

HUMANS

MOSQUITO CONTROL COMMERCIAL AND GOVERNMENT AGENCIES

E.W. Gray and Ray Noblet, Entomologists

ALERT — As of October 31, 2011 mosquito control operators will be required to conform to the Clean Water Act (CWA) and abide by Georgia's National Pollutant Discharge Elimination System (NPDES) permit. The state NPDES will be managed through the Georgia Environmental Protection Division (404) 657-5947. A Notice of Intent (NOI) will be required to be submitted to the EPD within 30-days of making a pesticide application that contacts "waters of the state". The Georgia Mosquito Control Association website (gamosquito.org) has comprehensive information about these new regulations. The University of Georgia Cooperative Extension service can be reached at (706) 542-1184 for additional information related to this matter.

Table 1. Label Recommendations of Insecticides for Use as Ultra Low Volume and Low Volume Sprays in Ground Applications for the Control of Adult Mosquitoes

INSECTICIDE	TRADE NAME	APPLICATION		REMARKS AND PRECAUTIONS
		FLOW RATE FL. OZ./MIN.	SPEED MPH	
chlorpyrifos	Mosquitomist One ULV	3.88 - 7.75	10	Non-corrosive, quick knockdown, low odor and low mammalian toxicity. 100' water set back. Breaks down quickly.
	Mosquitomist 1.5 ULV	1.4 - 10.5	5-20	
	Mosquitomist Two ULV	1.0 - 8.6	5-20	
chlorpyrifos + permethrin	ULV Mosquito Master 412	4.5 - 18.0	10	A choice where insecticide resistance is a serious concern.
etofenprox	Zenivex	1.8 - 26.4	10-20	New product that may be helpful if resistance is a concern.
malathion	Atrapa VCP	1.0 - 8.5	5-20	Long time standard and still effective and cost efficient. Odor present, excites mosquitoes prior to mortality.
	Fyfanon ULV	1.0 - 8.6	5-20	
naled	Dibrom Concentrate	0.6 - 1.8	5-15	Best choice for salt-marsh mosquitoes, very safe environmentally, no water set back, however highly corrosive to all equipment.
	Trumpet EC	0.75 - 2.2	5-15	
resmethrin	Scourge 1.5% + 4.5%	6.75 - 54.0	5-10	No water set back, better if used in aerial applications. Registration canceled after 2012; can use available stocks.
	Scourge 4.0% + 12%	2.25 - 18.0		
	Scourge 18% + 54%	1.5 - 18.0		
permethrin/pbo	Aqualuer 20-20	1.55 - 6.2	10-20	
	Aqua-Kontrol Concentrate	0.4 - 6.2	5-20	Water based, can be used as residential product too.
	Aqua-Reslin	0.7 - 35.4	10-20	Excellent choice for ground applications. Variety of rate applications.
	Biomist 1.5 - 7.5	6.0 - 54.0	5-15	Widely used and highly effective. Maintain dose in the 0.0035 lbs/acre range. Some resistance along gulf coast. 100' water set back.
	Biomist 2 + 2	4.6 - 36.0	5-20	
	Biomist 3 + 15	1.5 - 27.0	5-15	
	Biomist 4 + 4	4.5 - 18.0	5-15	
	Biomist 4 + 12	2.25 - 27.0	5-15	
	Biomist 30 + 30	1.0 - 6.0	5-15	
	Biomist 31 + 66	1.0 - 6.0	5-15	
	Envion	0.46 - 25.8	10-20	Can be diluted with water or oil.
	Evolver 2-2 ULV	9.5 - 151.0		Depending on dilution rate and speed.
	Evolver 4-4 ULV	4.7 - 75.2		Depending on dilution rate and speed.
	Evolver 30-30 ULV	1.08 - 2.19	10	
	Kontrol 2-2	4.7 - 18.9	5-20	
	Kontrol 4-4	4.0 - 16.0	5-20	
	Kontrol 30-30	0.53 - 2.2	5-20	
	Permanone - Ready-to-use	6.0 - 18.0	5-15	
	Permanone 30-3	0.5 - 2.0	5-20	
	Permanone 31-66	0.5 - 15.0	5-20	
	Perm-X UL 2-2	4.7 - 18.8	5-20	
	Perm-X UL 4-4			Rate varies according to dilution. Don't exceed 0.007 lbs/ai/a
	Perm-X 30-30		5-20	Rate varies according to dilution.
PermX 31-66		5-20		

Table 1 continued on next page.

MOSQUITO CONTROL COMMERCIAL AND GOVERNMENT AGENCIES (continued)

INSECTICIDE	TRADE NAME	APPLICATION		REMARKS AND PRECAUTIONS
		FLOW RATE FL. OZ./MIN.	SPEED MPH	
pyrethrin/pbo	Pyrenone 100	12.0 - 30.0	Variable	Rate not to exceed 0.0025 lbs of pyrethrins/acre. No water set back, many indoor uses.
	Aquahalt	1.7 - 4.6	5-20	Water based, labeled for use over crops, quick breakdown in the environment.
	Pyrethrins ULV 15 VS	15.0	5	
	Pyrethrins ULV 525 VS	5.0	5	
sumithrin/pbo	AquaAnvil	1.3 - 3.8	5-20	Water based, breaks down quickly in the environment.
	Anvil 2 + 2 ULV	3.1 - 37.2	5-20	No water set back, good for truck applications.
	10 + 10 ULV	0.6 - 7.6	5-20	
pralletron and sumithrin	Duet	2.5 - 7.5	5-20	Combines two active ingredients, cause benign agitation, may have uses against Asian Tiger Mosquito.

Table 2. Label recommendations of Insecticides for Use as Thermal Aerosols in Ground Applications for the Control of Adult Mosquitoes.

INSECTICIDE	TRADE NAME	APPLICATION		REMARKS AND PRECAUTIONS
		FLOW RATE FL. OZ./MIN.	SPEED MPH	
chlorpyrifos	Mosquitomist One ULV	9.6	5	Non-corrosive, quick knockdown, low odor and low mammalian toxicity. 100' water set back. Breaks down quickly.
	Mosquitomist 1.5 ULV	14	5	
etofenprox	Zenivex	1.8 - 26.4	10-20	Apply at the rate of 0.00175 – 0.0070 lbs. ai/a.
malathion	Atrapa VCP	1.6 - 2.1	5	Long time standard and still effective and cost efficient. Odor present, excites mosquitoes prior to mortality.
	Fyfanon ULV	1.6 - 2.1	5	
naled	Dibrom Concentrate	1.6 - 2.1	5-15	Best choice for salt-marsh mosquitoes, very safe environmentally, no water set back, however highly corrosive to all equipment.
permethrin/pbo	Aqualuer 20-20			Rate not to exceed 0.007 lbs/acre.
	Envion	2.2 - 25.8	10-20	Do not exceed 0.007 lbs ai/a.
	Evolver 2-2 ULV		5-20	Apply in 0.0035 - 0.007 lbs ai/a range.
	Evolver 4-4 ULV		5-20	Apply in 0.0035 - 0.007 lbs ai/a range.
	Evolver 30-30 ULV			Rates vary according to dilution, do not exceed 0.007 lbs/acre.
	Kontrol 2-2	10.5 - 32.0	5-20	Widely used and highly effective. Maintain dose in the 0.0035 lbs/acre range. Some resistance along gulf coast. 100' water set-back.
	Kontrol 4-4	21.0 - 64.0	5-20	
	Kontrol 30-30	21.0 - 64.0	5-20	
	Permanone 30-30	.41 - 3.0	5-20	Flow rate depends on concentration. Rate not to exceed 0.007 lbs permethrin/acre.
	Perm-X UL 2-2		5-20	Do not wet foliage.
	Perm-X UL 4-4		5-20	Do not exceed 0.007 lbs ai/a.
	Perm-X UL 30-30		5-20	Do not exceed 0.0185 lbs ai/a.
pyrethrin/pbo	Pyrenone 100	12.0 - 30.0	Variable	Rate not to exceed 0.0025 lbs of pyrethrins/acre. No water set back, many indoor uses.
	Pyronyl Oil Conc. #525			
sumithrin/ phenothrin/pbo	Anvil 2+2 ULV	3.1 - 37.2	5-20	No water set back, good for truck applications.
	Anvil 10+10 ULV	0.6 - 7.6	5-20	

MOSQUITO CONTROL COMMERCIAL AND GOVERNMENT AGENCIES (continued)

Table 3. Label Recommendations of Insecticides for Use in Aerial Applications for Control of Adult Mosquitoes.

INSECTICIDE	TRADE NAME	GROSS AMOUNT PER ACRE (OZ.)	REMARKS AND PRECAUTIONS
chlorpyrifos	Mosquitomist One ULV	3	Non-corrosive, quick knockdown, low odor and low mammalian toxicity. 100' water set back. Breaks down quickly.
	Mosquitomist 1.5 ULV	0.87	
	Mosquitomist Two ULV	0.71	
etofenprox	Zenivex		Apply diluted or undiluted at rates up to 0.007 lbs. ai/a. Minimum application height 100 ft.
malathion	Atrapa VCP	2.6 - 3.0	Long time standard and still effective and cost efficient. Odor present, excites mosquitoes prior to mortality.
	Fyanon ULV	2.6 - 3.0	
naled	Dibrom Concentrate	0.5 - 1.0	Best choice for salt-marsh mosquitoes, very safe environmentally, no water set back, however, highly corrosive to all equipment.
	Trumpet EC	0.6-1.2	
permethrin/pbo	AquaHalt	0.28 - 0.76	Water based, labeled for use over crops.
	Aqualuer 20-20		Apply diluted or undiluted at rates up to 0.007 lbs. ai/acre.
	Aqua-Reslin	0.25 - 0.5	Widely used and highly effective. Maintain dose in the 0.0035 lbs/acre range. Some resistance along gulf coast. 100' water set-back.
	Aqua-Kontrol Concentrate	0.02 - 0.04	
	Biomist 1.5 + 7.5 ULV	9	
	Biomist 4.0 + 4.0 ULV	3	
	Biomist 12 + 60 ULV	1.0 - 3.0	
	Biomist 30 + 30 ULV	0.33 - 1.0	
	Biomist 31 + 66 ULV	0.33 - 1.0	
	Envion		Apply diluted or undiluted at rates up to 0.007 lbs Parmethrin/PBO per acre
	Evolver 2-2 ULV	6.27	Do not exceed 6.27 fl. oz./acre.
	Evolver 4-4 ULV	3.1	Do not exceed 3.10 fl. oz./acre.
	Evolver 30-30 ULV	0.05 - 0.36	
	Kontrol 2 + 2	up to 1.5	
	Kontrol 4 + 4	up to 3.0	
	Kontrol 30 + 30	up to 0.35	
	Permanone 31 - 66	0.16 - 0.6	
	Perm-X UL 2-2		Recommended application height 120-175 ft. with rotary nozzles.
	Perm-X UL 4-4	3.1819	Minimum application height 100 ft.
	Perm-X UL 30-30	0.3646	Minimum application height 100 ft.
Perm-X UL 31-36	0.8448		
resmethrin/pbo	Scourge 4 + 12 MF	0.75 - 3.0	No water set back, better if used in aerial applications.
	Scourge 18 + 15 MF	1.5 - 3.0	
sumithrin/pbo	Anvil 2 + 2 ULV	1.0 - 3.0	No water set back.
	Anvil 10+ 10 ULV	0.21 - 0.62	
	AquaAnvil	0.21 - 0.62	Water based, breaks down quickly in the environment.
prallethrin and sumithrin	Duet	0.41 - 1.24	Combines two active ingredients, cause benign agitation, option for Asian Tiger Mosquito.

MOSQUITO CONTROL COMMERCIAL AND GOVERNMENT AGENCIES (continued)

Table 4. Label Recommendations of Insecticides for Use in Ground Applications for Larval Mosquito Control.

INSECTICIDE	TRADE NAME	GROSS AMOUNT PER ACRE	REMARKS AND PRECAUTIONS	
alcohol - surface film material	Agnique MMF	0.2 - 1.0 gal./acre	Approved for potable water applications, effective against both larvae and pupae.	
	Arosurf MSF	0.2 - 0.5		
petroleum hydrocarbons	GB1111	3 gal. or less	Surface film material. Not for use in environmentally sensitive areas. Effective against both larvae and pupae, low labor input required.	
	BVA2 Mosquiro Larvicide Oil	1 - 5 gal.		
mineral oil	Bonide	1.0 - 5.0 gal.		
methoprene	A.L.L.	3.0 - 4.0 fl. oz.	Significant residual effect possible, up-front cost more, can save labor costs. Approved for use in stock waters.	
	A.L.L. Concentrate	0.75 - 1.0 fl. oz.		
	Altosid Briquets	1/100 sq. ft.		
	Altosid XR Briquets	1 Briquet/100-200 sq. ft.		
	Altosid Pellets	2.5 - 10 lbs		
	Altosid G	8 - 10 lbs		
	Altosid SBG	5 - 20 lbs	Rate depends on target species.	
	Altosid XR-G	5 - 20 lbs		
<i>Bacillus thuringiensis</i> subsp. <i>israelensis</i>	Aquabac XT 12AS	1 - 2 pts	Biological control agent, very effective, environmentally sound, store products in cool areas and use by expiration date. Timing of application critical for maximum effectiveness.	
	Aquabac 200G	2.5 - 10 lbs		
	Aquabac 400G	1.25 - 8 lbs		
	Bactimos Briquets	1 Briquet/100 sq. ft.		
	Teknar HP-D	0.25 - 1.0 pts.		
	Vectobac CG	2.5 - 10 lbs		
	Vectobac 12AS	5 - 100 gals		
	Vectobac G	2 - 20 lbs		
<i>Bacillus sphaericus</i>	Vectolex WSP	1 pouch/50 sq. ft.	Biological control agent with residual effect. Targets specific species, especially Culex. Not recommended for salt-marsh mosquitoes.	
	Vectolex CG	5 - 20 lbs		
	(Waste Tires)	20 - 80 lbs or 0.5 - 2 lbs/1000 sq. ft.		
	Vectolex WDG	0.5 - 1.5 lbs		
<i>Bacillus thuringiensis</i> subsp. <i>israelensis</i> and <i>Bacillus sphaericus</i>	Vectomax CG	5 - 20 lbs./a 20 - 80 lbs./a for tire piles	Effective against all pest species of mosquitoes, will reduce likelihood of resistance.	
	Vectomax WSP	1 pouch/50 sq. ft.		
	Vectomax G	5 - 20 lbs./a 20 - 80 lbs./a for tire piles		
spinosad	Natular G	3.5 - 9 lbs./a	New product, registered as a reduced risk pesticide by EPA.	
	Natular XRG	5 - 20		
	Natular 2EC	1.3 - 2.8 fl. oz/a		
	Natular T30	1 tablet/100 sq. ft.		30 day residual.
	Natular XRT	1 tablet/100 sq. ft.		180 day residual.
temephos	Abate 4E	0.5 - 1.5 fl. oz.	Good choice for treatment of used tire piles, treat every 30 days.	
	5% Skeeter Abate	4 - 10 lbs.		
	Abate 5% Tire Treat	1 lb/100 sq. ft.		
	Abate 1-BG	5 - 20 lbs.		
	Abate 2-BG	2.5 - 10 lbs.		
	ProVect 1G	5 - 20 lbs.		
	ProVect 2G	2.5 - 25 lbs.		Use lower rates in open areas, higher rates in areas of dense vegetation or high organic mater.
	ProVect 4E	0.5 - 1.5 fl. oz.		
	ProVect 5G	1 - 10 lbs.		
ProVect Mini-G	6.6 - 10 lbs.	Less abrasive to equipment than traditional sand formulations.		

MOSQUITO CONTROL COMMERCIAL AND GOVERNMENT AGENCIES (continued)

Table 5. Label Recommendations of Insecticides for Use in Aerial Applications for Control of Larval Mosquitoes.

INSECTICIDE	TRADE NAME	GROSS AMOUNT PER ACRE	REMARKS AND PRECAUTIONS	
alcohol-surface film agent	Arosurf MSF	0.2 - 0.5 gal.	High sheer agitation system required.	
mineral oil	Bonide - Mosquito Larvicide	2.0 - 4.0 gal.	Surface film material. Not for use in environmentally sensitive areas. Surface film product that controls larvae and pupae.	
methoprene	A.L.L.	3.0 - 4.0 fl. oz	Effective against both larvae and pupae, low labor input required.	
	A.L.L. Concentrate	0.75 - 1.0 fl. oz		
	Altosid pellets	2.5 - 10 lbs		
	Altosid XR	1/200 sq. ft.		
	Altosid B	1/100 sq. ft.		
	Altosand G	8 - 10 lbs		
	Altosid SBG	5 - 20 lbs	Rate depends on target species.	
<i>Bacillus thuringiensis</i> subsp. <i>israelelensis</i>	Aquabac XT	0.25 - 2.0 pts	Biological control agent, very effective, environmentally sound, store products in cool areas and use by expiration date. Timing of application critical for maximum effectiveness.	
	Teknar HPD	.25 - 1.0 pts		
	Vectobac 12 AS	.25 - 2.0 pts		
	Vectobac CG	2.5 - 10 lbs		
	Vectobac G	2.5 - 5 lbs		
<i>Bacillus sphaericus</i>	Vectolex CG	5 - 20 lbs	Biological control agent with residual effect. Targets specific species, especially Culex.	
	Vectolex WDG	0.5 - 1.5 lbs		
	Vectolex WSP	1 pouch/50 sq. ft.	Water soluble pouch, good choice for catch basins.	
<i>Bacillus thuringiensis</i> subsp. <i>israensis</i> and <i>Bacillus sphaericus</i>	Vectomax CG	5 - 20 lbs./a 20 - 80 lbs./a for tire piles	Effective against all pest species of mosquitoes, will reduce likelihood of resistance.	
	Vectomax G	5 - 20 lbs./a 20 - 80 lbs./a for tire piles		
spinosad	Natular G	3.5 - 9 lbs./a	New product, registered as a reduced risk pesticide by EPA.	
	Natular XRG	5 - 20		
	Natular 2EC	1.3 - 2.8 fl. oz/a		
temephos	Abate 4E	0.5 - 1.5 fl. oz.	Good choice for treatment of used tire piles, treat every 30 days.	
	5% Skeeter Abate	4 - 10 lbs		
	Abate 5% Tire Treat	1 lb/100 sq. ft.		
	Abate 1-BG	5 - 20 lbs		
	Abate 2-BG	2.5 - 10 lbs		
	ProVect 1G	5 - 20 lbs.		
	ProVect 2G	2.5 - 25 lbs.		Use lower rates in open areas, higher rates in areas of dense vegetation or high organic mater.
	ProVect 4E	0.5 - 1.5 fl. oz.		
	ProVect 5G	1 - 10 lbs.		
	ProVect Mini-G	6.6 - 10 lbs.		Less abrasive to equipment than traditional sand formulations.

MOSQUITO CONTROL COMMERCIAL AND GOVERNMENT AGENCIES (continued)

Table 6. Toxicity of Insecticides Used in Mosquito Control Compared to Some Other Common Insecticides and Chemicals.

COMMON NAME	TRADE NAME	ACUTE ORAL LD ₅₀ IN MG. TECH/KG. FOR RATS BY REFERENCE NUMBER		
		1*	2**	3***
allethrin	--- ^b	310	680-1,000	920
aspirin	---	1,900 ^a	---	---
bendiocarb	Ficam	40	40-64	40-64
bti	--- ^b	non-toxic	---	non-toxic
chlorpyrifos	Dursban	135	82-245	163/135
dichlorvos	DDVP	56	25-170	
fenitrothion	Sumithion	490	250-740	300/800
fenthion	Baytex	190	255-740	375/290
malathion	Cythion	1375	885-2800	1,375/1,000
methoprene	Altosid	34600	> 34,600	> 34,600
methoxychlor	--- ^b	6000	5,000-7,000	> 6,000
monomolecular firm	Agnique	20000	---	> 20,000
naled	Dibrom	430	250-430	430
parathion	--- ^b	3	39170	---
phenothrin	Sumithrin	10000	> 10,000	> 10,000
phenthoate	Cidial	300	200-2,000	> 2,000
piperonyl butoxide	---	---	6,150-7,500	11500
propoxur	Baygon	90	83-104	95/104
pyrethrin	--- ^b	200	200-2,600	820-1,870
resmethrin	SBP-1382	2500	1500	4240
salt	---	4,500 ^a	---	---
sugar	---	27,000 ^a	---	---
temephos	Abate	2030	1,000-13,000	8,600-1,300

* Thompson, W.T. 1985. Agricultural chemicals, Book 1 Insecticides, 1985-86 Revision. Thompson Pub., Fresno, CA 255 pp.

** Kenaga, E.E., and R.W. Morgan. 1978. Commercial and Experimental Organic Insecticides. 1978 Revision, Entomol. Soc. of Am. Pub. 78-1. 79 pp.

*** From manufacturers technical data.

^a The Bottom Line. Dow Chemical Co., Midland, MI. January 1981, 7 pp. (from: Hodge, H.C. and W.C. Downs, Toxicol. Appl. Pharmacol. 3:689-695, 1961).

^b Manufactured under several trade names.