Controlling Biting Insects – Mosquitoes, Black Flies, No-See-Ums, Punkies, Sand Flies, Horse Flies, Deer Flies
Michigan State University
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CONTROLLING *BITING INSECTS*

MOSQUITOES
BLACK FLIES
NO-SEE-UMS
PUNKIES
SAND FLIES
HORSE FLIES
DEER FLIES

By H.D. Newson
Professor of Entomology

Flying, biting insects are present throughout all parts of Michigan during the warm months of the year and constitute an ever-present deterrent to the enjoyment of outdoor living. This bulletin provides some general information concerning the biting insects most commonly encountered in Michigan and outlines simple control measures that individuals can use to minimize biting insect problems.

MOSQUITOES

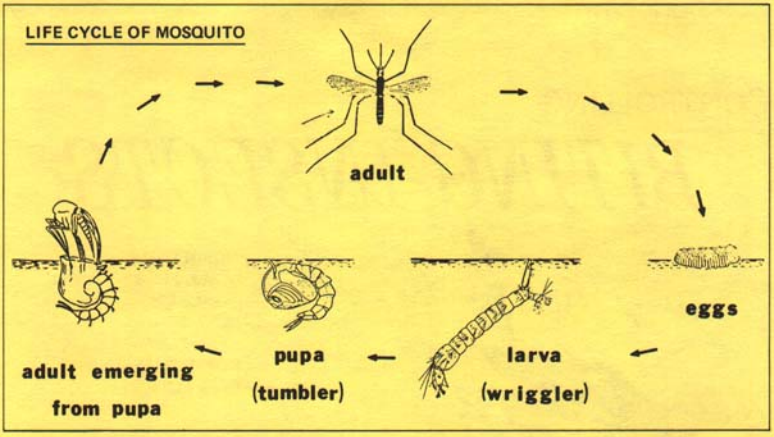
Mosquitoes are pests in virtually every part of Michigan throughout the summer months and seriously hamper outdoor activities. They also transmit several diseases that make them a serious threat to human and animal health. Dog heartworm and California encephalitis are widespread, and localized outbreaks of St. Louis and eastern equine encephalitis in recent years have been a serious concern to both health officials and the public at large. Effective mosquito control, therefore, is necessary both for the protection of human and animal health as well as for human comfort.

A formally organized community mosquito control organization directed by trained professional entomologists or biologists undoubtedly is the most efficient way to achieve effective mosquito control, but in the absence of such an organization there still are many things individuals can do to reduce mosquito populations to a tolerable level.

All mosquitoes require water for the development of immature stages, but, beyond that, they vary markedly in their requirements and behavior. There are over 60 species in Michigan, but only about one quarter of these are significant human pests, and an even smaller number create problems in any given locality.

Some species deposit eggs on damp or even dry soil where they may survive many months before they are flooded with water and hatch. Others deposit eggs directly on water where they hatch within a few days.

Michigan mosquitoes, depending upon the species, overwinter as eggs, larvae or adults and then continue their development or activities the following spring. Adults of some pest species regularly may fly a mile or more to obtain a blood meal, while others remain within a short distance of the water in which they develop and feed only on the vertebrates, including humans, that frequent that limited area.



Two groups of mosquitoes are the most serious pests throughout Michigan — "early season" and "floodwater" types, each of which includes several species. Eggs of the early season mosquitoes are deposited on the ground in low-lying wooded areas throughout the summer and hatch early the following year when these areas are flooded by melting snow and spring rains. These mosquitoes have only one generation each year. The adults emerge in large numbers in late May or early June, depending upon the weather, and usually cease to be a nuisance by the end of July.

Eggs of the floodwater mosquitoes are deposited on the ground in low-lying, sunlit areas subject to periodic flooding, but these mosquitoes may have a number of generations each year if there are frequent, heavy rainstorms. With favorable weather conditions, mosquitoes in this group become more numerous as the summer progresses and can be significant pests until the first killing frost in the fall.

Most species in both early season and floodwater groups have rather extended flight ranges and can be serious nuisances at some distance from their place of origin. The larval breeding sites of both the floodwater and early season groups are often very extensive and usually exceed the treatment capabilities of any individual.

LARVAL MOSQUITO CONTROL

Whether or not you live in an area with an active community mosquito control program, there are things you can do during the mosquito season to reduce the mosquitoes that originate in the immediate vicinity of your home — **ELIMINATE POTENTIAL MOSQUITO BREEDING SITES!**

WHAT YOU SHOULD DO

1. Get rid of all trash items in your yard that hold water. Old tires, unused automobiles, automobile parts and kitchen appliances, tin cans, buckets, drums, bottles and other water-holding containers make ideal breeding sites for mosquitoes.

2. Empty your children's plastic wading pool at least weekly and store it indoors when not in use.

3. Repair leaky pipes and outside faucets and move trailer drain hoses frequently enough to prevent pooling of water.

4. Change the water and scrub vases holding flowers and cuttings at least each week—or grow plant cuttings in sand. Change water in outside bird baths and scrub them at least weekly. Empty watering pans of pets and domestic stock daily.

5. Fill in low areas in your yard or install drainage tile to prevent the ponding or puddling of water.

6. Keep rain gutters clean and eliminate standing water on flat roofs.

Table 1 — Mosquito Larvae Control

Insecticide	*Directions For Use In Pressurized Sprayers*
Abate 4 E	Mix insecticide with enough water to obtain good coverage of the area to be treated, and apply mixture in a uniform spray at the rate of 1 fluid ounce of undiluted **Abate** per acre surface area of water. Repeat applications as necessary. Do not spray on food, forage or on pastureland. (Abate may have limited effectiveness in water containing excessive organic matter.)
Malathion 57% EL	For use in standing water (intermittently flooded areas, stagnant water, temporary rain pools). Mix in sufficient water to obtain good coverage of the water surface area to be treated, and apply mixture in a uniform spray at the rate of 13 fluid ounces of undiluted malathion per acre. Repeat applications as necessary. Do not spray food, forage or on pastureland.
Bacillus thuringiensis **var.** *israeliensis*	This toxic bacterial agent is sold under several trade names (e.g. Vectobac, Bactimos). Follow label instructions of the product you are using. This material is effective against mosquito larvae only, not the pupae, so applications must be made before mosquitoes have completed their larval development.
Altocid SR-10	Shake well before mixing. This material may separate on standing and must be thoroughly agitated before dilution. Mix in sufficient water to obtain good coverage of the water surface area to be treated, and apply at the rate of 3-4 fluid ounces of undiluted **Altocid SR-10** per acre. **Note:** This material is an insect growth regulator, not a conventional insecticide. It does not kill mosquito larvae outright but disrupts their normal development to the adult (biting) stage. It is effective only against mosquito larvae, so applications must be made before mosquitoes have completed their larval development.
Tossits	*For Hand Application To Small Water Accumulations* These are gelatin-like capsules that rupture and release the enclosed insecticide after being immersed in water. Apply according to manufacturer's recommendation.

7. Stock ornamental ponds with fish or drain and clean them at least once each week during the spring, summer and early fall.

8. Fill in tree rot holes and hollow stumps with sand or concrete.

9. Remove water from stored boats and canoes at least once weekly or provide cover or storage facilities that will prevent water accumulation.

10. Provide tight, insect-proof covers for all permanent water containers such as wells, cisterns, septic tanks and cesspools.

When it is not possible or practical to eliminate all mosquito-producing water from your property and adjacent areas, these water accumulations may be treated with an insecticide. **CAUTION!** When either early season or floodwater mosquitoes are the major problem, larval control, if it is to be effective, must extend from your home for a distance that exceeds the flight range of these species — up to a mile in some cases. Also, their breeding sites frequently include areas in which insecticide applications will adversely affect aquatic life other than mosquitoes. **For these reasons, extensive larval mosquito control is not recommended unless the operation is directed by a qualified professional entomologist or biologist and is part of an organized mosquito control program.**

Individual efforts to control either the early season or floodwater mosquitoes usually are more effective if directed against the adults.

ADULT MOSQUITO CONTROL

Two methods may be used for the control of adult mosquitoes, using equipment that normally is available to individuals for outdoor use around residences: (1) application of a liquid insecticide to vegetation and other resting sites of adult mosquitoes; and (2) spatial insecticide application in the form of a fine mist or fog. Unless power spray equipment is available, spraying usually is not practical if the area involved is more than a small sized yard. Mists and fogs, even using the small, hand-held types of equipment, penetrate vegetation more effectively and usually will provide better outdoor control than the sprays. Depending upon their extent and how near the mosquito breeding sites are to the treated areas, outdoor insecticide applications may provide a desirable level of adult control ranging from a few hours to a week or more.

To control adult mosquitoes indoors, an aerosol space spray containing pyrethrum (pyrethrins) or allethrin (pyrethroids) is the most direct and effective method. Under some conditions it may be more desirable to utilize the residual fumigant action provided by insecticide-impregnated resin strips.

Table 2 — Adult Mosquito Control

Application Method	*Insecticide*	*Directions For Use*
Outdoor residual spray for pressurized sprayers	Malathion 57% EL	Mix 5 tablespoons of malathion concentrate per gallon of water. Apply to grass, weeds, tree trunks and other vegetation as well as protected areas on outside walls and out-buildings where adult mosquitoes rest. Do not apply spray directly on ornamental plants.
Misting *	Malathion 57% EL	Mix 5 tablespoons of malathion concentrate per gallon of water. Direct mist into vegetation and wooded portions of the yard and adjacent areas. Also treat protected areas where vegetation is close to house foundation. Apply at the rate of 0.1 gallon of mixture per 1,000 square feet (5 gallons per acre).
	Pyrethrum **	Use according to label directions.
	Allethrin **	Use according to label directions.
Thermal fog *	Malathion 57% EL	Mix 6 fluid ounces of actual malathion (e.g. 11 oz. of 57% malathion or 6⅓ oz. of 95% malathion per gallon of fuel oil. Apply fog at the rate of ½ gallon of mixture per acre. Direct fog along the ground and into low vegetation where mosquitoes are resting.
		Note: Malathion may form a sludge when mixed with some types of fuel oil. Use of a cosolvent and sludge inhibitor may be required to avoid clogging the fogger. Consult your insecticide dealer for specific information on the use of sludge inhibitors. Premixed ready-to-use malathion formulations also are available from many dealers and may be preferred if mixing facilities are not available.
	Pyrethrum **	Use according to label directions.
	Allethrin **	Use according to label directions.
Indoor residual fumigation	Dichlorvos (DDVP or Vapona) resin strip	Hang strip(s) in enclosed area — 1 strip per 1,000 cubic feet of enclosed space. These strips are most effective in areas with minimum ventilation. They do not provide effective control if used outdoors or in well-ventilated rooms because, under these conditions, the Dichlorvos concentrations cannot reach levels that are toxic to mosquitoes.
		Caution: These strips are not registered for use where infants or aged persons will be exposed to the insecticide vapors, or in kitchens, restaurants or other areas where food is prepared or served.
Indoor aerosol space spray	Pyrethrum **	Use according to label directions.
	Allethrin **	Use according to label directions.
Personal application	Insect repellent containing either diethyltoluamide (DEET), Indalone, dimethylphthalate, or Rutgers 612.	These are available in a variety of formulations and concentrations as lotions, creams and sprays. Apply according to label instructions. **Note:** All insect repellents in this group are plasticizers and may mar or damage plastic glass frames, watch crystals and some synthetic fabrics. Frequent reapplications may be required when individuals are perspiring freely.

**Mists and fogs are most effective when atmospheric conditions cause them to hover over the ground — usually during the period between dusk and dawn. Their effectiveness is greatly reduced when they are applied during the hot part of the day. Do not fog or mist if wind speed is over 3 to 5 miles per hour.*

***Commercial preparations have varying amounts of Pyrethrum or Allethrin and often will include one or more additional chemicals to increase the insecticidal actions of these materials.*

SPECIFIC CONTROL PROGRAMS

Biting Midges

This group of biting flies includes several types of very tiny insects that are also called punkies, sand flies and no-see-ums. Those that bite humans are active in the evening and very early morning. Their bites cause a burning and irritation that is far greater than one would expect from so small an insect. They can become serious pests in localized areas, but the limited flight range of adults restricts their activities to localities near their breeding sites. They are weak fliers and are greatly inhibited by even light winds. You can encourage stronger wind currents, and thus reduce harborages for these insects, by keeping grass areas closely mowed, thinning out trees and shrubs and keeping shrubbery and low vegetation away from human and animal habitations.

Insecticide mists and fogs used for mosquito control also are effective on biting midges. These tiny insects are attracted to light and enter homes and other buildings by passing through window and door screens. An indoor aerosol containing either allethrin or pyrethrum (pyrethrins) will effectively eliminate adults indoors.

Most insect repellents do not prevent these insects from biting, but if applied in a thick enough film on the skin, a repellent may keep insects from reaching the skin surface. Lotion or cream formulations are most effective.

Horseflies and Deerflies

Many species of this group are common pests in low, moist areas of Michigan. Both horseflies and deerflies are strong fliers and are most abundant in swampy, forested localities from late May until September. They prefer to feed on large mammals, but also feed readily on humans.

No satisfactory control has been developed for these insects. The immature forms develop in a variety of aquatic and semi-aquatic areas that, because of both practical limitations and ecological considerations, cannot be treated with insecticide chemicals. The long flight range of adults enables them to move freely in search of suitable animal and human hosts, so they may become pests at some distance from where they originate. Wearing long trousers and long-sleeved shirts, and applying a insect repellent containing diethyltoluamide (Deet) to exposed skin will provide protection from their bites.

Black Flies

Blackflies, sometimes called buffalo gnats, are small black or gray flies with stout, humpback bodies; short, broad wings and short legs. They feed on the blood of wild or domestic animals, including birds, and in some parts of Michigan are also vicious human pests. There is little precise information concerning the flight range of Michigan species, but most can fly several miles from their breeding sites in streams and rivers. They bite only during the day but are persistent and may enter the ears, nostrils or crawl through openings in the clothing to feed on covered parts of the body. Outdoor space treatments recommended for adult mosquito control also provide some local temporary relief from black fly adults. Insect repellent applied to exposed skin combined with wearing tightly fastened clothing is probably the most effective protection against black fly bites.

INSECTICIDE DISPERSAL EQUIPMENT

One of the most important considerations in insect control is the proper selection, use and care of insecticide dispersal equipment. There are many kinds and sizes available. Selection should be made only after determining the types of insects to be controlled, the size of the areas to be treated and the types of insecticide that must be used.

Aerosol Dispensers

These self-pressurized containers discharge a fine insecticide spray through a push button nozzle. A spraying time of approximately 7 seconds per 1,000 cubic feet of space is usually sufficient to control flying insects within homes, tents or other habitations.

A number of self-pressurized dispensers of spray type insecticides closely resemble aerosol dispensers. Read container labels carefully to be sure that you use only aerosol formulations as indoor space sprays. Spray dispensers produce much coarser particles that are not effective as aerosols and may also contain insecticides that are more hazardous to inhale than those in aerosol formulations.

Hand Sprayers

Small hand sprayers of the flit-gun type usually have a capacity of 1 to 3 quarts and are used principally to apply small amounts of insecticide.

Compressed Air Sprayers

Sprayers of this type that are available to home owners usually have a capacity of 1 to 3 gallons. Air is compressed in the sprayer by means of a built-in, hand-operated pump and the pressurized air forces insecticide out through the nozzle. These sprayers may be equipped with several types of nozzles that can be adjusted to deliver sprays ranging from a solid stream to very fine particles. During use, frequent pumping is required to maintain adequate spraying pressure. With proper care and maintenance this type sprayer will provide good service in small-scale insect control operations.

Foggers

Fogging machines are available in a variety of sizes, from portable machines weighing under 20 pounds on up to truck or trailer-mounted units that weigh several hundred pounds and can deliver up to 40 or more gallons of insecticide per hour. The smaller units may be powered by either an electric or gasoline engine while the larger ones have gasoline motors only.

Mist Blowers

Like fogging machines, mist blowers vary in size from small portable unit of 2 to 4 quart capacity on up to truck mounted units holding several hundred gallons of insecticide. The selection of the unit best suited for your needs should be determined by the types of control operations planned and the size of the areas to be treated. Mist blowers atomize the insecticide mixture into fine particles that are carried out in a strong blast of air. The distribution of insecticide is dependent upon the air blast primarily, but may be supplemented or extended by winds. Insecticide mists, as with fogs, depend primarily upon contact with the insect for their effectiveness.

CAUTION

All pesticides are poisonous and always must be handled in such a way as to minimize the possibility of harm to humans and others through contamination of food and water or by contact. The insecticides recommended in this publication were selected on the basis of their proven effectiveness in mosquito control and their relatively low hazard, *if used properly*, to users and the environment. The key to safety in the use of all pesticide chemicals is a knowledge of the hazards involved in handling and applying them. Know and follow these basic rules.

1. Know the material being used. Read the container label and understand the directions for preparing and applying the insecticide. Do not use more insecticide than is necessary. Excessive application increases costs and may be hazardous. **FOLLOW THE DIRECTIONS!**

2. Take special care not to inhale and contaminate skin and clothing when using insecticides. If insecticide is spilled upon the skin or clothes, immediately remove all contaminated clothing and thoroughly wash the exposed skin with soap and water. Prompt action can prevent serious poisoning or death. Always wash with soap and water after spraying or handling insecticide chemicals.

3. Avoid contaminating human and animal foods and drink with insecticides.

4. Keep spray equipment clean and in good operating condition. Dispose of insecticide rinsed from equipment only where it will not affect man or wildlife.

5. Store insecticides in properly labeled original containers that are kept out of the reach of children. **NEVER** store insecticides in food or beverage containers.

6. Dispose of empty insecticide containers safely (e.g. bury in a sanitary landfill designated for this purpose) and never use these containers to store other materials.

7. In case of poisoning with insecticides, get the victim to a physician WITHOUT DELAY. If possible, take the container of the insecticide involved, with an intact label, to the physician so that he can determine the poison or poisons and prescribe the proper treatment. Immediate, proper and adequate treatment is essential.

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