ATTENTION!

MOSQUITOES!

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MOSQUITOES AND MOSQUITOBORNE DISEASES
Mosquito Control and Prevention to Reduce Your Risk
Over 60 species of mosquitoes can be found in Pennsylvania. The most common species are the common house mosquito (*Culex pipiens*), white-dotted mosquito (*Culex restuans*), inland floodwater mosquito (*Aedes vexans*), rock pool mosquito (*Aedes japonicus*), and eastern tree hole mosquito (*Aedes triseriatus*). Two invasive mosquito species, the yellow fever mosquito (*Aedes aegypti*) and the Asian tiger mosquito (*Aedes albopictus*), have been found in southern Pennsylvania; however, their range may change and move farther north.

The mosquito life cycle has four distinct life stages: egg, larva, pupa, and adult. Some mosquitoes can complete their life cycle (egg to adult) in as little as eight to 10 days under optimal conditions, but the overall amount of time to complete their life cycle will depend on the mosquito species, availability of resources, and weather conditions.

The egg, larval, and pupal stages are found in water habitats. To lay their eggs, adult female mosquitoes identify water habitats that contain organic material (decomposing grass, leaves, dirt, etc.) in order to provide immediate nutrition for larval mosquitoes. Females will lay their eggs in “rafts” (clusters of eggs) or singly on the water surface or areas prone to flooding. Eggs may hatch in two to three days under favorable conditions. Some eggs can survive for up to two years.
Once mosquito eggs hatch, larvae will feed on the organic material found in the water. Larvae, also known as “wigglers,” have a small head, an expanded thorax, and a cylinder-shaped abdomen. The larval stage is a stage of feeding, during which larvae filter through their mouthparts the organic materials and microscopic plants and animals found in the water habitat. Some mosquito larvae are predatory and feed on other mosquito larval species. Within four to 10 days, most mosquito larvae pass through four larval stages (instars) before pupating.

The pupal stage is a transitional stage before the adult stage. Pupae, also known as “tumblers,” are apostrophe shaped and will remain near the surface of the water unless they are disturbed. This is a nonfeeding stage. Within one to 10 days, the mosquito pupa is ready to emerge as the adult form.

Adult mosquitoes have one pair of true wings, long legs, elongated abdomens, and variable colorations and patterns. Male mosquitoes have full (plumose) antennae, while female mosquitoes have more sparse (pilose) antennae. Males feed on nectar to get the required carbohydrates for energy, but they do not feed on blood. In addition to nectar, most females will also feed on blood
as a source of protein and fat to produce eggs. Males will die soon after mating, while females can live for another month or longer depending on environmental conditions and the presence of hibernacula (protected areas where females can hide or rest).

During the blood-feeding process, female mosquitoes use their mouthparts to pierce the host’s skin, simultaneously taking blood from and injecting saliva into the host. Saliva from an infected mosquito can contain pathogens, which can enter the host as the mosquito feeds on blood. After blood-feeding, female mosquitoes will go in search of nutrient-rich water or areas prone to flooding to lay their eggs, thereby restarting the cycle.

MOSQUITOBORNE DISEASES

Mosquitoes are known to transmit many kinds of pathogens that cause diseases in humans and animals, but the types of pathogens that are transmitted depend on the mosquito species. For a mosquito borne disease to establish itself in a geographic location, the pathogen, susceptible hosts, and competent vectors must all be present.
Mosquitoes can transmit pathogens such as:

» WEST NILE VIRUS
» EASTERN EQUINE ENCEPHALITIS VIRUS
» ZIKA VIRUS
» HEARTWORM

Learn more at extension.psu.edu/mosquitoes-and-mosquito-borne-diseases.

MOSQUITO CONTROL AND PREVENTION

Because it is difficult to prevent mosquitoes from biting us or our animals, mosquito management is a high priority in preventing mosquito-borne diseases. Effective long-term mosquito management may require using more than one management technique such as:

» MECHANICAL/PHYSICAL CONTROL
» BIOLOGICAL CONTROL
» CHEMICAL CONTROL
» PERSONAL PROTECTION

Understanding mosquito biology will provide further guidance for the appropriate measures to take when controlling mosquito populations. For example, removing standing water will remove immature stages (egg, larva, or pupa), while insecticides applied in trees and bushes will target adult mosquitoes.

MECHANICAL/PHYSICAL CONTROL

Mechanical/physical control of mosquito populations will kill the mosquito directly, block mosquitoes, or make the environment unsuitable for mosquito survival. Examples of these controls include:

» Dumping standing water sources or regularly draining water
» Removing containers that can potentially hold water
Maintaining pools (draining regularly and chlorinating water)
Maintaining window/door screens
Removing vegetation or debris from water sources
Checking and removing water from tree holes
Using traps and bug zappers

**BIOLOGICAL CONTROL**

Biological control refers to the use of natural enemies (predators, parasites, pathogens, and competitors) to control mosquitoes. To control mosquito populations at home, the following biological controls can be used:

- Mosquito fish (*Gambusia affinis*)
- Bacteria, such as *Bacillus thuringiensis israeliensis* or *Bacillus sphaericus*
- Mermithid nematodes
- Cyclopoid copepods

**CHEMICAL CONTROL**

Chemical control is the use of pesticides against mosquito populations. Chemical controls should be used sparingly and in combination with other control methods for effective, long-lasting control. Chemical controls can be used against adults or immature stages, but applying these controls will require background knowledge of where the adults and larvae are likely to be found. It is also important to follow EPA guidelines and manufacturer instructions on how and when to apply chemical controls to maximize efficiency, reduce insecticide resistance, and prevent negative effects on nontarget insects and animals.
PERSONAL PROTECTION

Personal protection measures can protect you when the other controls are not available or feasible during outdoor activities such as hiking, camping, going to a park, fishing, or gardening.

» Protective clothing (long sleeves, long pants, loose-fitting, and light colors)
» Repellents registered by the EPA (DEET, picaridin, IR3535, oil of lemon eucalyptus, para-menthane-diol, or 2-undecanone)
» Permethrin-treated clothing (0.5%)

FOR MORE INFORMATION

Centers for Disease Control and Prevention (cdc.gov) and U.S. Environmental Protection Agency (epa.gov)

extension.psu.edu/mosquitoes-and-mosquito-borne-diseases