RECEIVED
MAR 15 2011
DIVISION OF WATER QUALITY

ATTACHMENT G – NOTICE OF INTENT

WATER QUALITY ORDER NO. 2011-XXXX-DWQ
GENERAL PERMIT NO. CAG XXXXXX

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

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item ☒ A. New Applicator ☐ B. Change of Information: WDID# _____

☐ C. Change of ownership or responsibility: WDID# _____

II. DISCHARGER INFORMATION

A. Name			
SANTA CRUZ COUNTY MOSQUITO ABATEMENT/VECTOR CONTROL CSA53			
B. Mailing Address			
640 CAPITOLA ROAD			
C. City	D. County	E. State	F. Zip Code
SANTA CRUZ	SANTA CRUZ	CA	95062
G. Contact Person	H. Email address	I. Title	J. Phone
PAUL BINDING	AGC002@AGDEPT.COM	MANAGER	(831) 454-2590

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. Pesticide residues discharge to (check all that apply)*:

1. ☒ Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.
   Name of the conveyance system: County of Santa Cruz - stormwater and drainage systems

2. ☒ Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger. CALTRANS - Flood Control systems, highway drainages
   Owner's name: City of Watsonville; City of Scotts Valley; City of Santa Cruz; City of Capitola
   Name of the conveyance system: stormwater and drainage systems

3. ☒ Directly to river, lake, creek, stream, bay, ocean, etc.
   Name of water body: All water bodies (potentially) within Santa Cruz County except Bay and Ocean.

   * 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 3 (Central Coast)
(List all regions where pesticide application is proposed.)

V. PESTICIDE APPLICATION INFORMATION

A. Target Organisms: X Vector Larvae X Adult Vector
Note: Adult vector control pesticides have not been applied since 1995

B. Pesticides Used: List Name and Active ingredients
See attached list of pesticides used in 2010

C. Period of Application: Start Date continuous End Date continuous

D. Types of Adjuvants Added by the Discharger: none

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 See http://www.agdept.com/mvc.html
See also Newstip/PSA (sample)

* If yes, a copy of the notifications shall be attached to the NOI.
See Elkhorn Slough NWR-CDFG Eco. Reserve: Draft Monitoring and Treatment Plan for USFWS special use Permit (SUP) application 2010

TENTATIVE ORDER

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: MaryLou Nicoletti

B. Signature: Mary Lou Nicoletti **Date:** 3/11/11

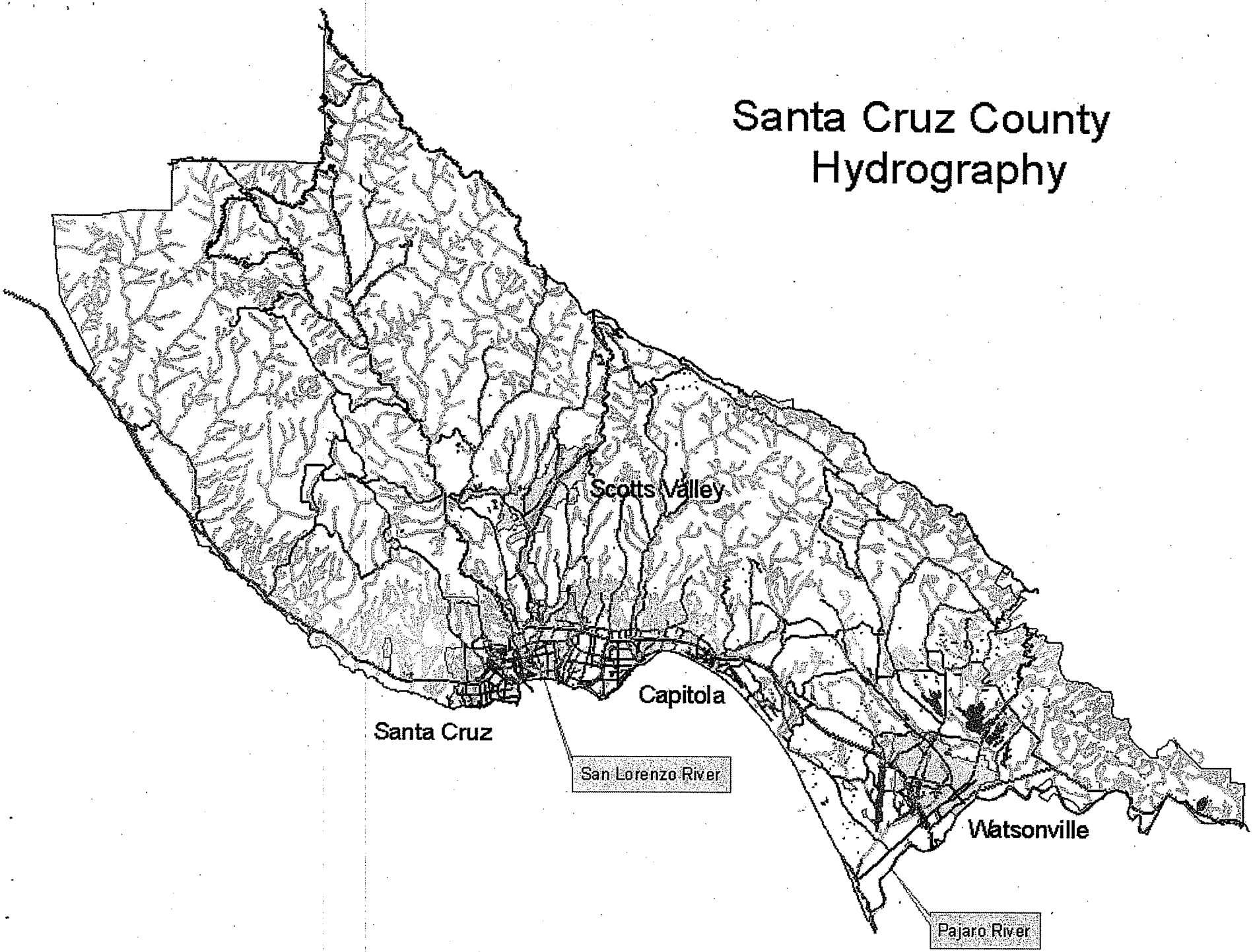
C. Title: SCCMVC Director/Agricultural Commissioner

X. FOR STATE WATER BOARD USE ONLY

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

TENTATIVE ORDER

Santa Cruz County Hydrography



Santa Cruz County Mosquito & Vector Control

3/12/2009

Santa Cruz County Mosquito and Vector Control (MVC) Pesticides Application Plan (PAP)

*The following **boldface text** was excerpted from pages 5-17 of the Draft NPDES Permit for Vector Control, which specifies what must be included in the PAP and BMPs*

a. **Description of the target area and adjacent areas, if different from the water body of the target area;**
See attached Santa Cruz County Hydrography map. The target area is potentially any fresh or brackish water within the boundaries of the County of Santa Cruz. These are still or standing water sites, permanent or temporary, natural or man-made, that may or may not have potential inflow or outflow, wetland or wildlife values or be hydrologically connected to other sites. A majority of these sites are subject to disturbance that makes them attractive to mosquitoes, such as by flooding by natural event or artificial means, or be subject to high organic nutrient load and reduced animal and plant diversity. Within this area there are also discrete artificial and natural containers that breed mosquitoes.

b. **Discussion of the factors influencing the decision to select pesticide applications for mosquito control;**
Please see the attached Statement of Best Management Practices for Santa Cruz County Mosquito and Vector Control and Best Management Practices for Mosquito Control in California (see References). Appendix A of the latter document describes surveillance methods conducted by public health agencies to monitor abundance and distribution of the many mosquito species found in the state, and the reason why, after consideration of other IPM options, mosquitocide intervention is sometimes appropriate and required to manage them once populations are found to exceed public health nuisance or disease thresholds, strictly following pesticide labeling. Also attached is a schematic of the MVC's Mosquito Control Strategy and a link in References.

c. **Type(s) of pesticides used, the method in which they are applied, and if applicable, the adjuvants and surfactants used;**
Please see the appendices within the Best Management Practices for Mosquito Control in California and the attached Statement of Best Management Practices for Santa Cruz County Mosquito and Vector Control (see References). Please note that the MVC has not used adulticides since 1995.

d. **Description of the types and locations of the anticipated application area* and the target area to be treated by the Discharger, recognizing that, with vector control, the precise locations may not be known until after surveillance;**

Any site that holds water for more than 96 hours (4 days) can produce mosquitoes. Source reduction is the MVC's preferred solution, and whenever possible the MVC 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. The typical sources treated by MVC include:

Habitat Type			
TYPE CODE	**HABITAT TYPE**	**ABBREVIATION**	**DESCRIPTION**
0	CATCH BASIN	CB	INCLUDES GUTTERS, STREET DRAINS AND BMPs
1	PERMANENT POND	PD	PONDS THAT HOLD WATER YEAR ROUND
2	EPHEMERAL POND	EP	NATURAL SEASONAL PONDING
3	FRESHWATER MARSH	MA	LOWLYING AREA OF SOFT WATERLOGGED GROUND, STANDING WATER, characterized by a growth of grasses, sedges, cattails, and rushes
4	BRACKISH MARSH	BM	SOMEWHAT SALTY MARSH
5	FLOODED AREA	FA	ANY AREA THAT EXPERIENCES INFREQUENT OR SEASONAL FLOODING FROM NATURAL OR IRRIGATION SOURCES
6	CHANNEL, DITCH	CH	MAN-MADE CONCRETE, WOODEN OR EARTHEN CHANNELS FOR WATER DIVERSION
7	AGRICULTURAL USE	AG	ALL MAN-MADE SOURCES CREATED FOR AGRICULTURAL USE
8	ARTIFICIAL CONTAINER	AC	KIDDIE POOLS, HORSE TROUGHS, JUNKYARD ITEMS, BOATS, BUCKETS, TARPS, ROOF TOPS, URNS, ORNAMENTAL PONDS, ETC.
9	MISCELLANEOUS PONDING	MP	RUTS, UNDER HOUSES, RAILROAD TRACKS
10	TREEHOLE	TH	HOLES IN THE TREE ITSELF
11	CREEK/STREAM/ NATURAL DRAINAGE	CK	NOT MAN-MADE
12	GREEN POOLS & JACUZZIS	GP	NEGLECTED
13	SEWAGE/SEPTIC	SE	INCLUDES PONDS, SEPTIC TANKS, DRAINS, TREATMENT PLANTS

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

With any mosquito or other vector source, the MVC's first goal is to look for ways to eliminate the source, or, if that is not possible, for ways to reduce the vector potential. The most commonly used methods and their limitations are included in the Best Management Practices for Mosquito Control in California and attached Statement of Best Management Practices for Santa Cruz County Mosquito. (see References)

Specific Integrated Pest Management (IPM) methods used by the MVC include stocking mosquito fish (*Gambusia affinis*) where this biological control method is appropriate, 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 MVC also reviews development plans that create, restore or affect wetlands or stormwater BMP's to evaluate and consult on their vector potential.

Pesticide use by MVC is only one aspect of an IPM strategy. This strategy includes the use of physical and biological control techniques whenever possible and is based on a program of continuous monitoring of both adult and immature mosquito populations.

f. Approximately how much product is anticipated to be used and how this amount was determined;

Estimate for mosquitocide use by the district is based upon our use for 2010.

SANTA CRUZ COUNTY MOSQUITO & VECTOR CONTROL MOSQUITOCIDE USE 2010

SUM	UNIT	EPA_REG_NO	DESCRIPTION	ACTIVE INGREDIENT
0.49	gal	275-66	Abbott Labs. Vectobac 12AS	*Bacillus thuringiensis israelensis*
4254.42	lbs	73049-10	Abbott Labs. Vectobac Granule	*Bacillus thuringiensis israelensis*
49.00	lbs	53263-30	COGNIS Agnique MMF Granule	Isostearyl alcohol ethoxylate
0.27	gal	53263-28	Henkel Agnique MMF Mosquito Larvicide	Isostearyl alcohol ethoxylate
4.36	lbs	73049-20	Valent Vectolex WSP	*Bacillus sphaericus*
222.02	lbs	73049-429	Valent VectoMax	*Bti / Bs*
2086.10	lbs	71236-1	Valent Vectolex Biological Larvicide	*Bacillus sphaericus*
15.83	gal	8898-16	Clarke Chemical Co. Golden Bear 1111	Aliphatic Petroleum Hydrocarbons
13.01	lbs	2724-375-	Zoecon Altosid Briquets	s-Methoprene

		64833		
68.09	lbs	2724-421-64833	Zoecon Altosid Ext. Residual Briquets	s-Methoprene
0.04	gal	2724-392-64833	Zoecon Altosid Liquid Larvicide	s-Methoprene
5.34	lbs	2724-448-64833	Zoecon Altosid Pellets	s-Methoprene
25.92	lbs	2724-448	Zoecon Altosid Pellets WSP	s-Methoprene
890.31	lbs	2724-489	Zoecon Altosid Single Brood Granule	s-Methoprene

Note: Amounts include larvicides reported separately to the Agricultural Commissioner by R&B Helicopters under contract to Santa Cruz County Mosquito and Vector Control.

This chart reports all mosquito larvicides used by Santa Cruz County Mosquito and Vector Control, for the purpose of estimating use in 2011. No adulticides were used in 2010. All materials have signal word Caution.
These larvicide amounts reflect the total used both in waters of the U.S. and in other County sites. 2011 applications could include use of Clarke Natular (spinosad) formulations and Fourstar (Bti/Bs) products.

g. **Representative monitoring locations* and the justification for selecting these monitoring locations**
Please see the MVCAC NPDES Coalition Monitoring Plan (see References). However, note that this district has not used adulticides since 1995, although it may potentially if mosquito-borne virus or severe nuisance conditions warrant.

h. **Evaluation of available BMPs to determine if there are feasible alternatives to the selected pesticide application project that could reduce potential water quality impacts; and**
Please see the Best Management Practices for Mosquito Control in California and the MVC Statement of Best Management Practices (see References).

i. **Description of the BMPs to be implemented**
Please see the Best Management Practices for Mosquito Control in California and the MVC Statement of Best Management Practices (see References).

2. The Discharger shall update the PAP periodically and submit the revised PAP to the State Water Board for approval if there are any changes to the original PAP.

D. Best Management Practices (BMPs)
The Discharger shall develop BMPs that contain the following elements:

The BMPs are described in the MVC's Statement of Best Management Practices and the Best Management Practices for Mosquito Control in California and the California Mosquito-borne Virus Surveillance and Response Plan. (see References)

1. **Identify the Problem**
   Prior to first pesticide application covered under this General Permit that will result in a discharge of 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. **Establish densities for larval and adult vector populations to serve as action threshold(s) for implementing pest management strategies**

      Only those mosquito sources that MVC staff determines to represent imminent threats to public health or quality of life are treated. The presence of low mosquito abundance may necessitate treatment, however higher thresholds may be applied depending on the MVC'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 or human activity
      - Size of source
      - Presence/absence of natural enemies or predators
      - Presence of sensitive/endangered species or habitats.

      More information regarding criteria is attached as Mosquito Management Criteria, Control selection Criteria and Larval Treatment Criteria.

   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 and the California Mosquito-borne Virus Surveillance and Response Plan. (see References). Also, see attached Larval Treatment Criteria and Control Selection Criteria charts and the MVC Statement of Best Management Practices.

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 MVC's preferred solution, and whenever possible the MVC works with property owners to implement long-term solutions to reduce or eliminate the need for continued applications as described in the MVC's Statement of Best Management Practices and the Best Management Practices for Mosquito Control in California. (see References)

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 MVC's Statement of Best Management Practices and the Best Management Practices for Mosquito Control in California and the California Mosquito-borne Virus Surveillance and Response Plan that MVC uses. The MVC continually collects adult and larval mosquito surveillance data, dead bird reports, and sentinel chicken test results and uses them to guide mosquito control activities.

2. **Examine the Possibility of Alternatives to Treatments**
Dischargers should continue to examine the possibility of alternatives to reduce the need for applying larvicides that contain temephos and for spraying adulticides. Such methods include:
a. Evaluating management and treatment options that may impact water quality, non-target organisms, vector resistance, feasibility, and cost effectiveness, such as:
   - **No action**
   - **Source prevention**
   - **Mechanical or physical source reduction methods**
   - **Cultural methods**
   - **Biological control agents**
   - **Pesticides**

b. Applying pesticides only when vectors are present at a level that will constitute a nuisance or threat to public health
c. Using the least intrusive method of pesticide application.
d. Public education efforts to reduce potential vector breeding habitat.
e. Applying a decision matrix concept to the choice of the most appropriate formulation.

This describes the MVC's existing integrated mosquito management program, as well as the practices described in the MVC's Statement of Best Management

Practices for Mosquito Control in California and California Mosquito-borne Virus Surveillance and Response Plan that are used by this agency (see References).

3. **Correct Use of Pesticides**
   Users of pesticides must ensure that all reasonable precautions are taken to minimize the impacts caused by pesticide applications. Reasonable precautions include using the proper spraying techniques and equipment, taking account of weather conditions and the need to protect the environment.
   a. **All errors in application and spills are reported to the proper authority.**
   b. **Staff training in the proper application of pesticides and handling of spills.**

   This is an existing practice of the MVC, 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, and are overseen by the Agricultural Commissioner. Pesticide labels are reviewed and strictly adhered to.

References:

Statement of Best Management Practices for Santa Cruz County Mosquito and Vector Control. See attached copy. Reviewed each year, updated as necessary. Available on website for download. http://www.agdept.com/mvc.html

Best Management Practices for Mosquito Control in California. 2010. Available by download from the California Department of Public Health at http://www.cdph.ca.gov/HealthInfo/discond/Pages/MosquitoBorneDiseases.aspx or http://www.westnile.ca.gov/resources.php under the heading Mosquito Control and Repellent Information. Copies may be also requested by calling the California Department of Public Health—Vector-Borne Disease Section at (916) 552-9730 or the Santa Cruz County Mosquito VC at (831)454-2590.

California Mosquito-borne Virus Surveillance and Response Plan.. 2010. [Note: this document is updated annually by CDPH]. Available by download from the California Department of Public Health—Vector-Borne Disease Section at http://www.cdph.ca.gov/HealthInfo/discond/Pages/MosquitoBorneDiseases.aspx or http://www.westnile.ca.gov/resources.php under the heading Response Plans and Guidelines. Copies may be also requested by calling the California Department of Public Health—Vector-Borne Disease Section at (916) 552-9730 or the Santa Cruz County Mosquito VC at (831)454-2590.

Mosquito Vector Control Association of California (MVCAC) NPDES Coalition Monitoring Plan. 2011. In development at the time of this NOI submission. Available by April 9, 2011 at http://mvcac.org/ prepared by MVCAC with assistance from URS http://www.urscorp.com/Markets/index.php?s=16.

Santa Cruz County Mosquito and Vector Control website at http://www.agdept.com/mvc.html See our Mosquito Control Strategy flow chart under the Main Menu and also attached.

Santa Cruz County Arbovirus Surveillance and Response Plan (2006) prepared at County Board of Supervisor request by the West Nile Virus Technical Advisory Committee (see attached).

RECEIVED
MAR 17 2011
DIVISION OF WATER QUALITY

Santa Cruz County Mosquito and Vector Control (MVC)
Pesticides Application Plan (PAP)
(addendum)

This section was left out of our previously submitted NOI / PAP. Please attach to our PAP submitted for the 2011 Vector Control Residual Pesticide NPDES General Permit.

E. Pesticide Application Log

The Discharger shall maintain a log for each pesticide application. The application log shall contain, at a minimum, the following information, when practical, for larvicide or adulticide applications:

1. Date of application;
2. Location of the application and target areas (e.g., address, crossroads, or map coordinates);
3. Name of applicator;
4. The names of the water bodies treated if known/ named(i.e., canal, creek, lake, etc.);
5. Application details, such as when the application started and stopped, pesticide application rate and concentration, water flow rate of the target area, surface water area, volume of water treated, pesticide(s) and adjuvants used by the Discharger, and volume or mass of each component discharged;

This is an existing practice of the District as required to comply with DPR regulations and our CDPH Cooperative Agreement requirements. We enter all application details into a MS Office Access database. A pesticide use report is generated monthly and sent to the Agricultural Commissioner and a more detailed report was sent monthly to the Central Coast Regional Water Quality Control Board for the prior 2004-2008 Aquatic Pesticide NPDES General Permit.

As we understand, reporting will be annually for the 2011 Vector Control Residual Pesticide NPDES General Permit.

Statement of Best Management Practices For Santa Cruz County Mosquito and Vector Control

Santa Cruz County Mosquito Abatement / Vector Control CSA53

FOR WATER QUALITY ORDER NO **2011-XXXX-DWQ** STATEWIDE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM VECTOR CONTROL APPLICATIONS
GENERAL PERMIT NO. **CAG XXXXXX**

BACKGROUND

The above named district is seeking coverage under the Permit as a "public entity" that applies aquatic pesticides for vector control in waters of the United States. The Santa Cruz County Mosquito and Vector Control (MVC) is a County Service Area operating as a division of the County Agricultural Commissioner. MVC was established in 1993 by Board resolution through CA Government Code (25210) in response to many years of public demand for relief from pestiferous mosquitoes. The MVC's underlying health and safety statutory mandates and requirements are outlined within the California Health and Safety Code (Division 3, Sections 2000 *et seq.*).

The program's primary function is vector surveillance and control following Integrated Pest Management practices incorporating public education, biological control, source reduction and least toxic pesticides that have minimal impact on people, wildlife, and the environment. The program and CEQA Technical Review can be found at the MVC website http://www.agdept.com/mvc.html .

The mosquito larvicides used are applied to water bodies with the purpose and intent of killing mosquito larvae. Extensive research has indicated that little or no lasting environmental impacts are imparted. Currently used EPA and DPR registered aquatic pesticides (*Bacillus thuringiensis israelensis*, *B. sphaericus*, methoprene and surface films) degrade rapidly in the environment, thus the areal extent and duration of residues may be considered negligible. When integrated with other strategies including vegetation management, surface acting agents, and predatory mosquitofish, following the label of these aquatic pesticides constitute safe and effective best management practices (BMP).

This document presents the BMPs of the MVC as a requisite to the NPDES Aquatic Pesticides Permit. Currently established MVC practices are sustainable, prioritizing environmental safety, using least-toxic alternatives and proven IPM systems developed following guidelines developed by the University of California and California Department of Public Health. Aquatic pesticides are applied at low rates leaving the physical parameters of the environment (i.e., temperature, salinity, turbidity and pH) essentially unchanged.

Statement of Best Management Practices

The MVC was formed pursuant to Government Code (25210.80) in 1993 by local citizens and governments to reduce the nuisance of biting mosquitoes and the associated risks of vector-borne disease to residents of the County. This includes vector-borne diseases such as West Nile virus and malaria.

A diverse group of agencies regulate and oversee MVC's pesticide use. Vector control districts are indirectly regulated by the Department of Pesticide Regulation (DPR). Supervisors and applicators are licensed through the California Department of Public Health (CDPH). Pesticide use by vector control agencies is reported to the County Agricultural Commission (CAC) in accordance with a 1995 Memorandum of Understanding among DPR, CDPH, and the CACs for the Protection of Human Health from the Adverse Effects of Pesticides and with cooperative agreements entered into between CDPH and vector control agencies, pursuant to Health and Safety Code section 116180.

The MVC has implemented Best Management Practices (BMP)s based on the philosophy of integrated pest management (IPM). The basic components of the program are:

(1) surveillance of pest populations,
(2) determination of treatment thresholds,
(3) selection from a variety of control options including physical, cultural, biological and chemical techniques
(4) training and certification of applicators
(5) public education

1. MOSQUITO SURVEILLANCE

Surveillance of pest populations is essential for assessing the necessity, location, timing and choice of appropriate control measures. It reduces the aerial extent and duration of pesticide use, by restricting treatments to areas where mosquito populations exceed established thresholds.

The 19 mosquito species known in the County differ in their biology, nuisance and disease potential and susceptibility to larvicides. Field data such as; species, density, and stages present are used to select an appropriate control strategy from integrated pest management alternatives.

A. Larval Mosquito Surveillance

Surveillance for immature mosquitoes is conducted by MVC staff assigned to zones within the district. These technicians maintain a list of known sites of mosquito development and visit them on a regular basis. When a site is surveyed, water is sampled with a 12 oz dipper to check for the presence of mosquitoes. Samples are examined in the field or laboratory to determine the abundance, species, and life-stage of mosquitoes present. This information is compared to historical records and used as a basis for treatment decisions.

B. Adult Mosquito Surveillance

Although control of larval mosquitoes is preferred, it is not possible to identify all larval sources. Therefore, adult mosquito surveillance is needed to pinpoint problem areas and locate previously unrecognized or new sites of larval development. Adult mosquitoes are sampled using standardized trapping techniques (i.e., New Jersey light traps, carbon dioxide-baited traps and oviposition traps).

Mosquitoes collected by these techniques are counted and identified to species. The spatial and seasonal abundance of adult mosquitoes is monitored on a regular basis and compared to historical data.

C. Service Requests

Information on adult mosquito abundance from traps is augmented by tracking mosquito complaints from residents. Analysis of service requests allows district staff to gauge the success of control efforts and locate undetected sources of mosquito development. The MVC conducts public outreach programs and encourage local residents to contact us to request services. When such requests are received, technicians visit the area, interview residents and search for sources that may have been missed. Residents are asked to provide a sample of the insect causing the problem. Identification of these samples provides information on the species present and can be helpful in locating the source of the complaint.

2. PRE-TREATMENT DECISION-MAKING

A. Thresholds

Treatment thresholds are established for mosquito developmental sites where potential disease vector and/or nuisance risks are evident. Therefore, only those sources that represent imminent threats to public health or quality of life are treated with larvicides (see attached Threshold explanation). Treatment thresholds are based on the following criteria:

- Mosquito species present
- Mosquito stage of development
- Nuisance or disease potential
- Biting complaints
- Mosquito abundance
- Flight range
- Proximity to populated areas or human activity
- Size of source
- Presence/absence of natural enemies or predators
- Presence of sensitive/endangered species

B. Selection of Control Strategy

Dip-sampled larvae are counted and averaged for areas of a breeding site, also trapping results are evaluated. When thresholds are exceeded an appropriate control strategy is implemented. Control strategies are selected to minimize potential environmental impacts while maximizing efficacy (see attached Larval Treatment Criteria and Control Selection Criteria). The method of control is based on the threshold criteria but also:

- Habitat type
- Water conditions and quality
- Weather conditions
- Cost
- Site accessibility
- Size and number of developmental sites

3. CONTROL STRATEGIES

A. Source Reduction and Physical Control

Source reduction includes elements such as, physical control, habitat manipulation and water management, and forms a component of the MVC's IPM program. The goal of physical control is to eliminate or reduce mosquito production at a particular site through alteration of habitat, where appropriate. Physical control is usually the most effective mosquito control technique because it provides a long-term solution by reducing or eliminating mosquito developmental sites and ultimately reduces the need for chemical applications.

Physical control programs conducted by MVC may be categorized into three areas: "maintenance", "new construction", and "cultural practices" such as vegetation management and water management. Maintenance activities are conducted within managed tidal and non-tidal marshes, seasonal wetlands, and flood control channels and in some creeks adjacent to wetlands. The following activities are classified as maintenance:

* Removal of sediments from existing water circulation ditches
* Repair of existing water control structures
* Removal of debris, weeds and emergent vegetation in natural channels
* Clearance of brush for access to wetland areas
* Filling of existing, non-functional water circulation ditches to achieve required water circulation dynamics and restore ditched wetlands.

The preceding activities are included within the permits required by U.S. Army Corps of Engineers (USACE) and Central Coast Regional Water Quality Control Board (CCRWQCB) and coordinated by the CDPH. Additional agencies involved may include the Coastal Conservancy, US Fish and Wildlife Service and the California Department of Fish and Game.

For wetland restoration, excavation of new ditches or construction of new water control structures, the MVC would consult with the County or Cities' Public Works departments to initiate new or remedial physical control projects. In most cases, MVC tries to work with landowners to manage their lands in a manner that does not promote mosquito development. MVC staff review proposals for wetlands construction to assess their impact on mosquito production. MVC then submits recommendations on hydrological design and maintenance that will reduce the production of mosquitoes and other vectors. This proactive approach involves a collaborative effort between landowners and MVC. Implementation of these standards may include cultural practices such as water management and aquatic vegetation control.

B. Biological control

Biological control agents of mosquito larvae include predatory fish, predatory aquatic invertebrates and mosquito pathogens. Of these, only mosquitofish are available in sufficient quantity for practical use in mosquito control programs. Natural predators may sometimes be present in numbers sufficient to reduce larval mosquito populations. The MVC's goal is to preserve and encourage species diversity while selectively reducing mosquitoes. Biological control is sometimes used in conjunction with selective bacterial or chemical insecticides.

1. Mosquitofish (*Gambusia affinis*)

The mosquitofish, *Gambusia affinis*, is a natural predator of mosquito larvae used throughout the world as a biological control agent for mosquitoes. Although not native to California, mosquitofish are now ubiquitous throughout most of the State's waterways and tributaries, where they have become an established part of aquatic food chains. In most natural pond locations in this area they pre-date the establishment of the MVC. They can be stocked in discrete mosquito larval sources by trained district technicians where appropriate, such as in backyard ornamental ponds and other artificial containers where there is not in-flow or out-flow to natural systems or ESA-listed species.

Advantages: The use of mosquitofish as a component of an IPM program may be environmentally and economically preferable to habitat modification or the exclusive use of pesticides, particularly in altered or artificial aquatic habitats. Mosquitofish are self-propagating, have a high reproductive potential and thrive in shallow, vegetated waters preferred by many mosquito species. They prefer to feed at the surface where mosquito larvae concentrate. These fish can be readily mass-reared for stocking or collected seasonally from sources with established, healthy populations for redistribution.

Barriers to Use: Water quality conditions, including temperature, dissolved oxygen, pH and pollutants may reduce or prevent survival and/or reproduction of mosquitofish in certain habitats. Mosquitofish may be preyed upon by other predators. They are opportunistic feeders and may prefer alternative prey when available. Introduction of mosquitofish may modify food chains in small contained pools and have potential impacts on endemic fish and shrimp in such situations. Wildlife agencies suspect mosquitofish may impact survival of amphibian larvae through predation or transmission of disease. Recent research has shown no significant impact on survival of the threatened California red-legged frog (Lawler et al. 1998), but mosquitofish have been shown to negatively impact the survival of the California tiger salamander (Leyse and Lawler 2000).

Impact on water quality: As used, mosquitofish populations are unlikely to impact water quality.

Solutions to Barriers: Strict stocking guidelines adopted by MVC restrict the use of mosquitofish to discrete habitats such as artificial containers, ornamental ponds, abandoned swimming pools, cattle troughs, stock ponds, etc., where water quality is suitable for survival and sensitive or endangered aquatic organisms are not present. Fish are treated for disease or parasites and are generally stocked at population densities lower than those required for effective mosquito control and allowed to reproduce naturally commensurate with the availability of mosquito larvae and other prey. MVC guidelines restrict capture from or stocking in habitats when ESA-listed amphibians, fish or other sensitive species/life stages or diseases may be present.

2. Natural predators: aquatic invertebrates

Many aquatic invertebrates, including diving beetles, dragonfly and damselfly naiads, backswimmers, water bugs and hydra are natural predators of mosquito larvae.

Advantages: In situations where natural predators are sufficiently abundant, additional mosquito control measures including application of pesticides may be deemed unnecessary.

Barriers to Use: Predatory aquatic invertebrates are frequently not sufficiently abundant to achieve effective larval control, particularly in disturbed habitats. Most are generalist feeders and may prefer alternative prey over mosquito larvae if available and more accessible. Seasonal abundance and

developmental rates often lag behind mosquito populations. Introduction or augmentation of natural predators has been suggested as a means of biological control, however there are currently no commercial sources since suitable mass-rearing techniques are not available.

Solutions to Barriers: The presence and abundance of natural predators is noted and taken into account during the larval surveillance process. Conservation of natural predators, whenever possible, is achieved through judicious use of highly target-specific pesticides including bacterial insecticides, with minimal impacts on non-target taxa.

Impact on water quality: As predatory invertebrates represent a natural part of aquatic ecosystems, they are unlikely to impact water quality. There are no established standards, tolerance, or EPA approved tests for aquatic invertebrate populations.

3. Insectivorous bats and birds

Bat dietary studies have shown that insectivorous bats are opportunistic feeders and that mosquitoes make up a very small percentage of their natural diet. Bats' behavior when locked in a room with nothing to feed upon but mosquitoes (and interpolated to estimate several thousand per hour) has no bearing on their behavior in the wild.

In order for a generalist insect predator to be an effective control, mosquito density must be high enough for random foraging to result in a drop of the mosquito population, and the height of activity for the predator and mosquitoes must coincide. In most locations, given a choice between chasing down a random mosquito or a fat moth or beetle, these insectivores will instinctively make the energy expenditure / protein gain decision favoring the large prey. It is far easier for bats to hunt around a streetlight. Bats and swallows are otherwise intrinsically important in natural ecosystems and helpful pest predators in gardens and agriculture.

It is sometimes asked why mosquito control districts do not use bat or swallow houses to supplement their other integrated mosquito management methods. Most bat house designs do not have the insulating values necessary to encourage bats to over-winter. Bats and swallows may abscond to highway overpasses and roof eaves and attics. In the latter their fecal deposits and mites may be a nuisance. Public agencies cannot accept the liability of encouraging a low benefit activity that could result in home damage, pest control expenditures or in the worst case scenario, rabies transmission from bats.

C. Bacterial Insecticides

Bacterial insecticides contain naturally produced bacterial proteins that are toxic to mosquito larvae when ingested in sufficient quantity. Although they are biological agents, such products are labeled and registered by the Environmental Protection Agency as pesticides and are considered by some to be a form of Chemical Control. Depending on the formulation, the method of application varies from hand spreading or graduated spray bottles for small breeding sources to backpack sprayers or blowers for medium-sized areas, and targeted boat applications and contracted helicopter (bucket granule spreader) for large areas. All mechanical methods employ graduated measurement devices and annually calibrated application equipment.

1. Bacillus thuringiensis var. *israelensis* (BTI)

Product names: Acrobe, Bactimos pellets, Teknar HP-D, Vectobac 12AS, Vectobac G.

Advantages: BTI is highly target-specific and has been found to have significant effects only on mosquito larvae, and closely related insects (eg., blackflies and some midges). It is available in a variety of liquid, granular and pelleted formulations which provide some flexibility in application methods and equipment. BTI has no measurable toxicity to vertebrates and is classified by EPA as "Practically Non-Toxic" (Caution). BTI formulations contain a combination of five different proteins within a larger crystal. These proteins have varying modes of action and synergistically act to reduce the likelihood of resistance developing in larval mosquito populations.

Barriers to Use: Bacterial insecticides must be fed upon by larvae in sufficient quantity to be effective. Therefore applications must be carefully timed to coincide with periods in the life cycle when larvae are actively feeding. Pupae and late 4th stage larvae do not feed and therefore will not be controlled by BTI. Low water temperature inhibits larval feeding behavior, reducing the effectiveness of BTI during the cooler months. Highly organic conditions also reduce the effectiveness of BTI. Cost per acre treated is generally higher than surfactants or organophosphate insecticides.

Solutions to Barriers: An increased frequency of surveillance of larvae ensures that bacterial insecticides can be applied during the appropriate stages of larval development to prevent adult mosquito emergence. Treated sites are re-checked to determine efficacy and assure selectivity.

Impact on water quality: BTI contains naturally produced bacterial proteins generally regarded as environmentally safe. It leaves no residues and is quickly biodegraded. At the application rates used in mosquito control programs, BTI is unlikely to have any measurable effect on water quality. There are no established standards, tolerances or EPA approved tests. Other naturally occurring strains of this bacterium are commonly found in aquatic habitats.

2. *Bacillus sphaericus* (BS)

Product names: Vectolex CG, Vectolex WDG

Advantages: BS is another bacterial pesticide with attributes similar to those of BTI. The efficacy of this bacterium is not affected by the degree of organic pollution in larval development sites and it may actually cycle in habitats containing high densities of mosquitoes, reducing the need for repeated applications.

Barriers to Use: Like BTI, BS must be consumed by mosquito larvae and is not is therefore not effective against nonfeeding stages such as late 4th instar larvae or pupae. BS is also ineffective against certain mosquito species such as those developing in saltmarshes, seasonal forest pools or treeholes. Toxicity of BS to mosquitoes is due to a single toxin rather than a complex of several molecules as is the case with BTI. Development of resistance has been reported in Brazil. Thailand and France in sites where BS was the sole material applied to control mosquitoes for extended periods of time.

Solutions to Barriers: Information obtained from larval surveillance on the stage and species of mosquitoes present can increase the effectiveness of this material, restricting it use to sources containing susceptible mosquitoes. Development of resistance can be delayed by rotating BS with other mosquitocidal agents and re-checking treated sites to determine efficacy.

Impact on water quality: BS is a naturally occurring bacterium and is environmentally safe. It leaves no residues and is quickly biodegraded. At the application rates used in mosquito control programs, BS is unlikely to have any measurable effect on water quality. There are no established standards, tolerances or EPA approved tests. Other naturally occurring strains of this bacterium are commonly found in aquatic habitats.

D. Methoprene

Product Names: Altosid briquets, Altosid liquid larvicide, Altosid pellets, Altosid SBG, Altosid XR briquets, Altosid XRG. See Section C above for application methods.

Advantages:

Methoprene is a larvicide that mimics the natural growth regulator used by insects. Methoprene can be applied as liquid or solid formulation or combined with BTI or BS to form a "duplex" application. Methoprene is a desirable IPM control strategy since affected larvae remain available as prey items for predators and the rest of the food chain. This material breaks down quickly in sunlight and when applied as a liquid formulation it is effective for only 3 to 5 days. Methoprene has been impregnated into charcoal-based carriers such as pellets and briquettes for longer residual activity ranging up to 150 days. The availability of different formulations provides options for treatment under a wide range of environmental conditions. Studies on nontarget organisms have found methoprene to be nontoxic to vertebrates and most invertebrates when exposed at concentrations used for mosquito control.

Barriers to Use: Methoprene products must be applied to larval stage mosquitoes since it is not effective against the other life stages. Monitoring for effectiveness is difficult since mortality is delayed. Methoprene is more expensive than most other mosquitocidal agents. Methoprene use is avoided in vernal pools. There may be toxicity to certain nontarget crustacean and insect species.

Solutions to Barriers: Surveillance and monitoring can provide information on mosquito larval stage present, timing for applications and efficacy and selectivity of the treatments.

Impact on Water Quality: Methoprene does not have a significant impact on water quality. It is rapidly degraded in the environment and is not known to have persistent or toxic breakdown products. It is applied and has been shown to be effective against mosquitoes at levels far below those that can be detected by any currently available test. Methoprene has been approved by the World Health Organization for use in drinking water containers.

E. Surfactants

Product Names: Golden Bear 1111, BVA, Agnique MMF

Surfactants are "surface-acting agents" that are either petroleum or isostearyl alcohol-based materials that form a thin layer on the water surface. These materials typically kill surface-breathing insects by mechanically blocking the respiratory mechanism. They are typically used as pupacides or larvicides in polluted sites where mosquitoes are the dominant organism.

Advantages: These materials are the only materials efficacious for reducing mosquito pupae since other larviciding strategies (i.e., methoprene, BTI and BS) are ineffective to that life stage. Agnique forms an invisible monomolecular film that is visually undetectable. Treatments are simplified due

to the spreading action of the surfactant across the water surface and into inaccessible areas. These surfactants are considered "practically nontoxic" by the EPA. Agnique is labeled "safe for use" in drinking water.

Barriers to Using: The drawback of using oils in habitats where natural enemies are established is that surface-breathing insects, particularly mosquito predators, are similarly affected. GB1111 forms a visible film on the water surface.

Solutions to Barriers: As a general rule, surfactant use is considered after alternate control strategies have been ruled out or in habitats that are not supporting a rich macro-invertebrate community (i.e., manmade sites).

F. Cultural Practices and Public Education

Wetland design criteria were developed and endorsed by CDPH and described in their booklet "Best Management Practices for Mosquito Control on California State Properties". Guidelines for the following source types are included in the above publication and may be considered cultural control techniques:

* Drainageway construction and maintenance practices
* Dredge material disposal sites
* Irrigated pastures
* Permanent ponds used as waterfowl habitat
* Permanent Water impoundments
* Salt marsh restoration of exterior levee lands
* Sedimentation ponds and retention basins
* Tidal marshes
* Utility construction practices

An integral part of the MVC BMP is to provide information to the public to assist them in resolving their pest problems. Staff at the MVC provides public outreach in the form of presentations to schools, utility districts, homeowner associations, county fairs, home and garden shows, as well as through the media such as newspaper, television, and radio. Information is provided on biological, physical and cultural control methods (i.e., BMPs) that property owner and managers can use to preclude or reduce mosquitoes and other disease and nuisance pests within their jurisdictions.

MVC provides literature and education programs for property owners on water management and elimination of mosquito developmental sites from residential property. These sources include rain gutters, artificial containers, ornamental ponds, abandoned swimming pools, tree holes, septic tanks, and other impounded waters. On public lands, governmental agencies are contacted for consultation prior to mosquito management intervention. Local development plans that contain stormwater BMP designs or wetland creation, restoration or impacts are reviewed for vector breeding potential and consulted upon.

G. Vegetation Management

Vegetation Management consists of the removal of vegetation within mosquito developmental sites to promote water circulation and species diversity, increase access of natural predators such as fish or provide MVCD staff access for surveillance and treatment operations. Vegetation management

is achieved either through recommendations to the landowner or by the use of hand tools and the application of selective herbicides when appropriate.

Vegetation management, one aspect of physical mosquito control, is an effective long-term control strategy that is occasionally employed by MVC. This methodology utilizes water management, burning, physical removal, and chemical means to manage vegetation within mosquito developmental sites. The presence of vegetation provides harborage for immature and adult mosquitoes by protecting them from potential predators as well as the effects of wind and wave action, which readily cause mortality. Vegetation reduction not only enhances water quality, circulation and the effects of predators and abiotic factors, but also reduces the need for chemical control. Several factors can limit the utilization of vegetation management. These include: sensitivity of the habitat, presence of special status species, size of the site, density and type of vegetation, species of mosquito and weather.

1. Burning and livestock grazing

Although not practiced by MVC to date, these techniques are used to achieve effective mosquito control where the density of unwanted vegetation precludes the use of other methodologies. Burning requires a permit, and coordination with local fire agencies and the Air Pollution Control District or Air Quality Management District. Factors limiting the use of this technique include weather, the limited number of approved burn days, and proximity of human habitation. As a general rule, burning is a last resort and not a primary method. These strategies are normally limited to manmade impoundments and fallow farmlands.

2. Physical Removal/Mowing/Trimming

Physical removal of vegetation is used to clear obstructed channels and ditches to promote water circulation, effectiveness of predators and improve access for mosquito control personnel to enter mosquito developmental sites. Ditches and channels can be cleared with a variety of tools ranging from shovels and small pruners to weed whackers and large mechanized equipment. Most removal activities performed by MVC utilizes small hand tools. This is the most frequently employed management technique once regulators and property owners have been consulted and all necessary permits have been obtained and it is performed in all types of habitats. Unfortunately, its effectiveness is temporary and labor intensive, and therefore requires routine maintenance on an annual or at most biennial basis. Other limiting actors include cost and the limited time period that MVC is allowed to perform the activity for many types of mosquito developmental sites.

Access trails to breeding sources are cleared seasonally using hand tools such as shovels, pruners, weed whackers, hedge trimmers and chainsaws. This technique is very labor intensive does not produce long-lasting results. Access pathways created in this manner require annual maintenance. Factors limiting the use of this technique include presence of sensitive species or habitats, and availability of sufficient staff to perform the work.

3. Chemical

MVC has conducted chemical control of vegetation in man-made habitats such as impoundments, channels and ditches. Both pre- and post-emergent herbicides have been used, with strict attention given to label requirements, weather conditions, potential for runoff and drift, and proximity of sensitive receptors such as special-status species, sensitive habitats, livestock, crops, and people. Routine intensive surveys are conducted to address many of these factors. The MVC uses very little

herbicide. The herbicides currently in use are glyphosate based (Roundup and Rodeo). The MVC will now restrict this useful practice to sites that are not waters of the U.S., as the current necessity of obtaining an NPDES permit with associated monitoring and water quality testing requirements would be burdensome and expensive for all areas.

Chemical name: Glyphosate

Product names: Roundup, Rodeo, Gallup, Landmaster, Pondmaster, Ranger, Touchdown, Aquamaster

Advantages: Glyphosate based herbicides are not applied directly to water, but along the levee tops and margins of wastewater ponds, channels, ditches and access roads as post-emergence herbicides. These are non-selective, low-residual herbicides used to control weeds and low-growing brush. These materials come in a variety of formulations, allowing for flexibility of use and application. MVC in recent years has only used the Roundup, Rodeo and Aquamaster formulations (Aquamaster being the registered replacement for Rodeo). Glyphosate acts in plants by inhibiting amino acid synthesis. Roundup (41% of the isopropylamine salt of glyphosate with surfactants) and Aquamaster (53% of the isopropylamine salt of glyphosate without surfactants) are applied from March through October for spot control of weed growth. Both of these materials have also occasionally been used to control growth of poison oak, blackberry vines and non-native aquatic weeds such as water hyacinth or parrotfeather that would prevent access, impede water flows or out-compete native vegetation in sensitive habitats.

Barriers to using: Landowners and regulators are notified before glyphosate is applied to any site and applications are timed with their operations. Furthermore, to prevent large, tall stands of dead vegetative material, applications must be timed so that weed growth is minimal. Weather conditions, specifically wind and rainfall, also affect timing and application of glyphosate based products. The proximity of food crops, groundwater protection zones and sensitive habitats must also be considered. Current NPDES permitting requirements for aquatic weed control require monitoring and testing requirements that create impediments and inefficiencies to MVC in the use of herbicides for small spot treatments, such as those used to keep trails to riparian sites from being overgrown by poison oak, as even peripheral dry sites may be construed as being waters of the United States.

Solutions to barriers: Intensive surveillance in and around target sites ensures that nontargets are not affected. Coordination with landowners and appropriate regulatory authorities and strictly conforming to label directions ensures that reasonable and ecologically acceptable applications occur. For large treatments, such as those used for invasive aquatic weed control, MVC could work in collaboration with landowners, with NPDES aquatic herbicide permits obtained by them.

Impact on water quality: In water, glyphosate is strongly adsorbed to suspended organic and mineral matter and is broken down primarily by microorganisms. Its half life in pond water ranges from 12 days to 10 weeks (Extoxnet). A 2004 report by the San Francisco Estuary Institute, contracted by the State Water Board to conduct the aquatic pesticide monitoring program reported: No toxicity was found to be associated with the glyphosate applications used in several locations with a nonylphenolethoxylate surfactant.

H. Organophosphates (OP)

MVC has never used OP's for mosquito control. Mosquito and vector control agencies that operate under the California Health and Safety Codes may utilize those materials registered as mosquitocides under the Federal Fungicide, Insecticide, and Rodenticide Act. Such materials used in accordance with label instructions are allowed by law. However, as a result of heightened concern over environmental impacts and worker health and safety, most of the districts have voluntarily eliminated their use. Organophosphate use, such as applications of temephos, will probably be reserved for emergency use against disease outbreaks and epidemics or when there is resistance to least-toxic materials.

I. Adulticiding

MVC has only conducted a ULV application of pyrethrin fog on one date in 1995, and does not expect to require adulticiding. This is due to success at breaking the mosquito breeding cycle by other IPM means, combined with low threat levels of mosquito-borne viruses, resulting in no reported human or equine cases locally despite the presence of West Nile Virus in local wild bird populations. Our disease response is outlined in the Santa Cruz County Arbovirus Surveillance and Response Plan (2006) prepared at County Board of Supervisor request by the West Nile Virus Technical Advisory Committee. As adulticiding is a last-resort element of this Plan, MVC is joining the MVCAC NPDES Coalition for the purpose of representative aquatic monitoring.

4. TRAINING AND CERTIFICATION

All MVC applicators must be certified to apply public health pesticides. The CDPH Vector-Borne Disease Section administers certification training and testing. All mosquito control personnel applying pesticides or overseeing the application of pesticides must obtain a Vector Control Technician certificate number. The Mosquito and Vector Control Association of California (MVCAC) provides training materials and exams are conducted by the CDPH. All certificate holders must maintain continuing education credit in at least two and as many as four subcategories. Category A (Laws and Regulations) and category B (Mosquito Biology) is mandatory for all certificate holders and requires 12 and 8 continuing education units (CEU) respectively, in a two year period. Category C (Terrestrial Invertebrate Control) and Category D (Vertebrate Control) are optional both with 8 hours of CEU per two-year cycle.

The MVCAC and MVC conduct educational and safety programs to increase the expertise of operational staff. Ultimate decisions regarding the need for and application of pesticides rest on the professional judgment of trained field staff based on information acquired from surveillance data and scrutiny of the pesticide label. Decisions to apply a particular product are made in accordance to California Environmental Quality Act (CEQA) documentation including threshold levels and other information regarding habitat type, distance from populated areas, and water quality data. In 2005 MVC prepared CEQA environmental review documents (negative declaration) and these documents are available on our web site http://www.agdept.com/mvc.html

Training opportunities to accumulate CEU credits are made available by the MVCAC regional committees that develop training programs fine-tuned to the local ecology and unique problems of the region. Training programs are submitted to the MVCAC state training coordinator for approval and then to the CDPH for final approval. Thirty-six hours of CEU credits are offered each two-year cycle.

5. OVERSIGHT

MVC, as a member of the MVCAC operates under the California Health and Safety Code and the California Government Code (reference Division 1, Administration of Public Health, Chapter 2, Powers and Duties; also Part 2, Local Administration, Chapter 8, State Aid for Local Health Administration; Division 3, Mosquito Abatement and Vector Control District Law, Sections 2000 *et seq.*). In addition, members of the MVCAC that are signatories to the California Department of Public Health Cooperative Agreement (Pursuant to Section 116180, Health and Safety Code) are required to comply with the following:

1. Calibrate all application equipment using acceptable techniques before using; maintain calibration records for review by the County Agricultural Commissioner (CAC).

2. Maintain for at least two years, pesticide use data for review by the CAC including a record of each pesticide application showing the target vector, the specific location treated, the size of the source, the formulations and amount of pesticides used, the method and equipment used, the type of habitat treated, the date of the application, and the name of the applicator.

3. Submit to the CAC each month a Pesticide Use Report on Department of Pesticide Regulation form PR-ENF-060. The report shall include the manufacturer and product name, the EPA registration number from the label, the amount of pesticide used, the number of applications of each pesticide, and the total number of applications, per county, per month.

4. Report to the CAC and the CDPH, in a manner specified any conspicuous or suspected adverse effects upon humans, domestic animals and other non-target organisms, or property from pesticide applications.

5. Require appropriate certification of its employees by CDPH in order to verify their competence in using pesticides to control pest and vector organisms, and to maintain continuing education unit information for those employees participating in continuing education.

6. Be inspected by the CAC on a regular basis to ensure that local activities are in compliance with state laws and regulations relating to pesticide use.

Other agencies such as local fire departments, the California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and other County departments such as Environmental Health (pesticide storage permit), and others have jurisdiction and oversight over some of our activities. We work closely with these agencies to comply with their requirements.

Santa Cruz County Mosquito and Vector Control

Mosquito Control Strategy

640 Capitola Rd Santa Cruz CA 95062 (831) 454-2590 www.agdept.com
Paul Binding, Manager

We practice Integrated Mosquito Management and respond to mosquito-borne disease using our Arbovirus Response Plan. It was adapted from the State response plan with strategies to respond to any mosquito issue, from routine nuisance control to disease emergency response.

The Arbovirus Response Plan was approved by the West Nile Virus Technical Advisory Committee, which is made up of community and local government agencies.

The Plan has three levels:

- ☐ **Level I Normal Season**
- ☐ **Level II Emergency Planning**
- ■ **Level III Epidemic Response or Disease Emergency**

Level I Normal Season

Education
Presentations at schools, community events, public forums.
Free consultations and informative pamphlets.

Surveillance

Disease

State or UC labs test adult mosquitoes, sentinel chicken flocks and dead wild birds and squirrels for West Nile Virus.

Larvae

Dip-cup sampling anywhere there's standing water!

We control larval mosquitoes when the population reaches a **Treatment Threshold**

Source reduction

Reduce breeding habitat by dumping out containers, draining small areas.

Biological control

Stock abandoned pools ornamental ponds, and horse troughs with mosquitofish.

Chemical Control

Apply biorational larvicides as needed to control larvae.

Adults

Trap mosquitoes with carbon dioxide and light baited traps.

Unusually large adult population

If Disease is Present
Adult mosquitoes, chickens, wild birds, or humans test positive for mosquito-borne disease

May indicate a need for Adult Mosquito Control

Extremely large adult populations or the presence of mosquito-borne disease would initiate Level II Emergency Planning

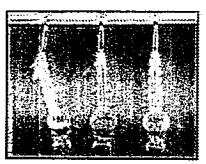
or **Level III Epidemic Response**

At which time the County Health Officer, Board of Supervisors, or State of California may declare a **Disease Emergency**

The SCCMVC would initiate a two pronged strategy:

Accelerate Routine Larval Control, Public Education and Surveillance

Adulticiding not approved



Convene the Technical Advisory Committee

Prepare for possible **Adulticiding**
This requires approval from the Board of Supervisors.

SCCMVC would make recommendations to the **Board of Supervisors** about how to respond to the Disease Emergency.

Hold Public Hearings

Public Notification
Media announcements

Adulticiding approved

Approved adulticides would be applied as a fog of ultra low volume, high concentration droplets to areas with large numbers of adult mosquitoes. These pesticides can be applied at ground level, or by air.

CONTROL SELECTION CRITERIA
SANTA CRUZ COUNTY MOSQUITO ABATEMENT DISTRICT

DO NOT USE	CHEMICAL CONTROL MATERIALS										FISH
	Bti and Bs		Methoprene					Mono -Film	Oil	Pyrethrum	
AFTER CONSULTATION	Liquid	Granular	Liquid	Granular	Pellets	Briquets	XR Briquets	Agnique	GB-1111	Pyrenone 25-5	
Water Temperature <65° F											
Water Temperature >65° F											
Larval Instar 1st - 2nd											
Larval Instar 4th - pupae											
Fresh Water											
Brackish Water											
Low Organic Load											
High Organic Load											
Emergent Vegetation <50%											
Emergent Vegetation >50%											
Predators Not Abundant											
Predators Abundant											
Endangered Aquatic or Terrestrial Species Absent											
Endangered Aquatic Species Present											
Endangered Aquatic Species Possible											
Endangered Terrestrial or Avian Species Present											
Endangered Terrestrial or Avian Species Possible											

Larval Treatment Criteria

	Species	Most Common Larval Habitats	Distance to Populated Area	Larval Treatment Threshold	Notes
OCHLEROTATUS	**Salt marsh mosquito** *Ochlerotatus dorsalis*	Salt marshes	0 meters - 2 miles	≥1 per 10 dips	High Pest Significance
	Asian tiger mosquito *Ochlerotatus albopictus*	Small Containers, Tires	ANY DISTANCE	IMMEDIATE TREATMENT IF ANY DETECTED	Found only once in San Francisco Bay area
	Tree hole mosquito *Ochlerotatus sierrensis*	Tree Holes, Tires,Miscellaneous Containers	0 - 300 meters	≥1 per dip or baster sample	High Pest Significance Vector of Canine Heartworm
	Winter salt marsh mosquito *Ochlerotatus squamiger*	Salt Marshes Reclaimed Marshes	0 meters - 10 miles	≥1 per 10 dips	High Pest Significance
	River mosquito *Aedes vexans*	Temporary Pools	0 meters - 1 mile	≥1 per 10 dips	Rare
	Woodland pool mosquito *Ochlerotatus washinoi*	Temporary Woodland Pools	0 meters - 1 mile	≥1 per 10 dips	High Pest Significance
ANOPHELES	*Anopheles franciscanus*	Shallow Pools and Streams in Algae mats	0 - 500 meters	≥1 >3rd instar larva per dip	Low Pest Significance
	Western malaria mosquito *Anopheles freeborni*	Seepages, Streams, Lakes,Gravel Pits	0 meters - 1 mile	≥1 >3rd instar larva per dip	Low Pest Significant Vector of Malaria
	Anopheles occidentalis	Streams, Lakes, Pools Occasionally in Brackish Water	0 - 500 meters	≥1 >3rd instar larva per dip	Low Pest Significance
	Anopheles punctipennis	Temporary Pools, Streams	0 meters - 1 mile	≥1 >3rd instar larva per dip	Moderate Pest Significant Vector of Malaria
CULEX	*Culex apicalis*	Woodland Creeks, Pools	NO TREATMENT	NO TREATMENT	No Pest Significance
	Culex boharti	Slow Streams, Pools	NO TREATMENT	NO TREATMENT	No Pest Significance
	Culex reevsi	Slow Streams, Pools	NO TREATMENT	NO TREATMENT	No Pest Significance
	Tule mosquito *Culex erythrothorax*	Lakes and Ponds Associated with Tules	0 - 500 meters	≥1 per dip	High Pest Significance Vector of West Nile Virus
	House mosquito *Culex pipiens*	Storm Drain Systems, Septic Tanks, Roadside Ditches, Cemetery Urns,Flooded Basements, Utility Vaults	0 meters - 1 mile	≥1 per 10 dips	High Pest Significance Vector of West Nile Virus
	Foul water mosquito *Culex stigmatosoma*	Foul Water, Sewage, Temporary Pools	0 - 300 meters	≥1 per dip	Low Pest Significance Vector of West Nile Virus
	Encephalitis mosquito *Culex tarsalis*	Creeks, Marshes, Temporary Pools,Roadside Ditches, Fresh Water	0 meters - 2 miles	≥1 per 10 dips	Moderate Pest Significance Vector of Encephalitis
CULISETA	**Fish pond mosquito** *Culiseta incidens*	Fish Ponds, Temporary Pools,Catch Basins, Roadside Ditches	0 meters - 1 mile	≥1 per dip	High Pest SignificancePossible Vector of Canine Heartworm
	Winter salt marsh mosquito*Culiseta inornata*	Marshes, Temporary Pools, Roadside Ditches	0 meters - 1 mile	≥1 per dip	High Pest Significance
	Culiseta particeps	Shaded Clean Pools, Streams	0 - 300 meters	≥1 per dip	Low Pest Significance

Mosquito Management Criteria

The Santa Cruz Mosquito and Vector Control CSA 53 does not treat all sites where mosquito breeding is found. That would be an inefficient use of time, materials and resources and could hasten resistance and cause unnecessary impact, however slight. Comprehensive and scientific criteria are used to determine the **action threshold** for appropriate intervention by means of source reduction (water or vegetation management), landowner education (or abatement enforcement), biological control or chemical larvaciding treatment. These criteria are larval density and abundance, mosquito species significance (nuisance or disease), stage of mosquito development, flight range, dispersal patterns, ecological sensitivity of the aquatic site, the presence, number and type of predators and competitors, and other environmental, meteorological or epidemiological factors when compared with human and domestic animal activity, injury and proximity.

Treatment decisions are based on adult mosquito surveillance findings (trap counts), complaints and larval dip sampling, and when possible all three. Typically, a suspected breeding site is sampled with a pint, long-handled dipper cup at various edge locations at intervals and an average number per ten dips established. The larvae are then identified or reared in our laboratory. Criteria for the site are then analyzed and often discussed before an action threshold level of larvae is determined for a particular site, beyond which intervention should take place. This action threshold number is then compared with the average number of larvae of that mosquito species per dip sample. The action threshold level is seasonally dynamic, partially intuitive and may change spatially and temporally or when more than one mosquito species are cohabiting.

See the Larval Treatment Criteria chart from our CEQA Technical Review for guideline threshold levels. Also see the Control Selection Criteria chart for treatment guidelines.

Santa Cruz County

Arbovirus Surveillance and Response Plan

Prepared by the West Nile Virus Technical Advisory Committee

July, 2006

- Health Services Agency
  - Environmental Health Services
  - Public Health – Disease Control
- Agricultural Commissioner
  - Mosquito and Vector Control (MVCD)

TAC CONTACTS: ROBERT KENNEDY, DIRECTOR – ENVIRONMENTAL HEALTH SERVICES (831) 454-2742
PAUL BINDING, MANAGER – SANTA CRUZ COUNTY MOSQUITO VCD (831) 454-2590

I. Statement of Purpose

The West Nile Technical Advisory Committee (TAC) was formed ad hoc in 2002 to prepare the County for the expected arrival of mosquito–borne West Nile virus and to provide recommendations for preparing for outbreaks of this and other arboviruses (arthropod-borne viruses). The TAC consists of the Santa Cruz County Mosquito and Vector Control (MVCD) and Santa Cruz County Health Services (HSA) personnel, coordinating with the State of California, the local medical and veterinary community and wildlife managers. The following pages describe the TAC's plan for detecting and interrupting West Nile and other arbovirus transmission in local human, mosquito and wildlife populations.

II. Agencies Involved

- Santa Cruz County Agricultural Commissioner
  - Mosquito and Vector Control (MVCD)
- Santa Cruz County Health Services Agency (HSA):
  - Environmental Health Services (EHS)
  - Public Health – Disease Control (PHDC)
- Santa Cruz County Office of Emergency Services (OES)
- California Conference of Directors of Environmental Health (CCDEH)
- Mosquito and Vector Control Association of California (MVCAC)
- California Department of Health Services (CDHS):
  - Vector-borne Disease Section
  - Viral and Rickettsial Disease Laboratory
  - Infectious Disease Branch
- U.S. Public Health Service Centers for Disease Control (CDC)
- University of California, Davis (UCD):
  - Arbovirus Research Unit
  - Center for Vector-borne Disease Research
- California Animal Health and Food Safety Laboratory (CAHFSL)

III. Current Local Status

Response to a mosquito-borne virus would be initiated at the local government level. The County Health Officer may take any preventive measure that may be necessary to protect and preserve the public health from any public health hazard during a local emergency. Preventive measure means abatement, correction, removal, or any other protective step that may be taken against any public health hazard that is caused by a disease outbreak that affects the public health (H&S Code sections 101040, 101475). The County Board of Supervisors or the Health Officer may proclaim a local emergency (GC8630). Once a local emergency has been declared, the Health Officer has the right to obtain all necessary information about the disease outbreak to abate the emergency and protect the public health. Health officials may provide this information to responding state or local agencies, or to medical and other professional personnel treating victims of the local emergency.

The MVCD is operational and funded for mosquito suppression and services countywide.

The following plan attempts to address the best-recommended methods of preparedness, education and response that the local resources can provide.

IV. Response Plan Components

CONDUCTED BY ALL TAC AGENCIES AND ORGANIZATIONS (Countywide):

A. Coordinate activities and share limited resources with other local, state and federal public health agencies

B. The MVC D, HSA, public health providers and veterinarians will monitor for arboviral infections among humans, horses and wildlife.

C. Staff will receive inquiries from the public and press on West Nile virus and distribute or provide educational information as necessary.

The following components include all of the above with the specific additions

CONDUCTED BY MVCD (Countywide):

A. Staff will continue to provide routine services to prevent the emergence of mosquitoes through control of larval breeding sources.

B. Staff will monitor local mosquito populations for potential to transmit arbovirus infection to vertebrate hosts.

Details:

CONDUCTED BY ALL TAC AGENCIES & ORGANIZATIONS

A. Summary of the Activities and Responsibilities of Cooperating Agencies

1) The MVCD will monitor mosquito populations, collect mosquito pools, blood samples from sentinel chicken flocks, and submit wild bird and tree squirrel carcasses for virus detection.

2) EHS will coordinate with the MVCD on abatement of mosquito breeding properties.

3) The MVCD will conduct preventative mosquito control using Integrated Pest Management methods including the application of least-toxic larvicides under normal conditions, with adulticides if conditions warrant.

4) The STATE, through its cooperative agreement and pesticide applicator certification programs, will assure proper usage of pesticides in vector control. Therefore, use of non-signatory entities is not recommended except in local epidemic, then overseen by the MVCD.

5) The STATE will coordinate laboratory testing of mosquito pools, chicken and tree squirrel sera, horse sera, and bird carcasses. The HSA is capable of conducting oral swab VecTec testing of dead crows.

6) The STATE will distribute statewide information on virus presence and mosquito density to county health agencies and mosquito abatement districts.

7) The University of California and the MVCD will monitor pesticide resistance levels and determine the efficacy of available larvicides and adulticides for local mosquito populations.

8) If large-scale mosquito-borne disease outbreaks are imminent and emergency control is needed, the STATE will assist the MVCD and HSA in obtaining necessary local, state and federal resources.

9) HSA will accept calls and provide information to the public. They will also investigate and oversee testing of human cases and conduct related disease control activities. They have developed a public health nurse investigation protocol and informational web pages at www.santacruzhealth.org.

10) The County will respond in epidemic situations by activating the Health Services Agency's Department Operating Center or the Operational Area Emergency Operations Center at the appropriate level.

B. The MVCD, HSA, public health providers and veterinarians will monitor for arboviral infections among humans, horses and wildlife.

1) Early each season, the STATE will notify all county health officers and appropriate public and private laboratory directors by letter, and the general medical community through the California Morbidity Report, on procedures to follow in reporting and submitting specimens to the State Department of Health of suspect human cases of arbovirus infections.

2) The State veterinarian will notify all veterinarians of procedures for reporting and submission of specimens from suspect equine cases of encephalitis.

3) Detection of arbovirus in equines, mosquito pools, sentinel chicken flocks, tree squirrels or wild birds will be reported to the county health officer so that physicians and hospitals can be alert for patients presenting symptoms compatible with arbovirus infection. Blood samples from acute and convalescent phases of the disease and autopsy samples in case of death will be forwarded to the CDHS for testing.

4) The MVCD and EHS will maintain a close liaison with the county health officer for notification of suspected and confirmed human cases within their jurisdictions so that epidemiological investigations, mosquito surveillance and control efforts can be coordinated.

5) All confirmed human cases of arbovirus infection will be investigated by the HSA, following the public health nursing protocol, and to determine possible areas where disease was contracted. The MVCD and EHS shall be notified when this determination has been made so that mosquito surveillance and control activities can be efficiently focused.

6) Surveillance for virus in mosquito populations will be conducted in the area adjacent to confirmed human cases. If this evaluation indicates adult mosquito populations must be reduced to mitigate the potential for virus transmission, adulticiding may be carried out if practical, following authorization by the Board of Supervisors.

C. The TAC agencies and others will distribute educational materials to the public.

1) The TAC will disseminate information to local schools, civic groups, libraries and other public and private entities regarding arbovirus surveillance and mosquito control programs. Information is also available on the HSA and CDHS web sites.

2) The TAC will provide information about the local and statewide mosquito-borne disease surveillance and control programs to the press when warranted. See the HSA Risk Communication Plan – West Nile virus.

3) Informational and educational materials will be provided to the TAC by the STATE to assist in the preparation and coordination of local news articles.

4) The MVCD includes information about vector-borne disease in its educational talks to schools and community groups and at community events.

PROVIDED BY MVCD:

A. Routine services to prevent the emergence of mosquitoes

1) Within the County, the MVCD maintains database and maps sources of mosquito larvae, along with a history of the density and species typically present. These sources are checked regularly and treated as needed.

2) Typical man-made sources for arbovirus vectors include catch basins, utility vaults, sewage treatment plants, impounds, ditches and drain lines. Stormwater structures installed for clean water goals, and urban wetland projects can vastly increase mosquito breeding sites. The MVCD reviews and comments on these development plans. Attention to source prevention Countywide would need to be intensified as public health risk of mosquitoes increases.

3) Yard breeding sources are equal to the above as the most important producers of mosquitoes of public health significance. They are largely controlled by informing residents and seeking their cooperation to drain receptacles of standing water and stock mosquito-eating fish in ornamental ponds, fountains and disused pools. Service request response and mosquitofish are provided Countywide to reduce vector production, dispersal and arbovirus risk.

B. Monitoring local mosquito populations for arboviral prevalence

1) Early seasonal environmental precursors to be used to monitor potential for virus activity:

a) Abnormal spring rainfall patterns and pre-existing sources

i. Mosquito sources created by spring rainfall will be monitored by the MVCD for vector mosquito production.

ii. Important sources that produce populations of *Culex* and *Aedes* species will be monitored and treated on a regular basis. These include underground conduits to dispose of sewage and storm wastewater, effluent from industrial sources and wastewater treatment facilities, recreation and ornamental water structures in parks, yards, creeks, drains, and fresh or saltwater marshes.

b) Abnormal temperature variations

i. Average spring and summer temperatures in Santa Cruz County appear to be sufficient to trigger transmission of West Nile virus[1]. Transmission of Western Equine Encephalitis (WEE) and St. Louis Encephalitis (SLE) is triggered when average temperatures [daily average = (maximum + minimum)/2] exceed 80° F for 10 consecutive days.

2) Biological surveillance indicators used to monitor the potential for outbreaks of encephalitis in vertebrates:

a) Density of adult mosquitoes

New Jersey Light Traps (NJLT) and Encephalitis Virus Surveillance Traps (EVS) are placed throughout the service area to determine the average presence of mosquitoes within an area. These traps attract adult mosquitoes by light and chemical (CO_2) stimuli.

i. Surveillance will be focused primarily on the adult populations of *Culex tarsalis* and *Culex pipiens* complex for the detection of arbovirus activity.

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[1] Dohm D.J., O'Guinn ML, Turrell MJ. Effect of environmental temperature on the ability of *Culex pipiens* (Diptera: Culicidae to transmit West Nile virus. *J. Med Entomol* 2002 Jan;39(1):221-5.

ii. New Jersey Light traps will be run for 9 months of the year and collected weekly. Encephalitis Virus Surveillance Traps (EVS) will be placed for 24 hr periods every week.

iii. Mosquitoes collected in both types of traps will be identified to species and counted.

iv. If collections in any individual trap exceed about 10 vector mosquitoes per trap night, supplementary control efforts will be undertaken to reduce those populations.

v. Supplementary control includes:
1. Inspection of all known sources within 1 mile of trap until source found or counts diminish
2. A detailed search of the area for additional undetected larval sources
3. Application of larvicides, where appropriate, to any source containing larvae in numbers that exceed a public health threshold for that site

b) Detection of virus through sentinel chicken flocks

Sentinel flocks indicate the presence of virus in biting adult mosquitoes by demonstrating a positive antibody seroconversion.

i. Sentinel flocks of chickens will be set out in spring in the MVCD service area to provide additional information on mosquito-borne virus transmission.

ii. Blood samples will be taken from the flocks every 2 weeks from late spring through early fall.

iii. Specimens will be sent to the STATE for testing. Samples that contain antibodies to arboviruses will be reported to the MVCD as soon as results are available, and to all other control agencies through weekly STATE reports.

iv. When chickens show antibody conversions:

1. Adult mosquitoes will be collected for virus isolation to determine the extent and prevalence of the virus in mosquito populations, particularly in areas adjacent to population centers.

2. Supplementary control efforts will be undertaken including:
   a. Inspection of all known sources within 1 mile of trap until source found or counts diminish
   b. A detailed search of the area for additional undetected larval sources
   c. Application of larvicides, where appropriate, to any source containing larvae in numbers that exceed a public health threshold for that site

c) Detection of virus in wild birds and tree squirrels .

Detection of virus in dead birds appears to be the most sensitive means for uncovering the presence of West Nile virus. Virus can be identified in wild birds and tree squirrels by isolation of infectious particles or detection of specific RNA by Reverse Transcription-Polymerase Chain Reaction (RT-PCR).

i. Surveillance for wild bird and tree squirrels carcasses will be initiated when local adult mosquito activity begins in the spring. Dead birds and tree squirrels in good condition (without obvious decomposition, scavenged or infested with maggots) will be submitted to CAHFSL for processing.

ii. The TAC and STATE will solicit the submission of dead birds and tree squirrels from local humane societies, wildlife rescue organizations and the public.

iii. MVCD and EHS staff will collect carcasses and submit them to VRDL.

iv. Birds and tree squirrels positive for West Nile virus will be reported to the TAC as soon as results are available, and to all other control agencies through weekly STATE reports.

v. When West Nile virus is detected in 1 or more wild birds or tree squirrels, supplementary surveillance and control efforts will be undertaken by the MVCD as follows:

1. Adult mosquitoes will be collected for virus isolation to determine the extent and prevalence of the virus in mosquito populations, particularly in areas adjacent to population centers (see (d) below for description of mosquito pool testing).

2. Supplementary mosquito control will be applied including:
   d. Inspection of all known larval development sources within 1 mile of trap until source found or counts diminish
   e. A detailed search of the area for additional undetected larval sources.
   f. Application of larvicides, where appropriate, to any source containing larvae in numbers that exceed a public health threshold for that site.

d) Virus isolations from mosquito pools

Within its service area, the MVCD will collect and test mosquitoes for the presence of virus when sentinel flocks or other susceptible hosts are confirmed positive for arboviruses by the STATE.

i. Using EVS and gravid mosquito traps, the MVCD will collect pools of 12 - 50 female mosquitoes of vector species and submit them to the UCD for virus testing.

ii. Isolations of arboviruses from mosquito pools will be reported to the MVCD and the TAC as soon as results are available.

iii. If virus is detected in mosquito pools, supplementary control efforts will be undertaken including:

1. Inspection of all known sources within 1 mile of trap until source found or counts diminish
2. A detailed search of the area for additional undetected larval sources.
3. Application of larvicides, where appropriate, to any source containing larvae in numbers that exceed a public health threshold for that site.

V. MVCD Support

A. Epidemiology

The STATE will provide epidemiological assistance as appropriate to the HSA as part of its ongoing disease surveillance and control program.

B. Laboratory

The arbovirus surveillance program depends upon the STATE, CAHFSL and UCD to test for arboviruses in mosquito pools and specimens from sentinel chicken flocks, dead birds and tree squirrels. In addition, the

STATE coordinates the testing of suspected human or horse cases submitted by local state authorities with selected local laboratories.

C. Mosquito Control

1) Surveillance

a) Adequate resources are available at the MVCD to carry out surveillance activities within its jurisdiction. This includes trained staff, equipment for collecting adult mosquitoes (portable traps, aspirators), shipping containers and a retail source of dry ice.

2) Control

a) The MVCD may utilize the appropriate provision of the Health and Safety Code and the Government Code to provide funding for routine and emergency mosquito control within its jurisdiction. Sections covering standby charges and restricted reserves for public health emergencies can be found in Chapter 8, Part 2, Division 2 of Title 3 of the Government Code commencing with §25850 or Division 3, Chapter 1, of the Health and Safety Code commencing with §2000.

b) In the event of virus recoveries or human cases in urbanized areas where the MVCD resources and/or public resistance limit the widespread application of adulticiding materials, an expanded and intensified larviciding program may be necessary to interrupt the transmission cycle and reduce the adult populations of vector species.

c) The STATE maintains current information, provided by the MVCAC Chemical Control Committee on the inventory of mosquito control equipment and pesticides being used by local control agencies. In epidemic-level situations, adult mosquito control equipment and assistance may be available from the California Department of Food and Agriculture.

d) The STATE will provide, on request, information and perform evaluations on adult control operations being conducted by the MVCD.

VI. Response Levels of Arbovirus Surveillance and Control Activity Triggered By Environmental and Epidemiological Conditions

This response plan is based on conditions that exist at 3 response levels identified as normal season, emergency planning, and epidemic. Seven risk factors are analyzed to determine the appropriate response:

1) Environmental conditions (snowpack, rainfall, temperature, season)
2) Adult mosquito vector abundance
3) Virus infection rate in mosquito vectors
4) Sentinel chicken seroconversions
5) Fatal infections in birds
6) Infections in equids and ratites (e.g. emus and ostriches)
7) Infections in humans
8) Proximity of detected virus activity to urban or suburban regions

Each factor is scored on an ordinal scale from 1 (least severe) to 5 (most severe). The mean score calculated from these factors corresponds to a response level as follows: normal season (1.0 to 2.5),

emergency planning (2.6 to 4.0), and epidemic (4.1 to 5.0). Table 1 provides a worksheet to assist in determining the appropriate rating for each of the risk factors for mosquito borne viruses.

A. LEVEL I – Normal Season: Risk Rating 1.0 to 2.5

1) Triggers:

a. Normal or below average rainfall and snow pack; average seasonal temperatures.
b. Mosquito abundance at or below five year average (key indicator = adults of vector species).
c. No virus isolations from mosquitoes.
d. Absence of antibody seroconversion in sentinel chicken flocks.
e. No WNV infected dead birds or squirrels.
f. No equine cases.
g. No human cases.

2) Responses:

a. Conduct routine public education (eliminate standing water around homes, use personal protective measures).
b. Conduct routine mosquito and virus surveillance activities.
c. Conduct routine control of mosquito larvae.
d. Inventory pesticides and equipment.
e. Monitor for pesticide resistance in vector species.
f. Ensure adequate emergency funding.
g. Release routine press notices.
h. HSA will send routine notifications to physicians and hospitals.
i. The TAC will establish and maintain routine communication with County Office of Emergency Services.

B. LEVEL II – Emergency planning: Risk rating 2.6 to 4.0

1) Triggers:

a. Snowpack and rainfall and/or temperatures above average.
b. Adult mosquito abundance greater than 5-year average (150% to 300%).
c. One or more virus isolations from mosquitoes (Minimum Infection Rate MIR / 1000 is <5)
d. One or more seroconversions in single flock or one or two seroconversions in multiple flocks in specific region (Santa Cruz County).
e. One to five positive dead birds or tree squirrels in specific region (Santa Cruz County).
f. One or two equine cases in region (adjacent counties).
g. One or more human case in region (adjacent counties).
h. Viral detection in small towns or suburban region.

2) Responses:

In addition to Level I responses, the following activities will be undertaken:

a. Enhance public education (include messages on signs and symptoms of encephalitis, seeking medical care if needed, inform public of pesticide applications if appropriate).
b. Enhance information to public health providers and other key organizations and agencies.
c. Increase surveillance and control of mosquito larvae
d. Increase number or frequency of traps set for adult mosquitoes.
e. Increase number of mosquito pools tested for virus.
f. Review and evaluate efficacy of labeled candidate adulticiding materials and contact formulators regarding availability
g. Conduct localized chemical control of adult mosquitoes, if needed and approved by Board of Supervisors.
h. Review and modify response plan as necessary.
i. Ensure notification of key agencies of the presence of viral activity including HSA and the County Office of Emergency Services.

j. Increase mosquito control staff if necessary and expedite training.
k. Obtain support from other County departments, local municipalities and agencies to assist in surveillance, procurement and source reduction.

C. LEVEL III – Epidemic Conditions: Risk rating 4.1 to 5.0

1) Triggers:

a. Snowpack, rainfall and water release rates from flood control dams and/or temperatures well above average.
b. Adult vector populations extremely high (>300%).
c. Virus isolation from multiple pools of mosquitoes (MIR / 1000 > 5.0).
d. More than two seroconversions per flock in multiple flocks in region (adjacent counties).
e. More than two equine cases in region (adjacent counties).
f. One or more human cases in Santa Cruz County.
g. Virus detection in local urban or suburban areas.

2) Responses:

In addition to Level II responses, the following activities will be undertaken:

a. Conduct full scale media campaign.
b. Alert physicians and veterinarians.
c. Conduct active human case detection. HSA will use nursing protocol to identify and investigate cases.
d. Continued enhanced larval surveillance and control of immature mosquitoes.
e. Broaden geographic coverage of adult mosquito surveillance.
f. Expand scope and area of adult mosquito control if appropriate and approved by Board of Supervisors.
g. The MVCD will coordinate its response with the HSA and the County Office of Emergency Services.
h. The STATE will explore all avenues available for emergency funding at the state and federal levels, and secure their release to local control agencies.
i. County HSA and the MVCD will determine whether a declaration of a "State of Emergency" should be considered by the County Board of Supervisors or Local Health Officer in consultation with the County Emergency Services Administrator and the County Administrative Officer.
j. In consultation with the County Health Officer, Emergency Services Administrator and the MVCD, the County Administrative Officer will determine whether the County will request the Governor to declare a "State of Emergency".
k. Educational and mosquito control campaigns will continue until mosquito abundance is substantially reduced and no additional human cases are detected.

Table 1.

WNV Surveillance Factor	Assessment Value	Benchmark	
1. **Environmental Conditions.** Rural transmission may favor El Niño conditions, whereas urban transmission may favor La Niña conditions. Temperature data link: http://www.ipm.ucdavis.edu:/WEATHER/wxretrieve.html	1	Avg daily temperature during preceding month <56 ° F	
	2	Avg daily temperature during preceding month 57-65° F	
	3	Avg daily temperature during preceding month 66-74° F	
	4	Avg daily temperature during preceding month 75-83 ° F	
	5	Avg daily temperature during preceding month >83 ° F	
2. **Adult *Culex tarsalis* and *Cx. pipiens complex* abundance** Determined by trapping adults, identifying them to species, and comparing numbers to those previously documented for an area for current time period.	1	Vector abundance well below average (<50%)	
	2	Vector abundance below average (50-90%)	
	3	Vector abundance average (90-150%)	
	4	Vector abundance above average (150-300%)	
	5	Vector abundance well above average (>300%)	
3. **Virus infection rate in *Culex tarsalis* and *Cx. pipiens* complex mosquitoes** Tested in pools of 50. Test results expressed as minimum infection rate (MIR) per 1,000 female mosquitoes tested (or per 20 pools).	1	MIR / 1000 = 0	
	2	MIR / 1000 = 0-1.0	
	3	MIR / 1000 = 1.1-2.0	
	4	MIR / 1000 = 2.1-5.0	
	5	MIR / 1000 > 5.0	
4. **Sentinel chicken seroconversion** Number of chickens in a flock that develop antibodies to WNV. If more than one flock is present in a region, number of flocks with seropositive chickens is an additional consideration. Typically 10 chickens per flock.	1	No seroconversions	
	2	One seroconversion in single flock over broad region	
	3	One to two seroconversions in a single flock in specific region	
	4	More than two seroconversions in single flock or one to two seroconversions in multiple flocks in specific region	
	5	More than two seroconversions per flock in multiple flocks in specific region	
5. **Dead bird infection** Includes zoo collections.	1	No WNV positive dead birds	
	2	One WNV positive dead bird in broad region	
	3	One WNV positive dead bird in specific region	
	4	Two to five WNV positive dead birds in specific region	
	5	More than five WNV positive dead birds and multiple reports of dead birds in specific region	
6. **Equine cases**	1	No equine cases	
	3	One equine case in broad region	
	4	One or two equine cases in specific region	
	5	More than two equine cases in specific region	
7. **Human cases**	1	No human cases	
	3	One human case in broad region (adjacent counties)	
	4	One human case in specific region (Santa Cruz County)	
	5	More than one human case in specific region	
8. **Proximity to urban or suburban regions** (score only if virus activity detected) Risk of outbreak is highest in urban areas because of high likelihood of contact between humans and vectors.	1	Virus detected in remote area	
	2	Virus detected in rural areas	
	3	Virus detected in small towns	
	4	Virus detected in suburban areas	
	5	Virus detected in urban area	
Response Level / Average Rating: Normal Season (1.0 to 2.5) Emergency Planning (2.6 to 4.0) Epidemic (4.1 to 5.0)		**TOTAL**	
		AVERAGE	

For NOI Section VII. Notification

County of Santa Cruz

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10/8/10

On Tuesday, October 12, 2010, at approximately 11:00 AM, weather permitting, the Santa Cruz County Mosquito & Vector Control (MVC) will apply mosquito control granules by helicopter to 50 acres in and near Watsonville: within portions of Watsonville slough, Atkinson Pond, Pinto Lake, Sunset State Beach marsh and Struve Slough. The outcome of this treatment will be a reduction in the number of pestiferous mosquitoes that emerge from the shallows of those wetlands. If the helicopter is unavailable or weather conditions prevent the application the treatment will be rescheduled for Wednesday, October 13, 2010. Treatments do not take long to complete so the helicopter will only be seen for a few minutes in any one area. Please be aware this is a directed granular treatment and not aerial fogging or an air dispersed application.

The mosquito control granule that will be applied is the biological microbial, *Bacillus thuringiensis israelensis* (Bti) on corncob granules. This product is very selective; meaning it targets immature mosquitoes (aquatic stages). This application will prevent the emergence of adult mosquitoes and is not harmful to humans, birds, fish or other wildlife. By controlling mosquitoes in the larval stage dispersal of adult mosquitoes into the community is minimized and the need to use less selective control measures such as fogging for adult mosquitoes is significantly reduced.

These treatments are necessary because warm weather species of mosquitoes are still hatching from aquatic larvae in significant numbers, particularly in the stagnant muck among dense vegetation. A larval control effort provides relief from bites and is important for the prevention of mosquito-borne diseases, including West Nile virus. The application of granules by helicopter is a proven method of controlling larvae, which we have successfully used since 1993.

In 2010 there has been four dead birds infected with West Nile virus found in Santa Cruz County with significant virus activity in neighboring counties. So far California has identified 66 human West Nile virus infections all the result of bites from infected mosquitoes.

The MVC encourages residents to empty yard containers of standing water; wear long sleeved shirts, pants, socks with shoes and repellants when outside at dawn or dusk; place mosquitofish in ornamental ponds or non-maintained pools; inform us of mosquito breeding situations such as unmaintained swimming pools or ponds and of biting mosquitoes at 831-454-2590. We also encourage reporting of dead birds and tree squirrels to the Department of Public Health - West Nile virus hotline, 1-877-WNV-BIRD, or website http://www.westnile.ca.gov/, as these reports can help locate West Nile virus activity.
Thank you.

For NOI
Section VII. Notification

Ellicott Slough NWR - CDFG Ecological Reserve: Draft Monitoring and Treatment Plan 2010

Santa Cruz County Mosquito and Vector Control - Paul Binding, Manager. 831-454-2590

The ecologically important wetland sites that make up the jointly managed protected areas for the endangered Santa Cruz Long-toed salamander (SCLTS) are historical sources of mosquito breeding that influenced the area being included in the formation of Santa Cruz County Mosquito and Vector Control (MVC) in 1993. There is anecdotal evidence of residents conducting illegal pesticide treatments to control mosquitoes on the refuge prior to this date. The MVC is developing this Best Management Plan (BMP) for the Ellicott Slough National Wildlife Refuge (ESNWR) in collaboration with the US Fish and Wildlife Service (FWS), to respond to mosquito management required by State Health and Safety Code laws while adhering to Environmental Species Act objectives for protection of species at risk. This BMP could assist in establishing sustainable mosquito management objectives for the FWS to include within the Comprehensive Conservation Plan and/or a Special Use Permit.

While the primary mission of the Santa Cruz County Mosquito and Vector Control (MVC) is to protect the public from vector-borne diseases, the MVC is desirous as well as required to be a good environmental steward. The program is based on integrated mosquito management methods that minimize environmental impacts. Mosquito control is not a use of the refuge, but a public safety benefit and service that is in response to threats to health of humans and wildlife posed by the wetland and therefore a compatible refuge activity. Mosquito breeding is not unlike wildfire in this respect. USFWS likewise has an obligation to the neighboring community and properties for maintaining the public benefit by reducing nuisance impacts caused by the refuge.

Public Health Impact

Although floodwater mosquito species are not known to transmit disease, when a mosquito bites, a person becomes sensitized to the foreign proteins, and small, itchy, red bumps appear within 24 hours. This is the most common reaction in adults and children. After more bites, a pale, swollen hive, or wheal, begins to appear within minutes after a bite -- followed by the red bump 24 hours later. Sometimes the protein in the mosquito's saliva can cause an exaggerated immune response such as blisters or persistent swelling. Increased Immunoglobulin E (IgE) antibody to mosquito saliva develops in people with mosquito allergy, causing more severe reactions at the sites of the mosquito bites. These allergic reactions, such as a large red swelling, a skin blister, bruise or hives, may last for a week or more. Rarely, severe acute allergic reactions involving many body systems may occur. A few people can develop a life threatening reaction known as anaphylactic shock.
(http://www.aaaai.org/patients/advocate/2005/summer/mosquito.stm)
(http://www.acaai.org/public/linkpages/bug_bites.htm)
(http://allergies.about.com/od/insectallergies/a/mosquitoallergy.htm)

Beyond annoyance, mosquitoes can make the most routine human activities unbearable. They can disrupt sleep, field work and education, and even the buzzing sound made while in flight can cause distraction and anxiety. Babies and small children are defenseless and can be traumatized by bites. Mosquitoes can make potential recreation areas unsuitable and interfere with normal living and work, reducing economic values of surrounding properties. Their bites can weaken nestling birds, irritate horses and pets and reduce production from domestic

animals. For these reasons, MVC recommends FWS collaborate with us on mosquito management for situations far short of disease emergencies.

The warm-weather *Culex* species are more likely to vector viruses such as West Nile and encephalitis (St. Louis, Western Equine). Santa Cruz County has had confirmed West Nile virus-infected dead wild birds since 2004. Although human cases are usually flu-like, mild or asymptomatic, a few victims have long bouts of febrile illness or neurological damage and some have died.

Mosquito Surveillance

Surveillance of pest populations is essential for assessing the necessity, location, timing and choice of appropriate control measures. Surveillance aides us to identify breeding mosquito populations that exceed established thresholds within defined areas. By doing so we are able to target breeding sites, thereby reducing the need for large area larvicidal treatments. Field data, such as species, density, and life stages present are used to select an appropriate reduction strategy utilizing integrated pest management alternatives.

Continued and regular mosquito monitoring through the season helps us to better establish threshold levels for appropriate intervention at each site in relation to larval and adult mosquito counts for various mosquito species. Surveillance via adult traps has the least impact on the refuge ecology, as it is unnecessary to get near the water. However this approach is not effective for floodwater mosquitoes because if the count is high it is too late to reduce immature populations.

In order to best establish a treatment threshold based primarily on adult monitoring we would need to collect and count samples of larvae over several years and compare larval numbers to the number of adults subsequently caught in traps. This would assist us in determining mosquito survivorship through emergence and assess the effects of predation. Adult mosquito counts could also be compared with surveys or complaints of local residents, Renaissance High School staff and KOA campers and staff about the level of biting nuisance they experience in order to make a correlation between number of adult mosquitoes per night and the public nuisance in the adjacent area. However, this tactic of monitoring without control intervention could have unfavorable public reaction, as an historical annoyance precedent has already been established for this area.

The predominant mosquito species in the temporarily-flooded sites is the floodwater mosquito, *Aedes washinoi*, a species not known to vector disease. This is a univoltine species with a winter hatch, or closely spaced cohort hatchings contingent on water level. The eggs are laid in the drying mud of ephemeral ponds by the gravid female prior to winter rains. The eggs hatch and the larvae go through late-stage diapause then pupate and adults emerge with longer, warmer days in March. To interrupt development in the vulnerable larval stages prior to emergence and dispersal as adults, larval monitoring is necessary following flooding to establish treatment timing. The KOA ditch and Railroad ponds historically have had the highest counts.

When a site is surveyed, water is sampled with a twelve ounce dipper at determined distance intervals to check for the presence of eggs and immature mosquitoes. Monitoring by dipper counts to establish abundance and distribution in the ponds requires foot access but with care

and mitigation has little impact on the refuge ecology. Mosquito survivorship is affected by predation, but as the species is a pioneering species it is often ahead of predator development. Adult mosquito emergence through the spring is partially synchronous and can lead to pestilent levels of active biting daytime nuisance in the localized area, but the species are weak flyers with a maximum dispersal of 1 ½ miles.

Intervention Decisions

Treatment thresholds are established for mosquito developmental sites where potential disease vector and/or nuisance risks are evident. Therefore, only those sources that represent imminent threats to public health or quality of life are treated. Treatment thresholds are based on the following criteria that individually can influence the action threshold:

- Mosquito species present
- Mosquito stage of development
- Nuisance or disease potential
- Mosquito abundance
- Flight range
- Proximity to populated areas
- Size of source
- Presence/absence of natural enemies or predators
- Presence of sensitive/endangered species
- Water quality and aquatic vegetation type and coverage

Selection of Control Strategy

When thresholds are exceeded an appropriate control strategy is implemented. Control strategies are selected to minimize potential environmental impacts and resistance while maximizing efficacy. Rotation of two or more larvicides (such as Bti and methoprene) helps forestall resistance.

For sites with known Santa Cruz Long-toed Salamander breeding such as Ellicott Pond and Calabasas Pond, intervention and reduction with biorational larvicide treatments would only be performed at the upper larval counts that exceed threshold determinations. In such cases we would consult with FWS. In non-breeding SCLTS sites such as the KOA ditch, Prospect Pond and Railroad Ponds we would respond to high larval counts with an appropriate reduced risk larvicide after notification of FWS and CDFG and adhering to the established treatment and disinfection protocol. To assist in establishing intervention thresholds the following surveillance methods would be utilized:

Adult Mosquito Monitoring

Three established CO2 trap locations are sited within a ¼ mile of the three sources:

Trap # 1.42 - KOA Campground, 1186 San Andreas Rd
Approx. 1500' from the NE end of Ellicott
Approx 150' from NE end of KOA ditch

Trap # 1.423 Across from RR ditch, Crest Lane neighborhood
Approx 800' from N end of RR ditch
Approx 1000' form S end of Ellicott

Trap # 1.08 Peaceful Valley Rd
Approx 400' from S end of Ellicott
Approx 600' form N end of RR ditch

Trap season traditionally begins in March and concludes in November. Traps would be inspected every two weeks.

Tentative public health risk thresholds for adult trap counts:

- Female competent West Nile virus vectors including *Culex tarsalis* and *pipiens* ≥ 15 per night.
- All other female mosquito species including *Aedes washinoi* and *Culiseta* spp. ≥ 50 per night.

Nuisance Monitoring

MVC documents complaints received from area residents, personnel and campers at KOA and Renaissance High School staff. Any complaints are followed up with CO2 trapping and count verification. Three indicators: complaints, high trap counts and high dip counts can initiate our contact with FWS or CDFG to recommend intervention. At this time, adulticiding or fogging of nuisance mosquito species is considered a last resort by the MVC.

Larval Monitoring

Source inspections are accomplished by dip-sampling the sites (twelve ounce standard dipper) at fixed distance intervals to determine an average dip count. Pre and post-treatment larval counts could be compared to subsequent adult counts. Disinfection protocol for amphibian protection is practiced by MVC.

Tentative treatment thresholds for larval counts:
Aedes (Ochlerotatus) washinoi - ≥ 1 per 10 dips
Culex tarsalis - ≥ 1 per 10 dips
Culiseta spp.- ≥ 1 per dip

If beneficial predators present:
Aedes (Ochlerotatus) washinoi - ≥ 2 per 10 dips
Culex tarsalis - ≥ 2 per 10 dips
Culiseta spp.- ≥ 3 per dip

Larval Treatment

Larval treatments to the sites without documented SCLTS will follow protocol and conditions arranged with USFWS and documented in correspondence of March 8, 1996 Noda, March 6, 2000 Barr, March 23, 2007 Hurt and March 9, 2009 Cooper, in addition to other oral and written correspondences. MVC in the past has contacted FWS prior to treatment and post treatment maps were provided. Disinfection to protect amphibians before moving to new sites will generally follow USFWS recommendations. Larvicides will not be applied to the SCLTS breeding ponds on the State reserve without FWS concurrence.

The following measures will be implemented to avoid injuries or mortality to SCLTS:
- Only Service-approved mosquito control agents will be applied. Currently this includes only *Bacillus thuringiensis israelensis* liquid or granular formulations.
- Applications should be made from the shoreline without entry into the ponds. To facilitate access to shoreline, some vegetation clearing may occur to provide a pathway to various points around the non-SCLTS breeding ponds.
- Vegetation clearing will be limited to no lower than knee high length; no ground level vegetation clearing will occur; selective cutting avoiding oaks, sticky monkeyflower, coffeeberry and live limbs over 6" diameter.
- When feasible, hand tools, such as machetes and pruning shears, will be used to clear vegetation, and cut vegetation and limbs will be left in situ.
- A FWS biologist will be notified for opportunity to be present for larval dip monitoring in sensitive sites, vegetation clearing and larvicide application activities to monitor SCLTS.
- If any SCLTS or their eggs are found, they will not be moved, disturbed, or have their natural behavior altered in any way. Dipper samples are returned to the pond.
- All MVC staff sampling for mosquito larvae with a dipper shall be trained in amphibian identification and informed of the appropriate techniques for avoiding the capture of larvae and dislocating eggs and egg masses of the Santa Cruz long-toed salamander or threatened amphibians and for their release if they are inadvertently netted. Workers conducting monitoring activities shall not enter the water and take great care in their approach.
- To avoid transferring disease or pathogens between aquatic habitats, mosquito abatement technicians will follow the Declining Amphibian Population Task Force's Code of Practice.
- An annual pesticide use report will be provided to USFWS at the beginning of the year.

Consultation by the MVC with the FWS should ensure that mosquito abatement activities can occur without risk to SCLTS or other sensitive species but it is understood that such agreement does not authorize injury, mortality, or other adverse effects to SCLTS. If a SCLTS is found injured or dead, MVC will cease all activities and contact FWS immediately.

MVC advises that the Service manage aquatic vegetation growth to encourage diversity and water circulation and prevent monoculture coverage or invasive exotics that could lead to reduced water quality and mosquito harborage.

Attachments

See the Mosquito Management Criteria explanation of 'threshold' attached; also the Larval Treatment Criteria table and the Control Selection Criteria table which are useful as guidelines. A discussion of larvicides is also attached.

Technical information about the MVC's program can be found in the CEQA review documents on our website.
http://www.agdept.com/mvc.html