Outcome Report on the Precautionary Principle Pilot Project Involving the Division of Environmental Health Vector Control Program

Summary

In response to the spread of West Nile Virus the California Department of Health Services allocated grant money to local jurisdictions in 2005 for mosquito control activities. Mendocino County DEH received $9,000. DEH staff met with representatives of the Sonoma County Vector Control District and the Vector Control Officer for Humboldt County to discuss and evaluate control practices that they had implemented. Based on information gained from those meetings and additional research into mosquito larvacide the following controls were decided upon: mosquito fish, *Bacillus thuringiensis*, *Bacillus sphaericus*, and methoprene. Application of the controls was determined through a bio-rational approach that would minimize potential impact to the environment.

In August, 2007 DEH volunteered to participate in the Precautionary Principle pilot program. DEH opened the Vector Control Program to Precautionary Principle decision making. Adhering to the Precautionary Principle Procedure and Public Participation Guidelines DEH prepared for a public work shop that was held on January 23, 2008. Preparation and presentation took 100 hours of staff time and included: research and writing of a larval control fact sheet; development of a power point presentation; advertising for the work shop that included the posting of a public notice in the Ukiah Daily Journal and a press release sent to all local media outlets. The public work shop was attended by several individuals. The public comment period ended February 22, 2008. Two questions and one proposed alternative were raised at the work shop and two letters were received before the close of the comment period.

After reviewing public comment and researching and evaluating the proposed alternatives DEH is confident the best action to take is to continue to follow its current larvae control procedure.

Decision Making Process Involved in Mosquito Larvae Control

Established DEH Procedure	Precautionary Principle
Meet with outside agencies to obtain information on their procedures.	Review Precautionary Principle Procedure to evaluate impact of action.
Research controls.	Advertise to solicit public input.
Choose controls and application procedures that minimize potential environmental impact.	Facilitate public work shop.
	Evaluate public input and suggested alternatives.
	Determine best action.
	Report back to stakeholders
	Monitor & follow up.

Precautionary Principle Procedure

The Precautionary Principle was passed as a Mendocino County Administrative Policy by the Board of Supervisors on June 27, 2006. It is a tool to help make decisions that will have the best long-term effect on the health, well-being and environment of Mendocino County. The Precautionary Principle seeks to ask questions that will help prevent harm and unforeseen costs. It facilitates taking action to prevent harm even if full scientific certainty has not been established. It requires decision makers to choose the alternative that presents the least overall harm, not simply the lowest priced option.

This form is designed to lead you through the decision-making process of the Precautionary Principle. You may not be able to fill it out at one time, but may need to revisit it during the decision-making process in order to be sure to cover all aspects. Please refer back at various points in the process to the included Precautionary Principle Timeline to be reminded of the steps to take into account as you proceed. Also, you may need to update your answers along the way.

Project/Action: Application of mosquito larvae control

Date Began: August 2005 County Department: Public Health, DEH

Staff involved: John Morley Phone: 707-463-4466

I. DESCRIPTION OF SITUATION/PROPOSED ACTION/POTENTIAL HARM

1. Describe the situation that needs to be addressed.

Control of mosquito larvae to aid in the prevention of West Nile Virus.

2. What is the current practice?

Apply larval controls rated to have the least environmental impact to standing waters.

3. What is the proposed action to be taken to address this situation or problem at this initial stage?

Not Applicable

4. Describe why this action is necessary or preferred.

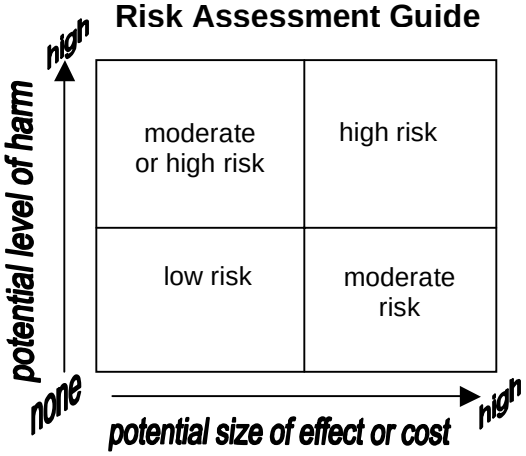
Application of larvae controls will reduce the population of adult mosquitoes that are capable of transmitting West Nile Virus.

5. Evaluate, to the best of your ability and current knowledge, the potential impact or risk of this action using the **Risk Assessment Guide** below as a reference and checking appropriate boxes in the **Impact/Risk Matrix** below.

Impact/Risk Matrix

Potential	LEVEL OF IMPACT/RISK			
IMPACT ON	None	Low	Moderate	High
Environment (such as air quality, water quality, geology)		X		
Community (such as noise, traffic, aesthetics, public services)	X			
Population Health		X		
Land Use	X			
Wildlife			X	
Housing	X			
Energy Use	X			
Cost to Society (such as disposal of waste, labor, clean up, transportation, raw materials)	X			

Risk Assessment Guide



If any checks in the matrix above are moderate or high, please continue with this procedure. If all checks are none or low, you may go to the page 6.

6. What are the short and long-term potential **benefits** of this action? (Include financial benefits, job creation, energy, health, safety, impacts to the local economy, social and economic equity, etc)

Applying mosquito larvae controls will reduce the population of adult mosquitoes capable of transmitting West Nile Virus.

II. PUBLIC INPUT PROCESS (for moderate or high risk projects only)

1. How will the people affected receive information about this action and provide input into decision-making? (Refer to Public Participation Guidelines for ideas.)

Public Notice will be run in UDJ and press release will be sent to local media advertising a public work shop on the issue. There will be a 30 day public comment period.

2. What specific outreach activities will be conducted to seek input from affected minority, low-income and non-English speaking people?

None other than steps mentioned above.

III. ASSESSMENT OF ALTERNATIVES

1. What uncertainties or gaps in information remain after input from the public?

Gaps involve the use of biological controls such as mosquito fish, dragonflies, and bats.

2. After consulting affected people and considering gaps in information, how have you reconsidered the problem or situation to describe the underlying interest or what needs to be done? For example, in the case of pesticides, reconsidering the big picture leads to the more important issue of managing pests rather than spraying pesticides.

Continue the use of providing mosquito fish to the public with the advisory to apply only to closed water systems. No information on mosquito fish having an adverse affect on ecosystems.

3. List the alternatives to this decision or action that address the concerns. (Include the alternative of doing nothing.)

No action.

Incorporate the use of dragonflies.

Promote the use of bat houses.

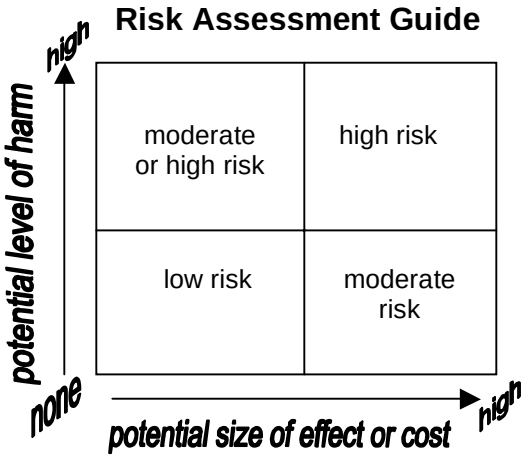
4. Evaluate, to the best of your ability, the potential impact or risk of each alternative using the **Risk Assessment Guide** and the **Impact/Risk Matrix** below.

Please copy the next page, complete the matrix and answer the potential benefits question for each alternative listed in III-3.

Evaluation of Alternative: (please specify) BAT HOUSES

Impact/Risk Matrix

Potential	LEVEL OF IMPACT/RISK			
IMPACT ON	None	Low	Moderate	High
Environment (such as air quality, water quality, geology)	X			
Community (such as noise, traffic, aesthetics, public services)	X			
Population Health		X		
Land Use	X			
Wildlife		X		
Housing	X			
Energy Use	X			
Cost to Society (such as disposal of waste, labor, clean up, transportation, raw materials)	X			



If any checks in the matrix above are moderate or high, please continue.

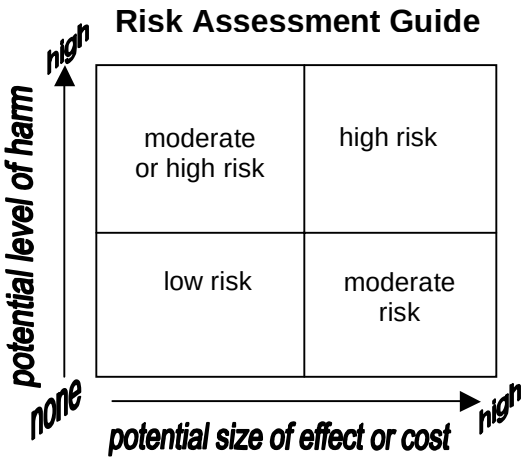
What are the short and long-term potential **benefits** of this alternative to the action? (Include financial benefits, job creation, energy, health, safety, impacts to the local economy, social and economic equity, etc)

Modest benefit in controlling mosquito population. Bats are high risk species for transmitting rabies. Please see attachment.

Evaluation of Alternative: (please specify) DRAGONFLIES

Impact/Risk Matrix

Potential	LEVEL OF IMPACT/RISK			
IMPACT ON	None	Low	Moderate	High
Environment (such as air quality, water quality, geology)	X			
Community (such as noise, traffic, aesthetics, public services)	X			
Population Health	X			
Land Use	X			
Wildlife		X		
Housing	X			
Energy Use	X			
Cost to Society (such as disposal of waste, labor, clean up, transportation, raw materials)	X			



If any checks in the matrix above are moderate or high, please continue.

What are the short and long-term potential **benefits** of this alternative to the action? (Include financial benefits, job creation, energy, health, safety, impacts to the local economy, social and economic equity, etc)

Modest benefit for controlling mosquitoes. Please see attachment.

IV. DETERMINE COURSE OF ACTION

1. Looking at the evaluation pages of all alternatives and considering all of the above potential costs and benefits, public input and taking into account the severity or uncertainty of the potential harm and the economic feasibility of all courses of action, **what is the best action to take?**

Continue the control practices currently utilized by DEH.

2. Report to the stakeholders using agreed upon method.

Date this was done:_____

V. MONITORING AND FOLLOW-UP

1. How will you measure success of this decision? _____
_____
_____
_____
_____

2. How will this decision or action be monitored and evaluated and by whom?
_____
_____
_____
_____
_____

3. How did the Precautionary Principle process help (or not help) you make this decision? _____
_____
_____
_____
_____
_____

PRECAUTIONARY PRINCIPLE TIMELINE

	Date Begun	Date Completed
Initial Description of Situation	8/07	11/07
Public Input Process	1/12/08	2/22/08
Assessment of Alternatives	4/24/08	4/29/08
Determine Course of Action	4/29/08	4/29/08
Monitoring and Follow-up		

Comments about this process:

This was a very time consuming process. 100 hours of staff time went into the preparation and presentation of the public work shop. The work shop was sparsely attended and there was little public input generated during a 30 day public comment period. After evaluating public input and alternatives it was determined the best course of action was to continue currently employed control practices.

Call Paul Cayler at 463-4441 for help, information or questions.

When this process is complete, please send a copy of these forms to Paul Cayler at Mendocino County Admin Office, 501 Low gap Rd, Ukiah 95482

Persistence

Environmental persistence of *B. sphaericus* varies depending on the formulation used and environmental conditions. Breakdown of *B. sphaericus* usually takes several weeks but residual levels have been shown to persist in some waters for up to nine months. Recycling of *B. sphaericus* from mosquito corpses can increase its persistence

Source: Lacey, LA, 1990. Persistence and Formulation of *Bacillus Sphaericu*s in Bacterial Control of Mosquitoes and Black Flies: Biochemistry, Genetics and Applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus,* pp 284-294. Editors: Barjac and Sutherland. New Brunswick: Rutgers University Press.

Lethal dose comparison

sphaericus

Oral LD50: > 5,000 mg/kg for Technical Powder. (rat)
Dermal LD50: > 2,000 mg/kg for Technical Powder. (rabbit)

Inhalation LC50: N/D. No lethality in rats after a 4-hour exposure at the maximum obtainable inhalation exposure chamber concentration (0.09 mg/l) to VectoLex® Technical Powder.

thuringiensis

Oral LD50: > 5,000 mg/kg for Technical Powder. (rat)
Dermal LD50: > 5,000 mg/kg for Technical Powder. (rabbit)

Inhalation LC50: N/D. No lethality was observed in rats after a 4-hour exposure at the highest obtainable inhalation exposure chamber concentration (2.84 mg/l) to VectoBac® Technical Powder.

Summation: Both oral LD50's are 5 times the body weight, but for dermal contact, Bs is 2 times the body weight where as Bt is still 5 times the body weight, meaning Bs is slightly more toxic in dermal applications than Bt

Dragonflies

Immature dragonflies, called naiads, are completely different in appearance from the adult form. They are long insects with a large head, compound eyes and six spindly legs. Naiad mouth parts are designed to be able to thrust forward and seize prey. Fully extended they total about 1/3rd of the insects body length. Species vary in length from 1/4" to 3 inches and range in color from gray to green to brown. Dragonfly naiads feed on almost any kind of aquatic animal. Some species stalk their prey while others wait for their next meal to come by.

Source: Sutter/Yuba MVCD http://www.sutter-yubamvcd.org/Aquatic_Predators.asp

Mosquitoes have natural predators laying in wait to feast on them from larval stage through adulthood. These predators alone, however, are neither prevalent enough or physically able to do the job necessary to control the populations we see, for they are not preying exclusively on mosquitoes.
Adult mosquitoes have predators as well. Frogs, dragonflies, birds and bats are known to eat mosquitoes. Research shows, however, that although mosquitoes do make up part of these creatures' diet, the number or mosquitoes they eat over the course of a night are not significant enough to make a substantial difference in mosquito populations.

Source: Cass County MVCD http://www.casscountynd.gov/departments/vector/Larviciding.htm North Dakota

It was found that during a 24-hour study period, a nymph of *B. pratense* would consume (mean value of three observations) 66 fourth-instar *Anopheles subpictus* larvae released in a water bowl containing 3 liters of pond water.

Source: Journal of Environmental Health. 2007 Apr; 69(8):44-8.Eco-friendly control of mosquito larvae by Brachytron pratense nymph.

Summation: Dragonflies, and dragonfly nymphs do eat mosquitoes, but it is not their sole diet. While they may provide some control over both larval and adult mosquitoes in their native ecosystems, in order for them to be an effective mosquito control measure, they would need to be stocked in local wet areas in high quantities where they could significantly reduce the mosquito population. As with any wildlife, there is no guarantee they will consume mosquitoes, and there is no guarantee that they will survive in numbers great enough to provide effective vector control.

Bats

During the 1920's several bat towers were constructed near San Antonio, Texas, in order to help control malarial mosquitoes. Mosquito populations were not affected and the project was discontinued.

Bats in temperate areas of the world are almost exclusively insectivorous. Food items identified in their diet are primarily beetles, wasps, and moths. Mosquitoes have comprised less than 1% of gut contents of wild caught bats in all studies to date.

Bats tend to be opportunistic feeders. They do not appear to specialize on particular types of insects, but will feed on whatever food source presents itself. Large, concentrated populations of mosquitoes could provide adequate nutrition in the absence of alternative food. However, a moth provides much more nutritional value per capture than a mosquito.
M.D. Tuttle, a world authority on bats, is often quoted for his anecdotal report that bats effectively controlled mosquito populations at a popular resort in New York State. While there is no doubt that bats have probably played a visible, if not prominent, role in reducing the mosquito problems in many areas, the natural abatement of mosquito populations is an extremely complex process to study, comprising poorly known ecological relationships. Tuttle attempts to

underscore the bats role by citing an experiment in which bats released into a laboratory room filled with mosquitoes caught up to 10 mosquitoes per minute. He extrapolated this value to 600 mosquitoes per hour. Thus, a colony of 500 bats could consume over a quarter of a million mosquitoes per hour. Impressive numbers indeed, but singularly unrealistic when based upon a study where bats were confined in a room with mosquitoes as their only food source.

Source: American Mosquito Control Association http://www.mosquito.org/mosquito-information/faq.aspx

Summation: There is no question that bats eat mosquitoes, but to utilize them as the sole measure of control would be ineffective, given the low percentage that mosquitoes make up of their diet. Bats also come with some risk due to their ability to carry other diseases.