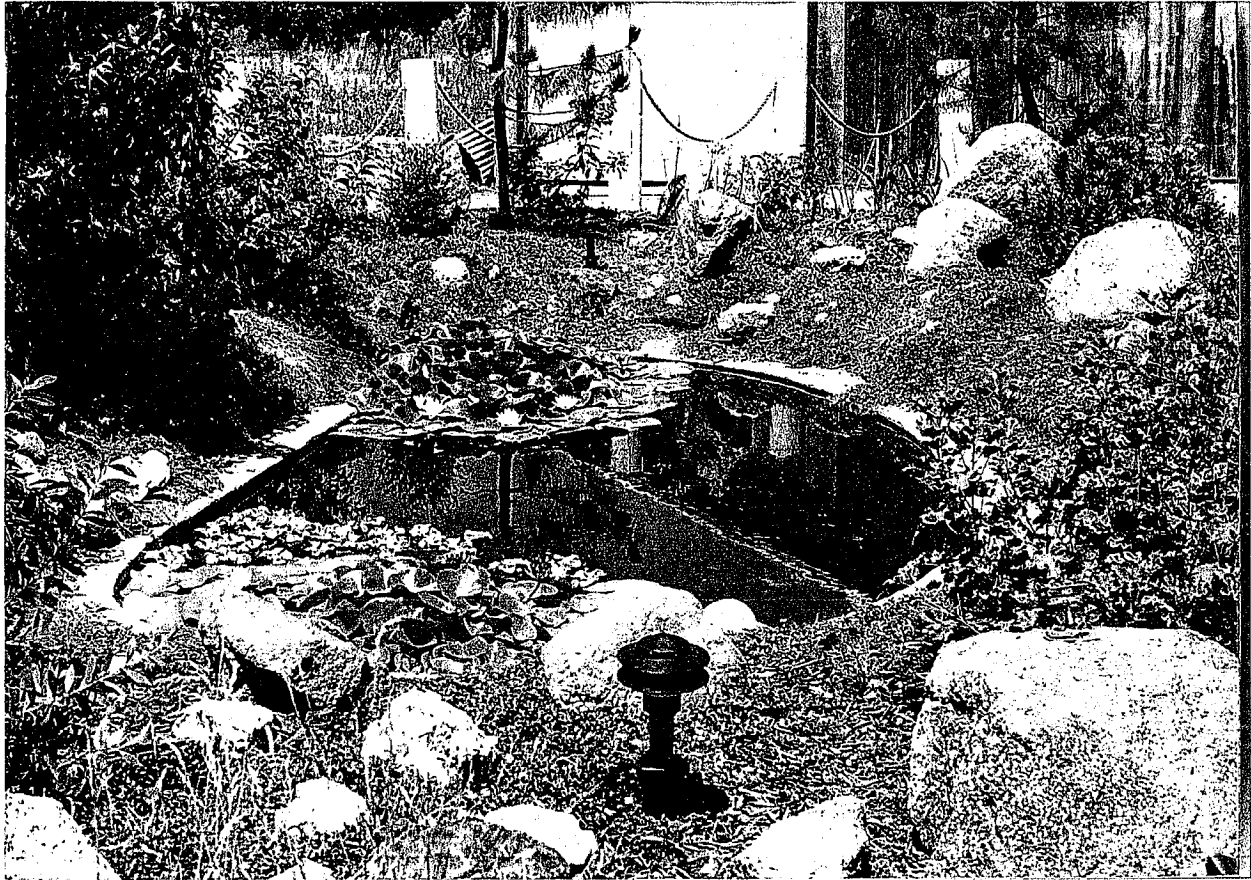
Coordination with the District

MW-35. Consult with the District on agency-sponsored habitat management plans on private lands (e.g. Presley Program); on the timing of wetland flooding on public and private lands, urge private landowners to do the same (Kwasny et al., 2004).

MW-36. Identify problem locations for mosquito production with the District and work to implement mosquito BMPs. Identify potential cost-share opportunities to implement BMPs (Kwasny et al., 2004).

MW-37. Consult with the District on the design of restoration and enhancement projects that have the possibility of affecting mosquito production or control operations (Kwasny et al., 2004).

URBAN AND SUBURBAN MOSQUITO-BREEDING SOURCES



Common Mosquito Breeding Sites

- Unmaintained swimming pools and spas
- Decorative ponds and fountains
- Bird baths
- Water-filled containers
- Clogged rain gutters
- Poorly designed or damaged landscape irrigation systems
- Cemetery vases
- Ornamental and/or Koi ponds
- Stored or waste tires

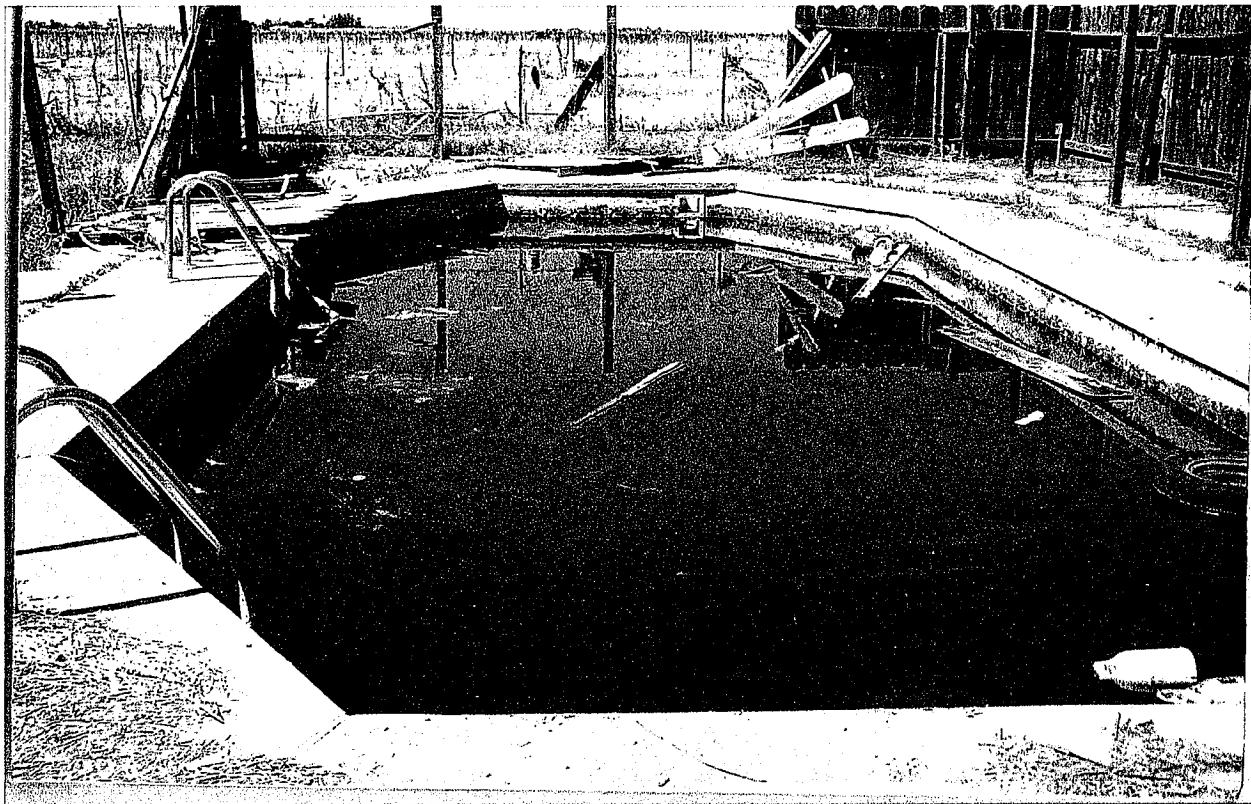
Common Mosquito Species Identified in Above-Listed Sites

- Cleaner water sources: *Culex tarsalis*
- Water with more organic material: *Culex pipiens* & *Culex stigmatosoma*
- Containers with high organic material: *Aedes sierrensis*

Special Concerns Urban and suburban mosquito sources are especially important because sources may be in and around private residences that are not easily seen or accessed by mosquito and vector control specialists and may produce mosquitoes in areas of high population density. This can quickly lead to vector-borne disease transmission since the vector (mosquito) and host (human) are often in close proximity. Most urban and suburban mosquito species produced are the species of mosquito that are of highest importance due to their more-than-favorable ability to transmit WNV. Economic or social changes in a neighborhood can result in an increase in mosquito sources such as unmaintained swimming pools. Fortunately, most BMPs for residential areas are relatively inexpensive and easy to implement.

General Practices to Reduce Mosquito Breeding

1. Prevent or eliminate unnecessary standing water that stands for more than 72 hours during mosquito season. Mosquito season starts when the weather warms, and it ends when the weather cools. The typical season for the District is May through October.
2. Maintain access for District staff to monitor and treat mosquito-breeding sources.
3. Minimize emergent vegetation and surface debris on the water.
4. Contact the District for technical guidance and/or assistance in implementing BMPs to reduce mosquito-breeding.





BMPs AIMED TO REDUCE MOSQUITO BREEDING IN URBAN AND SUBURBAN SOURCES

Urban and Suburban Residential Areas

- US-1. Drain all containers of standing water, including pet dishes, wading pools, potted plant drip trays, boats, birdbaths, tires, and buckets, at least once a week during mosquito season. Keep in mind that mosquitoes can develop in as little as 1/8" of standing water.
- US-2. Use an approved disinfection process (chlorine, bromine) to prevent mosquito breeding in swimming pools and spas. Use skimmers and filter systems to remove egg rafts and mosquito larvae.
- US-3. If a pool or spa is not going to be maintained for any reason, do one of the following: 1) Drain the pool or spa completely of any water. (Note that in-ground pools may be damaged by being completely drained. Above-ground pools and spas generally may be drained without damage.) 2) Notify the District so that the pool can be inspected regularly and treated with a larvicide and/or stocked with mosquitofish if needed.
- US-4. Notify the District of any ponds (including ponds with ornamental fish such as koi or goldfish) with permanent or seasonally permanent water. Allow District technicians to inspect and periodically stock mosquitofish or guppies to control mosquito larvae biologically.
- US-5. Landscape irrigation drainage should be managed such that no water stands for more than 72 hours during mosquito-breeding season.
- US-6. All underground drain-pipes should be laid to grade to avoid low areas that may hold water for longer than 72 hours.
- US-7. Keep rain gutters clear of leaves and debris. Check for standing water in gutters after rain events during mosquito season.
- US-8. Provide safe access for District technicians to all pools, spas, ponds, landscape irrigation structures, catch basins, storm drains, drainage pipes, sewer cleanouts, or any other potential mosquito-breeding source.
- US-9. Repair leaks or damaged drainage system components to prevent standing water for more than 72 hours during mosquito season.
- US-10. Notify District of any condition that may produce mosquitoes on the property such as flooding, broken pipe, damaged septic tank cover, or leaking outdoor faucet if unable to be fixed or if it results in standing water for more than 72 hours during mosquito season.

Tire Storage

- TR-1. Never allow water to accumulate in tires. Tires should be stored in a covered location or covered by a tarp in order to prevent the accumulation of water from rain, sprinklers, etc.
- TR-2. Tires should never be stored in a pile. Tires should be stored on racks or in a stack not more than two rows wide.
- TR-3. Tires should be stored in a manner that allows inspection of each individual tire.
- TR-4. Waste tires should be picked up by the proper disposal entity on a regular basis.
- TR-5. Those responsible for stored tires should inspect for and dump out any water that may have accumulated inside tires on their premises on a weekly basis.
- TR-6. Tires used for boundary markers should be cut in half or have one-inch or larger holes drilled in lower side walls to prevent water accumulation.

Cemetery Flower Vases

- CV-1. Use a water-absorbing polymer material (super-absorbent polyacrylamide), which turns standing water into a gel. This eliminates the chance of mosquito development, yet allows cut flowers to remain fresh.
- CV-2. Seek alternatives to in-ground or mounted flower vases that can hold water for 72-96 hours.
- CV-3. Dump out all vases weekly during the spring, summer, and fall.
- CV-4. Consider drilling holes in vases that sit in/on a permeable substrate such as soil.

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ADDRESS _____

\$ 136⁰⁰

FOR COUNTY OF SUTTER CK# 1-005433

ACCOUNT		
AMT. OF ACCOUNT		
AMT. PAID		
BALANCE DUE		

CASH

CHECK

MONEY ORDER

BY *[Signature]*