



MOSQUITOES

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Mosquitoes are widely distributed and familiar to us all. Although there are roughly 40 species in Maine, slightly less than half are considered biting pests of humans. In spite of this, one of the most common of all complaints from people trying to enjoy the outdoors during the spring and summer months concerns the annoyance caused by the often enormous populations of these small, slender, long-legged flies and the bites they inflict. Both males and females obtain some nutrition from flower nectar and plant sap, but it is only the females that bite feeding on blood to acquire the extra protein boost needed to produce and lay eggs. In this process the females can also carry disease organisms and parasites from one host to another and thus may serve as vectors of diseases such as malaria, yellow fever, and various forms of encephalitis. In the past these diseases have not been considered a problem in Maine. More recently, however, concern has been expressed regarding increased incidence of arboviruses (arthropod-borne viruses) such as Eastern Equine Encephalitis (EEE). The introduction into the eastern U.S. of another form of encephalitis known as the West Nile Virus (WNV) has further raised concerns regarding its potential threat in Maine. As several of the mosquito vectors occur in Maine a monitoring protocol is being developed. Heartworm, a disease of canine pets caused by filarial worms, is also transmitted by mosquitoes and is now established throughout most of New England.

Life History and Habits - In Maine most of the nuisance biting mosquitoes belong to the genus *Aedes* and can be broadly grouped on the basis of where they breed, woodland or salt marsh pools. A few additional species breed in small stagnant ponds or swampy areas such as *Mansonia perturbans*. Most mosquito vectors of encephalitis are species which feed primarily on reservoir bird hosts and only occasionally on humans: *Culiseta melanura* breeds in bogs and swamps and only occasionally ventures forth. The northern house mosquito (*Culex pipiens*) and *C. restuans* are more urban species breeding in almost any water container from temporary pools, wading pools and bird baths to tin cans, tires and septic tanks. These two species feed on birds and humans and pose the greatest threat in disease transmission.

The Asian Tiger Mosquito (*Aedes albopictus*) does not occur in Maine and prefers warmer climates to the south. Another introduced species, *Aedes japonicus* will likely enter Maine in the near future. This species is an effective vector of WNV.

Woodland (or Upland) Mosquitoes - The majority of woodland mosquitoes overwinter as eggs or larvae and have only a single brood or hatch each year. These often develop from temporary pools of water. Pools where snow melt water accumulates are one of the more common breeding sites thus the term snow-pool mosquitoes. Other sites include moist depressions and on flood plains. Contrary to popular belief mosquitoes will not breed in lakes or deep and moving streams. Eggs normally begin to hatch in April or May. The tiny hatching larvae which are also known as "wrigglers" or "wiggle tails" are aquatic and undergo a few molts prior to pupation in May or June. Their rate of development increases as the temperature rises. Emergence of the adults usually occurs in late May or early June in central Maine. Females mate, seek blood, and deposit their eggs within a few weeks after emerging. Eggs of most species remain dormant until the following spring.

The adult mosquitoes may persist for many weeks, some even until September, but the populations usually start to decrease during hot and dry weather conditions later in the summer. Adults do move around in short flights and may on rare occasions move long distances of up to a few miles. Mosquitoes are mostly active in the evening or on overcast days. During the day they remain resting on vegetation, taking flight only when someone comes in their vicinity. June is generally considered the month for woodland mosquitoes except in wet years when the season may be prolonged. Mosquitoes which appear briefly in the fall or spring and occasionally during the winter are females of overwintering species.

Salt-Marsh Mosquitoes - Unlike the woodland mosquitoes, the salt-marsh mosquitoes (*Aedes cantator* and *A. sollicitans*) produce several generations per year and fly much longer distances - up to ten to twenty miles or more from the coast in their search for food. These species breed only in pools in or near salt marshes. Eggs occur in and about depressions and hatch upon being submerged as a result of flooding due to heavy rainfall or high tides. The frequency of high-run tides determine the frequency of each generation, one generation of mosquitoes per high-run tide and with each generation numbers of individuals increase greatly.

Personal Protection - The use of protective clothing and insect repellents are both methods which can provide some personal protection against adult mosquitoes, and are especially suitable for hikers, campers, picnickers, fishermen, and others who are active in mosquito infested areas. Types of protective clothing include veils or mosquito netting worn around the head, high boots, long sleeved shirts, long pants, gloves, etc. Insect netting fashioned into a bed net can also provide excellent protection for those camping or sleeping in the open. As with many biting flies it is best to avoid the use of colognes and perfumes while in the field as these may enhance biting fly activity!

Insect repellents are chemicals that can be applied to the skin or clothing. Some may work against other pests as well including black flies and ticks. A number of products are available, and come in either pressurized sprays or liquid formulations which are usually spread on exposed parts of the body. Usually a few drops applied to the neck, face, hands, and arms or sprayed onto thin clothing items such as stockings can repel mosquitoes for periods of 2 hours or more. Since repellents can irritate the eyes or the lips, care should be taken in their application. Be sure to read the instructions to make sure the repellent won't harm clothing or especially plastic items. Do not over use repellents especially on young children and particularly those containing DEET.

Clothing treatments with permethrin products have a long lasting period of effectiveness but cannot be applied directly to the skin; once dried on clothing however, there is little or no transfer of chemical compounds.

Homeowners and campowners can alleviate the mosquito nuisance indoors by installing and maintaining tight fitting window and door screens. The screening in of porches and picnic areas may also be a worthwhile consideration. Specific materials for screen treatment containing methoxychlor or permethrin may add to the effectiveness of screens. Space spraying of tents or sleeping areas before use may also help.

Natural Controls - The following are various controls that can be undertaken to reduce the presence of mosquitoes, either by elimination of breeding places or destruction of the adults or larvae.

Eliminate Breeding Sites - Locate during April all stagnant water such as unused pools, old tires, tin cans along with other similar discarded containers, and drain or remove these to destroy their breeding sites. Also, be sure to check water in small children's swimming pools for larvae. Treatment of breeding pools with *Bacillus thuringiensis israelensis* (Bti) will help if done properly. This biological treatment is available in briquet form for easy application.

Cut Back or Remove Dense Brush and Similar Vegetation From Around Houses and Camps - To eliminate adult resting sites, and promote natural breezes to discourage mosquito occurrence. Keep grassy areas mowed short.

Encourage Natural Predators - Although limited in their effectiveness, predators such as dragonflies, bats, birds, frogs and mosquito eating fish do naturally control the numbers of mosquitoes, especially in and around small garden ponds or pools. Both the nymphs and adult dragonflies are natural enemies of mosquitoes. The nymphs which are aquatic feed on a variety of aquatic insects, including mosquito larvae. Dragonfly adults feed on flying mosquitoes. Mosquito eating fish, such as *Gambusia* feed on the larvae and are more effective where stock ponds and ornamental garden pools are free of excessive vegetation and algae.

Use of **burning wicks** containing pyrethrum or **citronella candles** may provide some relief in limited areas provided that there is no wind.

Novelty approaches to mosquito control include such things as "bug zappers," various sound devices, and scented geraniums ("mosquito plants"). While there may be certain psychological benefits to the use of such things, they are usually expensive and there is little scientific evidence to support the claims of those who market such products. There is no sure fire solution to the problem as some would assert.

Chemical Controls* - As of February 2000, there were over 700 products registered in Maine with mosquitoes on the label, larvicides, insect repellents and adulticides. The larvicides include: *Bacillus thuringiensis* var. *israelensis* (*Bti*) and insect growth regulators such as methoprene and pyrioxifyfen. When using a larvicide in standing water, you may need a permit from DEP. Just over 200 of the registered products are adulticides designed to kill adult mosquitoes. The active components of these products include synergized pyrethrins, synthetic pyrethroids (such as: resmethrin, phenothrin and permethrin) and organophosphates (such as: malathion and naled).

***NOTE:** These recommendations are not a substitute for pesticide labelling. Read the label before applying any pesticide. Pesticide recommendations are contingent on continued EPA and Maine Board of Pesticides Control [(207) 287-2731] registration and are subject to change.

Caution: For your own protection and that of the environment, apply the pesticide only in strict accordance with label directions and precautions.