



## 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.

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.

## Mosquito Species Occurring in Maine

Compiled by Kimberly A. Foss and Richard G. Dearborn  
From a variety of sources      Revised May 2003

Species	WNV Vector	EEE Vector	Bites Humans	Adult Host	Larval Habitat	No. Gen./ Yr.	Over-winters As:	Common Name and Comments
<b><i>AEDES</i></b>								
<i>cinereus</i> (Meigen)	y	y	Yes Major pest in wooded or shaded areas	Mammals	Wooded snowmelt pools, semi-permanent bogs and swamps	2-3	Egg	Day and night biter
<i>vexans</i> (Meigen)	y	y	Yes Major pest	Mammals	Wooded temporary, permanent, semi-permanent pools, open flooded areas	2-3	Egg	Day and night biter
<b><i>OCHLEROTATUS</i></b>								
<i>aberratus</i> (Felt & Young)			Yes Common spring pest	Mammals, birds	Snowmelt pools	1	Egg	Day and night biter
<i>atropalpus</i> (Coquillett)	y		Yes Around breeding areas	Mammals	Rock pools, some artificial containers	1	Egg	Day and night biter
<i>aurifer</i> (Coquillett)			Yes Around breeding areas	Mammals	Snowmelt pools, swamps, bogs, open marshes	1	Egg	Day and night biter
<i>canadensis</i> (Theobald)	y	y	Yes Major late spring pest around breeding areas	Mammals, amphibians, reptiles, sometimes birds	Wooded snowmelt pools, flood waters	1-2	Egg	Day and night biter
<i>cantator</i> (Coquillett)	y		Yes	Mammals, birds	Salt marshes, fresh or brackish water	1+	Egg	Day and night biter
<i>communis</i> (DeGeer)			Yes	Mammals, birds	Wooded snowmelt pools	1	Egg	Day and evening biter
<i>decticus</i> (Howard, Dyar and Knab)			Yes	Mammals, birds	Sphagnum, acid bogs	1	Egg	Day and night biter
<i>diantaeus</i> (Howard, Dyar and Knab)			Yes Wooded areas	Mammals, birds	Wooded snowmelt pools	1	Egg	Morning and evening biter
<i>excrucians</i> (Walker)			Yes Common spring - summer pest	Mammals, sometimes birds	Wooded snowmelt pools, marshes	1-2	Egg	Day and evening biter
<i>fitchii</i> (Felt & Young)			Yes Common spring - summer pest in wooded areas	Mammals, birds	Snowmelt pools, bogs, grassy roadside ditches	1	Egg	Day and night biter
<i>hendersoni</i> (Cockerell)			Yes	Mammals	Tree holes, occasionally tires	1-2	Egg	
<i>implicatus</i> (Vockeroth)			Yes Spring pest	Mammals	Wooded snowmelt pools	1	Egg	Day and night biter

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<b>OCHLEROTATUS</b> (continued)								
<i>intrudens</i> (Dyar)			Yes Common spring pest	Mammals	Wooded snowmelt pools	1	Egg	Day and night biter
<i>japonicus</i> (Theobald)	y		Yes	Mammals, birds	Tires, artificial containers, tree holes, rock pools	2+	Egg	Day biter <b>New Record Portland, ME: June 26, 2001 (K.Foss)</b>
<i>pionips</i> (Dyar)			Rarely		Snowmelt pools	1	Egg	
<i>provocans</i> (Walker)			Yes Early spring	Mammals	Semi-permanent marshes, wooded snowmelt pools	1	Egg	Evening biter
<i>punctator</i> (Kirby)			Yes Spring	Mammals	Wooded snowmelt pools	1	Egg	Day and night biter
<i>sollicitans</i> (Walker)	y	y	Yes Major coastal summer pest	Mammals, birds, reptiles, amphibians	Salt marshes	4+	Egg	“Eastern salt marsh mosquito” Day and night biter
<i>sticticus</i> (Meigen)			Yes Major pest around breeding areas	Mammals, birds, reptiles	Flood waters, wooded snowmelt pools	1-2	Egg	Day and evening biter
<i>stimulans</i> (Walker)	y		Yes Major spring pest	Mammals, birds	Snowmelt pools	1	Egg	Long lived
<i>taeniorhynchus</i> (Wiedemann)	y	y	Yes Major pest around breeding areas	Birds, mammals	Salt marshes	2+	Egg	“Black salt marsh mosquito” Day and evening biter <b>New record for 2002 (M. Holman)</b>
<i>triseriatus</i> (Say)	y		Yes Common summer pest around breeding areas	Mammals, birds, reptiles, amphibians	Tires, artificial containers, tree holes	1	Egg	“Tree hole mosquito” Day and evening biter
<i>trivittatus</i> (Coquillett)	y	y	Yes Common summer pest around breeding areas	Mammals, birds	Wooded snowmelt pools	1	Egg	Day and evening biter

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<b>ANOPHELES</b>								
<i>earlei</i> (Vargas)			Yes Common spring pest	Mammals	Confined bodies of water	1-2	Adult	Day and night biter
<i>punctipennis</i> (Say)	y		Yes Major summer pest	Mammals, birds	Confined and flowing bodies of water, artificial containers	2-3	Adult	“Spotted-winged Mosquito” Day and night biter
<i>quadrimaculatus</i> (Say)	y		Yes Common summer pest	Mammals, sometimes birds and reptiles	Confined bodies of water	2-3	Adult	Common “Malaria Mosquito” Day and night biter
<i>walkeri</i> (Theobald)	y		Yes	Mammals	Confined bodies of water	2+	Egg	Day and night biter
<b>COQUILLETIDIA</b>								
<i>perturbans</i> (Walker)	y	y	Yes Major summer pest Birds, mammals, amphibians, sometimes reptiles		Marshes	1-2	Larva	Larvae attach to base of aquatic plants Day and night biter
<b>CULEX</b>								
<i>pipiens</i> (Linnaeus)	y		Rarely	Birds	Artificial containers, grassy roadside ditches, catch basins	1-2	Adult	“Northern house mosquito”
<i>restuans</i> (Theobald)	y		Yes	Birds, sometimes mammals	Tires, tree holes, artificial containers, puddles, grassy roadside ditches, catch basins	1-2	Adult	Day and night biter
<i>salinarius</i> (Coquillett)	y	y	Yes	Birds, mammals	Artificial containers, grassy roadside ditches, brackish water, catch basins	1-2	Adult	Night biter, enters homes
<i>territans</i> (Walker)	y		Rarely	Frogs	Ponds, pools, marshes, grassy roadside ditches, artificial containers	1-3	Adult	

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<b><i>CULISETA</i></b>								
<i>impatiens</i> (Walker)			Yes Uncommon early spring species	Mammals	Semipermanent ponds, bogs, wooded ground pools	1	Adult	Long lived, rare Day and evening biter
<i>inornata</i> (Williston)		y	Yes Uncommon early spring species	Mammals	Wooded snowmelt pools, marshes, bogs, swamps	2+	Adult	“Winter mosquito”
<i>melanura</i> (Coquillett)	y	y	Rarely	Birds	Within stumps in acidic swamps and bogs, snowmelt pools	2+	Larva	
<i>minnesotae</i> (Barr)			Rarely	Birds, small mammals, turtles	Snowmelt pools, marshes	1-2	Adult	<b>New Record for 2001</b> (M. Holman)
<i>morsitans</i> (Coquillett)			Rarely	Birds	Semi-permanent swamps, wooded snowmelt pools, marshes, bogs	1	Egg	
<b><i>PSOROPHORA</i></b>								
<i>ferox</i> (Humboldt)	y		Yes Within wooded areas Uncommon species	Mammals	Wooded temporary ground pools, flood-water areas	1	Egg	“White- footed woods mosquito” Day and evening biter <b>New Record for 2001</b> (M. Holman)
<b><i>URANOTAENIA</i></b>								
<i>sapphirina</i> (Osten Sacken)	y		Rarely Summer species		Permanent and semipermanent ponds, pools, swamps, marshes	1-2	Adult	<b>New Record Portland, ME July 24, 2001</b> (K. Foss)
<b><i>WYEOMYIA</i></b>								
<i>smithii</i> (Coquillett)			Never		Sphagnum bogs	1	Larva	“Pitcher plant mosquito” Spends most of year as larvae

**MAINE DEPARTMENT OF CONSERVATION**  
 Maine Forest Service - Forest Health and Monitoring Division  
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