

INSECT CONTROL IN RECREATION AREAS

Insect	Repellent	Rate	Application	Comments/Precautions
Repellents for: Mosquitoes, Biting Flies, Gnats, Chiggers and Ticks	DEET or N, N-Diethyl-meta-toluamide (many brands and formulations)	---	Hand Application: Protect skin by applying a few drops on the palm and rubbing onto exposed skin.	Wash hands after applying. Keep out of eyes and mouth. Higher concentrations provide longer protection, but complete coverage is required.
	DEET or N, N-Diethyl-meta-toluamide (many brands and formulations)	---	Aerosol Application: Hold 6-8 inches from skin or clothing and apply with a slow sweeping motion. Rub gently to spread over skin evenly. Also spray on clothing.	DEET may damage watch crystals or other plastic materials. Children should use 30% concentrations or less. Product should be applied by parents. Apply to parent's hand and then spread onto child's skin. Approved for use on children over 2 months of age.
	IR3535 (Amino acid based)			Classified as a bio-pesticide by the EPA
	oil of lemon eucalyptus	---		Not approved for children under 3 years of age. Skin reactions have been documented
	picaridin	---		Effective alternative to DEET for children over 3 years old.
	permethrin (many brands and formulations)	---	To be used on clothing only.	Also good choice when exposed to ticks and chiggers.

Insect	Insecticide	Rate	Application	Comments/Precautions
Ants	alpha cypermethrin (Fendona CS)		Apply as directed on label.	
	carbaryl (various brands)	see label		Treat mounds and surrounding area or apply broadcast.
	pyrethroids (Advanced Garden, DeltaGard, Scimitar, Talstar, Tempo)	see label		
Ants (Red Imported Fire)	Apply all bait products when ants are active and soil temperature is above 60 degrees F. DO NOT treat if rain is anticipated within 6 hours.			
	abamectin B1 0.011% (Award II)	5-7 Tbsp/mound 1 lb/acre	Mound-to-mound treatment rate Broadcast rate	
	acephate 75% (Orthene T, T&O WSP)	0.33 lb in 26.6 gal water	Mound drench only	Apply 1 gal of mix to each mound area by sprinkling the mound until wet and treat 4-foot diameter circle around mound. DO NOT treat mound more than once per season.
	acetamiprid + bifenthrin 22.73% + 27.27% (Transport)		Apply 0.11% concentration of active ingredient to cover 1,000 sq ft.	DO NOT apply more than 0.11% finished dilution per 1,000 square feet.
	alpha cypermethrin (Fendona CS)		Apply as directed on label	
	fipronil 0.0143% granular insecticide (Quali-Pro Fipronil, Top Choice)	2 lb/1,000 sq ft or 87 lb/acre	Broadcast only	For use on home lawns, golf courses, commercial and recreational turf, and sod farms. One application per year. Restricted Use Pesticide.
	hydramethylnon (Amdro, Amdro Pro, Combat Fire Ant Bait, Maxforce)	2-5 Tbsp/mound 1.0-1.5 lb/acre	Mound-to-mound treatment rate Broadcast rate	
	indoxacarb 0.045% (Advion)	4 Tbsp/mound 1.5 lb/acre	Distribute uniformly around mound. Broadcast rate	
	metaflumizone 0.063% (Siesta Fire Ant Bait)	1.0-1.5 lb/acre 2-4 Tbsp/mound	Broadcast rate Mound-to-mound treatment rate	DO NOT exceed 6.0 lb/acre total or 4 applications in a one-year period.

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Ants (Red Imported Fire) (cont.)	Apply all bait products when ants are active and soil temperature is above 60 degrees F. DO NOT treat if rain is anticipated within 6 hours.				
	pyrethroids (various brands) bifenthrin (Talstar) cyfluthrin (Tempo) deltamethrin (DeltaGard) lambda-cyhalothrin (Scimitar CS, GC) permethrin (various brands)	see label			
	pyriproxyfen (Distance, Esteem)	1-4 Tbsp/mound 1.0-1.5 lb/acre	Mound-to-mound treatment rate Broadcast rate	This is an insect growth regulator (IGR).	
	S-methoprene (Extinguish)	3-5 Tbsp/mound 1.0-1.5 lb/acre	Mound-to-mound treatment rate Broadcast rate	This is an IGR.	
	S-methoprene + hydramethylnon (Extinguish Plus)	3-5 Tbsp/mound 1.0-1.5 lb/acre	Mound-to-mound treatment rate Broadcast rate	This is an IGR plus a toxicant.	
spinosad 0.015% (Conserve Fire Ant Bait/OMRI Listed, Ferti-lome Come and Get It Fire Ant Killer)	4-6 Tbsp/mound 2.5-5.0 lb/acre	Mound-to-mound treatment rate Broadcast rate			
Eye Gnats	prallethrin 0.04% and cyfluthrin 0.03% (OFF! Outdoor Fogger Backyard Pretreat)	--	see label	Air movement from electric fans will give protection in a limited area. Commercial repellents are not very satisfactory. However, devices like the Thermocell Mosquito Repellent or the Off Power Pad Lamp may provide localized relief.	
	tetramethrin 0.15%, deltamethrin 0.15%, piperonyl butoxide 0.75% (Bonide Mosquito Beater Yard Fog)	--	see label	Not suitable control for indoor use.	
	tetramethrin 0.2% and phenothrin 0.2% (Cutter Backyard Bug Control Outdoor Fogger)	--	see label	Fogging and space sprays give temporary relief to limited areas (patio, porch, etc.). Mosquito adulticides will provide temporary relief.	
Midge	temephos (5% Skeeter Abate)		2-10 lb/acre	For control of mosquito and midge larvae, apply uniformly by conventional air or ground equipment. Application of this product by Belly-Grinder is prohibited.	
	methoprene 20% EC (Strike)	4-5 oz/1 million gal wastewater	---	For use in wastewater treatment facilities. Uniformly apply at the influent side over a 24-hour period. Apply to natural and manmade aquatic habitats. High rate recommended for wastewater.	
	4.25% pellet (Strike)	---	5-10 lb/acre		
	spinosad 2.5% G (Natular XRG)	ready to use	5-20 lb		

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Ticks and Chiggers	acetamiprid + bifenthrin 22.73% + 27.27% (Transport)		Apply 0.11% concentration of active ingredient to cover 1,000 sq ft.	DO NOT apply more than 0.11% finished dilution per 1,000 square feet. Apply outdoors as an exterior perimeter treatment around structures.
	alpha cyermethrin (Fendona CS)		Apply as directed on label	
	beta-cyfluthrin (Tempo) SC Ultra 11.8% Ultra WP	6-12 fl oz/acre 7.7-15.4 oz/acre		Use high rate for chiggers. Apply when pests first appear. Reapply as needed based on pest reinfestation. DO NOT treat more than 6 times per year. Keep children and pets off treated areas until lawn has dried.
	bifenthrin (Talstar) EZ Granular Insecticide 0.2%	100-200 lb/acre	Ready to use	DO NOT make spot applications. Treat the entire area where exposure to ticks may occur. DO NOT allow public use of treated areas during application.
	P Professional Insecticide 7.9%	0.5-1.0 fl oz/ 1,000 sq ft	Broadcast treatment rate	DO NOT make spot applications. Treat the entire area where exposure to ticks may occur. Use application volumes of up to 10 gal/1,000 sq ft to get uniform coverage when treating dense grass foliage. Limit repeat application to no more than once every 7 days.
	carbaryl (Sevin) 80 WSP SL	2.5 to 5 lb/acre 2 to 4 qts/A		Repeat applications as necessary up to a total of 4 times per year but not more often than once every 7 days.
	deltamethrin (Suspend 0.42 SC)	17.5-26.0 fl oz/acre		Apply when pests become evident. Apply as a broadcast spray in a minimum of 2 gal of water/1,000 sq ft.
	imidacloprid-cyfluthrin (Temprid)	0.075% - 0.15% fl oz/ gal water		Apply at rate not to cause drip/run-off from site.
	rosemary oil, Geraniol, Winter-green (Essentria IC3)	1 to 8 ounces of Essentria IC3 per gallon of water	43 gal/Acre	2 gallons per 1,000 square feet.
	tetrachlorvinphos (Rabon 50% WP)	0.5 lb/6 gal water		Apply as a spot treatment using a low pressure handwand sprayer only. Apply along woody borders of kennels, yards, campgrounds, recreational parks, footpaths, and roadways leading to such areas.

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Insect	Insecticide	Mixing Instructions and Application Equipment	Application Rate @ 10 mph	Droplet Size Requirements on Label (µm)	Comments/Precautions
Mosquitoes, Adults (Ground application)	alpha cypermethrin (Fendona CS)	0.33-1.0 fl oz/gal water in backpack or hydraulic sprayer			Apply as directed on label.
	bifenthrin 7.9L (Bifen I/T)	0.33-1.0 fl oz/gal water in backpack or hydraulic sprayer			Apply at a rate of 1 gallon per 1,000 square feet for thorough coverage of lawns and/or ornamentals.
	deltamethrin (Suspend Polyzone)	0.33 to 1.0 fl oz/gal water in backpack or hydraulic sprayer			Treat with mist or spray around landscape plants, turf, ground cover, under decks, around building foundations where mosquitoes may rest.
	etofenprox (Zenivex E20)	Apply undiluted or up to 1:4.5 dilution	Varies with dilution	VMD-7-30 µm Dv 0.9 < 50 µm	DO NOT apply more than 0.18 lbs per acre per site per year. DO NOT make more than 25 applications per site per year.
	garlic oil 0.04% (Terminix ALLCLEAR ATSB Mosquito Bait Concentrate)	Thoroughly mix 1 part concentrate in 3 parts water and apply with ground-based spray equipment such as motorized portable, pump-up, backpack, handheld, vehicle-mounted and other ground-based spray equipment capable of medium to heavy spray droplets.			Apply at a rate of 10-20 ounces per 100 linear feet to vegetation 1 to 5 feet above the ground, wetting both surfaces of foliage to the point of runoff. DO NOT apply with handheld or truck-mounted cold ULV or thermal foggers or by aircraft.
	lambda-cyhalothrin (Cyonara 9.7, Demand CS, Cysmic CS)	0.8 fl. oz/gal. water in backpack or hydraulic sprayer			Treat resting areas on structures as well as surrounding shrubs.
	malathion 96.5% concentrate (Fyfanon ULV)	Use undiluted with aerosol ULV sprayer.	2.0-4.3 fl oz/min	VMD < 30 µm Dv 0.9 < 50 µm	Apply only when weather conditions are favorable. Wind and rising air currents may cause undesirable spray drift and reduce insect control. Avoid direct application to vehicles as paint damage may result. Toxic to fish, aquatic invertebrates and aquatic life stages of amphibians. DO NOT spray when wind speed is more than 5 mph.
	naled 87.4% concentrate (Dibrom)	Dilute 3.9-5.2 gal to 100 gal with No. 2 fuel or diesel oil; use in thermal fog sprayer.	80 gal/hr	VMD < 40 µm Dv 0.9 < 75 µm	Restricted Use Pesticide. Toxic to fish, aquatic invertebrates and wildlife. DO NOT directly apply to water or to areas where runoff into water is likely to occur.
		10 fl oz to 10 gal No. 2 fuel or diesel oil; use in thermal fog sprayer.			
		Dilute 0.5 gal to 5 gal with soybean oil or HAN; use in ULV sprayer.	6-12 fl oz/min	VMD < 40 µm Dv 0.9 < 75 µm	
		Apply undiluted or mix with refined mineral or soybean oil.	0.31-15.0 oz/min depending on dilution	VMD = 150 to 300 µm	Permethrin 57% is not for use in residential misting systems. DO NOT allow drift onto cropland, poultry ranges or potable water supplies. DO NOT use on crops used for food or forage.
		(Permanone) 10% EC	Dilute 1:20 with water (6.5 fl oz/1 gal water).		Treat surfaces using coarse wet spray. Spray to runoff.
	permethrin (20%) and piperonyl butoxide (20%) (Aqua-Reslin)	Dilute 1 gal with 2-12 gal water.	2.1-9.0 oz/min depending on dilution	VMD < 30 µm Dv 0.9 < 50 µm	Dilute with water only. Toxic to fish and aquatic invertebrates.
	permethrin and piperonyl butoxide (Permanone 31-66, Biomist 4+12 ULV)	Dilute 1 to 2.4 gal with lightweight oil; use in ULV sprayer.	0.5-3.0 fl oz/min	VMD < 30 µm Dv 0.9 < 50 µm	

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Mosquitoes, Adults (Ground application) (cont.)	prallethrin (1%) and sumithrin (5%) and piperonyl butoxide (5%) (Duet)	Apply diluted with aerosol ULV sprayer.	2.5-7.5 oz/min	VMD = 8 to 30 µm Dv 0.9 < 50 µm	DO NOT allow drift onto pastureland, rangeland or potable water supplies.
	pyrethrins (5%) and piperonyl butoxide (25%) (Aquahalt)	Apply undiluted or diluted with water and applied as an ultra low volume (ULV)	0.27 to 0.76 oz/ac	VMD < 30 µm Dv 0.9 < 50µm	Do not apply more than 0.2 pounds of pyrethrins/acre/year or 1.0 pound PBO/acre/year in any treated area
	sumithrin and piperonyl butoxide (Anvil 10+10 ULV or 2+2 ULV)	Use undiluted or dilute 10+10 formulation with light mineral oil.	1.3-18.6 oz/min	VMD < 30 µm Dv 0.9 < 50 µm	
Mosquitoes, Adults (Fixed-wing aerial application)	deltamethrin (Imperium)	0.00089 to 0.00134 lb. ai/A (undiluted or diluted in water)	Varies with dilution	See Label	During any three day period do not apply more than 0.00134 lb ai/A. Do not make more than 25 applications per site per year at the high rate of 0.00134 lb ai/A. More frequent applications and more than 25 applications per site may be made to prevent or control a threat to public and/or animal health determined by a state, tribal or local health or vector control agency on the basis of documented evidence of disease causing agents in vector mosquitoes or the occurrence of mosquito-borne disease in animal or human populations, or if specifically approved by the state or tribe during a natural disaster recovery effort.
	etofenprox (Zenivex E20)	0.00175 to 0.007 oz (undiluted) per acre	Varies with dilution	VMD < 60 µm Dv 0.9 < 50 µm	DO NOT spray more than 0.18 lbs etofenprox per acre per site per year. Do not make more than 25 applications per site per year. More frequent treatments may be made to prevent or control a threat to public and/or animal health determined by a state, tribal, or local health or vector control agency on the basis of documented evidence of disease-causing agents in vector mosquitoes or the occurrence of mosquito-borne disease in animal or human populations, or if specifically approved by the state or tribe during a natural disaster recovery effort.
	malathion 96.5% concentrate (Fyfanon ULV)	Use undiluted.	2.6-3.0 fl oz/acre	VMD < 60 µm Dv 0.9 < 100 µm	Toxic to fish, aquatic invertebrates and aquatic life stages of amphibians. DO NOT directly apply to water or to areas where runoff into water is likely to occur. DO NOT retreat a site more than three times in any one week except in emergencies.
	naled 87.4% concentrate (Dibrom)	Use undiluted. Dilute 50-100 fl oz to 100 gal with No. 2 fuel oil or diesel oil	0.5-1.0 fl oz/acre 1 gal/acre	VMD = 60 µm Dv 0.9 < 115 µm VMD = 60 µm Dv 0.9 < 115 µm	Toxic to fish, aquatic invertebrates, and wildlife. DO NOT directly apply to water, except when necessary to target areas where adult mosquitoes are present or to areas where runoff into water is likely to occur. NOT for use in or around homes.

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	permethrin (20%) and piperonyl butoxide (20%) (Aqua-Reslin)	Dilute 1 gal with 2-12 gal water	2.1-9.0 oz/min depending on dilution	VMD < 60 µm Dv 0.9 < 100 µm	Dilute with water only. Toxic to fish and aquatic invertebrates.
	prallethrin (1%) and sumithrin (5%) and piperonyl butoxide (5%) (Duet)	Apply diluted with aerosol ULV sprayer.	0.41-1.24 oz/acre	VMD = < 60 µm	DO NOT allow drift onto pastureland, rangeland or potable water supplies.
	pyrethrins (5%) and piperonyl butoxide (25%) (Aquahalt Water-Based Adulticide)	Apply undiluted or diluted with water and applied as an ultra low volume (ULV).	0.28-0.76 fl oz/acre	VMD < 60 µm Dv 0.9 < 100 µm	DO NOT treat a site with more than 0.0025 lb ai/acre per day. DO NOT apply more than 0.0625 lb ai/acre per year.
	sumithrin (10%) and piperonyl butoxide (10%) (Anvil 10+10 ULV)	Use undiluted or dilute with light mineral oil if dilution is preferred. DO NOT DILUTE WITH WATER.	0.21-0.62 fl oz/acre	VMD < 60 µm Dv 0.9 < 115 µm	Application should be made at 75 to 300 feet for rotary aircraft and 100 to 300 feet for fixed-wing aircraft.

KEY: Dv 0.9 = 90% of the spray volume droplets are smaller than value given
VMD = Volume Median Diameter
µm = micrometer

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Mosquitoes Immatures	<i>Bacillus sphaericus</i> (Vectolex) CG 7.5% WDG 51.2%	ready to use ground (5-100 gal water/acre) aerial (0.5-10 gal water/acre)	5-20 lb 0.5-1.5 lb	Only effective against larvae. Apply uniformly by aerial or conventional ground equipment. Reapply as needed after 1-4 weeks. Use higher rates in areas where extended residual control is necessary or in habitats having deep water or dense surface cover.
	WSP 7.5%	ready to use	1 pouch/50 sq ft	
	<i>Bacillus thuringiensis</i> , var. <i>israelensis</i> (Bactimos, Teknar, Vectobac) 50 WP 2 WP 14.3% aqueous conc. 15% aqueous conc. 1.2% aqueous conc. 0.8% aqueous conc.	Dilute with sufficient water to obtain uniform coverage.	6-12 oz 4-16 oz 0.5-3.0 pt 0.5-3.0 pt 0.25-2.0 pt 0.5-2.0 pt	Only effective against larvae. Can be applied to all breeding habitats, including potable water supplies.
	<i>Bacillus thuringiensis</i> , var. <i>israelensis</i> (Bactimos) briquettes 10%	ready to use	---	Use one briquette per 100 sq ft of surface area regardless of depth.
	<i>Bacillus thuringiensis</i> , var. <i>israelensis</i> (Bactimos, Teknar, Vectobac) granules 0.2% pellets 0.4%	ready to use	---	Apply 4-10 lb per acre with aircraft or ground equipment.
	methoprene 20% EC (Altosid)	3-4 fl oz/gal water	1 gal	Apply when larvae are in 3rd and 4th instar. Methoprene will not kill pupae or adults.
	methoprene (Altosid) briquette 2.1%, 8.6% (Altosid) pellet 4.2% (Altosid) granule 0.27%, 1.5%	ready to use	---	Water less than 2 ft; 1 briquette per 100 sq ft deeper or flowing water; 1 briquette per 10 cu ft, 2.5- to 10-lb pellet per acre; use high rate in breeding sites with high organic content.
	monomolecular surface film (Agnique MMF)	---	0.2-0.5 gal	Use in conjunction with indicator oil to avoid overtreatment. Can be used for semipermanent or permanent fresh water sources (including potable and irrigation).
	proprietary mosquito control oils (GB-1111, etc.)	---	1-5 gal	Dosage depends on amount of flottage and vegetation in water.
	spinosad 2.5% G (Natular XRG)	ready to use	5-20 lb	
	temephos (5% Skeeter Abate)		2-10 lb/acre	For control of mosquito and midge larvae, apply uniformly by conventional air or ground equipment. Application of this product by Belly-Grinder is prohibited.