

**Mosquito Control Chemical Guide  
2003 West Nile Virus Response Plan**



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**Introduction**

Because of concern in Oregon about possible West NileVirus (WNV) activity in 2003, it is likely that some communities will begin or increase mosquito control programs this year. Consequently, Oregon Department of Human Services recommend that local governments that conduct mosquito control programs should emphasize the methods that are most effective at controlling the anticipated primary mosquito vectors (carriers) of WNV.

Please be aware that all pesticide applicators for mosquito control should be licensed by the Oregon Department of Agriculture (ODA). The only exceptions are if one applies pesticide(s) to one's own residential property.

## Control of the West Nile Virus Mosquito Vector

**Control of *Culex spp.* larvae is a priority:** Although WNV has been detected in several species of mosquitoes, about 70% of the positive samples have been from *Culex pipiens* (the house mosquito) and related species of *Culex*. The house mosquito breeds most prolifically in stagnant water that has a heavy organic content. In urban areas, catch basins, artificial water-filled containers like used tires and poorly-draining ditches are common production sites for *Culex spp.* mosquitoes. Additionally, **most of the house mosquitoes present in a community were produced locally**, because the house mosquito does not fly more than about 1 to 2 miles from its production site. In contrast, the inland floodwater mosquito, *Aedes vexans* can fly 20 or more miles from where it hatches, particularly along prevailing winds. Although floodwater mosquitoes can be a nuisance to the public when they are abundant, they are currently believed to be minor carriers of WNV.

The most effective method of mosquito control is "larviciding," or the treatment of locations where mosquito larvae are present, such as the water impounded in the bottom of "catch basins" (storm drains). Catch basins may be found along streets, in parking lots and sometimes in backyards. Because catch basins are a major source of the house mosquito in urban areas, the Department recommends that catch basins be treated at least three times during the summer to control *Culex spp.* mosquitoes. Ideally, communities should treat catch basins and other locations that produce *Culex spp.* mosquitoes as often as determined by necessary inspection and according to insecticide label directions. However, **a minimum response** by a municipality would be to treat catch basins and other *Culex* production sites three times during the summer (June, July and August). Please see Table 1 for a list of mosquito larvicides. This would reduce numbers of **vector** mosquitoes during late summer, the period that seems to be of greatest risk to humans. We recommend that local officials review the references about mosquito control found in Table 2, particularly the CDC /USEPA Joint Statement on Mosquito Control and Integrated Methods of Mosquito Control.

**Spraying for Adult Mosquitoes:** Adult mosquito control (also called "fogging," "spraying" or "adulticiding") is the method of mosquito control that is most familiar to the public. However, the aerosol fog kills only mosquitoes that contact insecticide droplets; the fog soon dissipates. Although the local mosquito population is reduced for a few days, fogging does not prevent mosquitoes from re-entering the area. Because only a part of the local adult mosquito population is reduced only for a few days by fogging, municipalities should give priority to larval mosquito control of *Culex spp.* mosquitoes. Nonetheless, when the risk of human disease is present, the only method that will reduce the population of **WNV-infected** mosquitoes throughout a community is adulticiding. This may be the best option available to those communities lacking an organized mosquito control program. However, every effort should be made to inform the public when treatment for adult mosquitoes is planned. An informed public will better understand the measures being taken and will be able to take precautions to limit their exposure to pesticides.

**Non-chemical Mosquito Control:** Mosquito larvae or "wrigglers" must live in still water for five or more days to complete their growth before changing into adult biting mosquitoes capable of transmitting disease. Often, the number of mosquitoes in an area can be reduced by removing sources of standing water around residences. For example, hundreds of mosquitoes can come from a single discarded tire. Local agencies should inform the public how to prevent mosquito production around residences and prevent mosquito bites:

1. Get rid of old tires, tin cans, buckets, drums, bottles or any water-holding containers.
2. Keep drains, ditches, and culverts free of weeds and trash so water will drain properly.
3. Keep roof gutters free of leaves and other debris.
4. Empty plastic wading pools at least once a week and store indoors when not in use.
5. Unused swimming pools should be drained and kept dry during the mosquito season.
6. Change the water in birdbaths and plant pots or drip trays at least once each week.
7. Store boats covered or upside down, or remove rainwater weekly.
8. Make sure ornamental ponds are well maintained, and are stocked with fish.
9. Repair window screens.
10. When outdoors in the evening or when mosquitoes are biting, use personal protection measures to prevent mosquito bites (proper use of insect repellent and appropriate clothing).

In summary, local agencies that conduct mosquito control should give highest priority to eliminating breeding sites and larviciding. Elimination and treatment of *Culex spp.* mosquito production sites will help municipalities protect Oregon citizens from mosquito-borne West Nile virus.

**Mosquito larvicides for use in West Nile virus Response.**

Always read and follow all current pesticide label instructions. If any information in these recommendations disagrees with the pesticide label, the label instructions must be followed. Use of a product name does not constitute product endorsement. All pesticides must be registered with USEPA and the ODA.

Common Mosquito Larvacides registered for use in Oregon.

These materials offer residual control.

***Active Ingredient Bacillus sphaericus***

Vectolex CG  
Vectolex WSP  
Vectolex WDG

***Active Ingredient Methoprene***

Altosid Pellets  
Altosid Briquets  
Altosid XR Briquets  
Altosid XRG  
Altosid ALL

These materials offer no residual control.

***Active Ingredient Bacillus thuringiensis var. israelensis***

Vectobac G  
Vectobac CG  
Vectobac 12AS  
Aquabac G  
Aquabac CG

**Mosquito Adulticides for use in West Nile Virus Response.**

Applications of pesticides for the control of adult mosquitoes should only be made by personnel properly trained and holding an Oregon State Department of Agriculture Public Health Pesticide Applicator license. Fogging for adult mosquitoes should ONLY be conducted at the proper time when mosquitoes are most active, usually evening or early morning, and under appropriate environmental conditions (such as temperatures from 60 to 85 degrees Fahrenheit and low wind speeds). For ultra-low volume (ULV) spraying units to control mosquitoes, they MUST be serviced so they produce a proper droplet size spectrum. Please consult the pesticide label and manufacturer's recommendations for further information

## Common Mosquito Adulticides registered for use in Oregon.

### Tier 1

#### *Active Ingredient Pyrethrin*

Pyrenone 100

Pyrenone 25-5

Pyrenone 50

Pyrenone Crop Spray

Pyroicide Mosquito Adulticiding Conc.

These materials offer no crop restrictions or setbacks to water.

Pesticide products containing pyrethrins usually contain a synergist such as piperonyl butoxide (PBO). PBO's work by restricting an enzyme that insects use to detoxify the pyrethrins. A synergist allows the insecticide to be more effective.

Pyrethrins have a soil half life of 12 days. They have an extremely low pesticide movement rating because they bind tightly to soil. Pyrethrins are unstable in light or air, and are rapidly degraded in sunlight at the soil surface, and in water. Pyrethrins are highly toxic to fish, tadpoles, honeybees and many aquatic invertebrates.

### Tier 2

#### *Active Ingredients Permethrin, Resmethrin and Sumithrin*

Anvil 10+10 ULV

Anvil 2+2 ULV

Aqua Reslin

Permanone 10% E.C.

Permanone 31-66

Permanone Ready to use Insecticide

Scourge 18% + 54%

Scourge 4% + 12%

Permethrin, Resmethrin and Sumithrin have setback restrictions to water, and do contain restrictions on applications to some crops. These materials also contain PBO's. The typical half life of these materials in soil is 30 days. These materials have an extremely low potential to move in soil. They are unlikely to contaminate groundwater because they bind tightly to soil particles. In water, and on soil surfaces these materials are degraded by sunlight. These products are highly toxic to fish, bees and many aquatic invertebrates.

### **Tier 3**

#### ***Active Ingredient Malathion***

Fyfanon ULV (Malathion 96.5%)

Malathion ULV

Atrapa 96.5

Malathion does have setbacks restrictions to water, but does not contain any crop restrictions. Based on its physical-chemical properties, malathion shows little persistence in soil and water. This product is highly toxic to fish, bees and many aquatic invertebrates.

#### ***Active Ingredient Dibrom***

Trumpet EC

Dibrom Concentrate

This product can be applied by conventional ground based ULV applications, however it is best suited as an aerial applied adulticide. This product does not have setback restrictions to water, is labeled on over 25 crops and has a .5 ppm tolerance as established by the EPA for all crops. Naled shows little persistence in soil or water. This product is highly toxic to fish, bees and many aquatic invertebrates.

**Table 1**

	<b>Aqua Reslin</b>	<b>Permanone</b>	<b>Scourge</b>	<b>Anvil</b>	<b>Pyrenone</b>	<b>Mosquito Mist</b>
<b>Active Ingredient</b>	Permethrin	Permethrin	Resmethrin	Sumithrin	Pyrethrin	Chlopyrifios
<b>Class of Insecticide</b>	Pyrethroid	Pyrethroid	Pyrethroid	Pyrethroid	Pyrethrin	Organophospate
<b>AI%</b>	20		18	10	5	19.36
<b>PBO %</b>	20	66	54	10	25	
<b>Max Label Rate</b>	0.0071lb of ai/acre	0.0071lb of ai/acre	0.0071lb of ai/acre	.0036lb of ai/acre	0.0025lb of ai/acre	0.01lb of ai/acre
<b>Set Back</b>	100 feet	100 feet	no	no	no	no
<b>Corp Tolerance</b>	no	no	no	no	yes	no
<b>Photodegradation</b>	Stable	Stable	less than 4 hours	48 hours	Rapid	
<b>Photolysis</b>	Stable	Stable	37 minutes	200 days	Rapid	
<b>Fish Toxicity</b>	Rainbow trout LC50 (96h) = 2.5 ug/l		Rainbow trout LC50 (96h) = 2.4 ug/l	Rainbow trout LC50 (96h) = .0167 mg/l	Rainbow trout LC50 (96h) = 54 ug/l	
<b>Specific Gravity</b>	1.015	1.11	0.99	0.884	0.884	
<b>Oral LD50</b>	1000 mg/kg rat	1250 mg/kg rat	2700 mg/kg rat	>5000 mg/kg rat	>5000 mg/kg	
<b>Dermal LD50</b>	>5000 mg/kg rabbit	2,020 mg/kg rabbit	>2000 mg/kg rabbit	>5000 mg/kg rabbit	>5000 mg/kg	
<b>Inhalatin LC50 - 4hr</b>	>2.87 mg/L rat	4.39 mg/L	>2.64 mg/L rat	1.21 mg/L - 4hr. Rat	>4.93 mg/L	

**Table 2****DIBROM****TRUMPET**

<b>Active Ingredient</b>	<b>Naled</b>	<b>Naled</b>	<b>Fyfanon</b>	<b>Atrapa</b>	<b>Baytex - FL only</b>
<b>Class of Insecticide</b>	Organophosphate	Organophosphate	Malathion	Malathion	Fenthion
<b>AI%</b>	87.4	78	Organophosphate	Organophosphate	Organophosphate
<b>PBO %</b>	0.0	0.0	96.5	96.5	95
<b>Max Label Rate</b>	0.10 lb of ai/acre	0.10 lb of ai/acre			
<b>Set Back</b>	no	no	.05lb of ai/acre	.05lb of ai/acre	0.1lb of ai/acre
<b>Crop Tolerance</b>	yes	yes	no	no	
<b>Photodegradation</b>	<24 hours	<24 hours	yes	yes	no
<b>Photolysis</b>	<24 hours	<24 hours			
<b>Fish Toxicity</b>	Rainbow trout LC50 (96h) = .195 mg/l	Rainbow trout LC50 (96h) = .195 mg/l			
<b>Specific Gravity</b>	1.79	1.67			
<b>Oral LD50</b>	50-100mg/kg rat	50-100mg/kg rat	1.23		1.24
<b>Dermal LD50</b>	2-5000 mg/kg rabbit	2-5000 mg/kg rabbit	5500 mg/kg rat	1950 mg/kg rat	405 mg/kg rat
<b>Inhalatin LC50 - 4hr</b>	1.2 mg/L - 4hr. Rat 87.4	1.2 mg/L - 4hr. Rat 78	8790 mg/kg rabbit >5.2 mg/L rat	>2000 mg/kg rat >2.05 mg/L rat	586 mg/kg rabbit .454 mg/L rat



**Table 3 Mosquito Control References**

<b>Agency</b>	<b>Title</b>	<b>Web Site Address</b>
ODHS	West Nile Virus Web Site	<a href="http://www.dhs.state.or.us/publichealth/acd/wnile/index.cfm"><u>http://www.dhs.state.or.us/publichealth/acd/wnile/index.cfm</u></a>
CDC	DEET Insect Repellents	<a href="http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm"><u>http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm</u></a>
CDC and USEPA	CDC / US EPA Joint Statement on Mosquito Control	<a href="http://www.epa.gov/pesticides/citizens/mosquitojoint.htm"><u>http://www.epa.gov/pesticides/citizens/mosquitojoint.htm</u></a>
	Pesticides and Public Health: Integrated Methods of Mosquito Management	<a href="http://www.cdc.gov/ncidod/eid/vol7no1/rose.htm"><u>http://www.cdc.gov/ncidod/eid/vol7no1/rose.htm</u></a>
USEPA	Pesticides and Mosquito Control	<a href="http://www.epa.gov/pesticides/citizens/pmcfps.pdf"><u>http://www.epa.gov/pesticides/citizens/pmcfps.pdf</u></a> <a href="http://www.epa.gov/pesticides/factsheets/skeeters.htm"><u>http://www.epa.gov/pesticides/factsheets/skeeters.htm</u></a>
	Using Insect Repellents Safely	<a href="http://www.epa.gov/pesticides/citizens/insectrp.htm"><u>http://www.epa.gov/pesticides/citizens/insectrp.htm</u></a>
	Larvicides for Mosquito Control	<a href="http://www.epa.gov/pesticides/citizens/larvfs.pdf"><u>http://www.epa.gov/pesticides/citizens/larvfs.pdf</u></a> <a href="http://www.epa.gov/pesticides/citizens/larvicides4mosquitos.htm"><u>http://www.epa.gov/pesticides/citizens/larvicides4mosquitos.htm</u></a>
	Synthetic Pyrethroids for Mosquito Control	<a href="http://www.epa.gov/pesticides/citizens/synpyfs.pdf"><u>http://www.epa.gov/pesticides/citizens/synpyfs.pdf</u></a> <a href="http://www.epa.gov/pesticides/citizens/pyrethroids4mosquitos.htm"><u>http://www.epa.gov/pesticides/citizens/pyrethroids4mosquitos.htm</u></a>