

## Mosquito Biology



Photo courtesy of Ary Farajollahi MCMC, NJ

**To view a video on the lifecycle of a mosquito, please click on the following link:**

<http://www.youtube.com/watch?v=wFfO7f8Vr9c>

*Video courtesy of Backyard Bugs via YouTube*

Mosquitoes have four distinct developmental stages: egg, larva, pupa, and adult.

No matter what the mosquito species, water is essential for breeding. The larval stage is aquatic. Their larvae prefer still water and can be found in water holding containers, tree holes, roadside ditches, low lying areas, swamps, and tidal salt marshes. Mosquitoes are not found in moving streams and rivers or in areas subjected to heavy wave action. Contrary to popular belief, mosquitoes do not breed in tall grass or thick brush. These areas provide an excellent refuge for adult mosquitoes during the heat of the day but in no way contribute to mosquito breeding.

Many species of mosquitoes are specific in their host preference for birds, mammals, or cold-blooded vertebrates such as reptiles and frogs. Consequently, various mosquito species use a wide variety of cues to find a suitable host. These cues can be either odors emanating from a persons' skin or breathing, or visual cues such as movement or contrast of a potential host with the surrounding background. Carbon dioxide is a major cue and is often used as bait in mosquito traps.

---

## Eggs

Mosquito eggs can be characterized by two major types: Floodwater and Permanent water eggs. The females of floodwater species will lay their eggs on a moist substrate – not on standing water. These eggs need to dry out for a period of time before they will become viable. Once they have passed through the critical drying time, they will hatch if the area is flooded by rain or by high tides.

Permanent water mosquito eggs are laid singly, or in a raft containing ~50 to 300 eggs. These eggs cannot survive if they dry out, and must be laid in a fairly permanent source of water such as a lake or swamp.

---

## Larvae

The larval stage of the mosquito is aquatic. Most species of larvae breathe at the water's surface through a siphon tube at its tail end. Some species lay flat against the water surface, while others pierce the root of submerged plants and breathe through the root system.

All larvae are voracious feeders, needing nourishment to develop to the next stage. Larvae or "wigglers" can be seen resting at the water's surface or wiggling downward as they forage for food or attempt to hide from predators. It is during this stage that larvicide treatments are administered because they are taken into the larva's system while eating.

The larval stage provides nutrition for the non-feeding pupal stage. During the larval stage, the mosquito will shed its skin, (molt) four times - each of the periods in between the molts is called an instar. Towards the end of the 4th instar, the mosquito larva stops feeding.

---

## Pupae



Photo courtesy of Ary Farajollahi

The pupal stage of the mosquito is also aquatic. The pupa is lighter than water and floats at the surface. Pupae are commonly called "tumblers" because they move in a somersault fashion through the water when they are disturbed, then float back to the surface. It takes in oxygen through two breathing tubes called "trumpets". The pupa does not feed.

The metamorphosis of the mosquito into an adult is completed within the pupal case.

---

## Adults



Photo courtesy of Ary Farajollahi MCMC, NJ

When the adult is ready to emerge, the pupal skin splits along the top. The adult mosquito slowly works its way out of the pupal case. After emerging, it will float on the surface of the water and rest until its body and wings harden. Once this occurs, the mosquito will fly off to begin its new life. One of the first things newly emerged mosquitoes do is seek out nectar for a sugar meal to provide energy for flying and mating.

Generally, male mosquitoes emerge a few days before female mosquitoes. This gives the males a chance to mature before the females emerge. The males then use their feathery antennae to hear the wings of the newly emerged females. Each mosquito species has a different sound to its wings so the males can find females of the same species. After they mate the female will look for a blood meal. Only female mosquitoes feed on blood. She needs the protein from the blood to develop her eggs. Both males and females will feed on nectar for energy. Most mosquito species are actively searching for a blood meal in the evening hours from dusk until dawn. During the daytime, females rest in cooler vegetated areas where the humidity is higher and they are protected from drying out. With some species, females will readily bite during the daytime hours.

---

## Mosquito Breeding Habitats

All mosquitoes require some type of water source to complete their lifecycle. Different mosquitoes prefer to breed in specific types of waters. For example, the species *Culiseta melanura* (the primary vector for EEE) breeds in acidic Red Maple and Atlantic White Cedar swamps. The species *Aedes sollicitans* breeds in saltmarshes, while *Culex pipiens* (the primary

vector of WNV) prefers stagnant, temporary pools of water that have a high organic content, such as artificial containers and catch basins.

Breeding habitats can be broken down into Permanent (or semi-permanent) and Temporary water sources. Permanent waters include swamps, bogs, brackish and freshwater ponds and wetlands, marshes, etc. Temporary waters include woodland pools, drainage ditches, tree holes, artificial containers, floodwaters, and catch basins.

In most cases, if the water is flowing it is not likely to produce any mosquitoes. This is why we work so hard during the off season to clean out blocked ditches and waterways to keep the water moving.