

Backyard Mosquito Management

Practices that do not poison you or the environment

By Becky Crouse

First and foremost, let's get a couple of things straight. Mosquito management does NOT mean dousing yourself and your kin in your favorite DEET product and then stepping out to enjoy the local wildlife. It is not swatting at the suckers as they bite you. And it is not investing in one of those full-body net suits for your next camping trip.

To manage mosquitoes, you have to get rid of the situations that are attracting them to your property, and, if you detect any breeding activity, kill them before they become adults. That's called LARVICIDE!

So what then do mosquitoes need? Why are they finding your backyard so darn attractive? They need suitable aquatic breeding habitats in order to complete their life cycle (a.k.a they need water). Eggs must be laid on the surface of slow-moving or standing water. Your first step in managing mosquitoes should be to remove any and all potential breeding areas – anyplace that water collects – from your yard. This will provide long-term control over mosquito populations and also controls populations before they mature and have a chance to reproduce, transfer disease, and annoy. If mosquitoes do breed, larviciding allows control measures to be used in targeted areas, while mosquito larvae are still concentrated in breeding pools and before adult mosquitoes spread throughout the community.

Adulticiding programs spray pesticides indiscriminately and do not get at the mosquitoes until they have matured and are already nibbling at your skin. They also do little to restrict breeding. Mosquitoes develop resistance to chemical pesticides over time, which render the chemicals ineffective. Adulticides present considerable risk to all living things, and kill beneficial insects and natural mosquito predators, such as dragonflies, damselflies, and beetles.

According to David Pimentel, Ph.D., an entomologist from Cornell University, close to 99.9 percent of the sprayed chemicals go off into the environment where they can have detrimental effects on public health ecosystems, leaving 0.10 percent to actually hit the target pest ("Amounts of Pesticides Reaching Target Pests: Environmental Impacts and Ethics." *Journal of Agricultural and Environmental Ethics* Vol. 8, No. 1

(1995), pgs. 17-29). He has continually questioned the efficacy of spray-based strategies against mosquitoes, conducting research for several cities in the mid-1980s.

Life Cycle of a Skeeter

There are more than 2,500 different species of mosquitoes in the world, 150 of which occur in the U.S. and a only small fraction of which actually transmit disease.

Mosquitoes go through four stages in their life cycle – egg, larva, pupa, and adult. Eggs can be laid either one at a time or in rafts and float on the surface of the water. *Culex* and *Culiseta* species stick their eggs together in rafts of 200 or more, which looks like a speck of soot floating on the water, about 1/4-inch long and 1/8-inch wide. *Anopheles* and *Aedes* species do not make rafts, but lay their eggs separately. *Aedes* lay their eggs on damp soil that will be flooded by water. Most eggs hatch into larvae within 48 hours.

Larvae live in the water and come to the surface to breathe. They feed on micro-organisms and organic matter in the water. They molt four times, growing larger after each molting, and changing into pupae after the fourth molt when they are about 1/2-inch long.

The pupal stage is a resting, non-feeding stage. This is when the mosquito turns into an adult. It takes about two days for the adult to fully develop, split the pupal skin and emerge.

Adults rest on the surface of the water to allow their body parts to harden and wings to dry. The complete life cycle can take as little as four days or as long as one month, depending on the temperature. Only adult female mosquitoes bite animals and require blood meals; males feed on the nectar of flowers.

Personal Prevention

- Remain indoors in the evenings, when most mosquito activity occurs.
- Use screened-in porches instead of open porches.
- Use herbal repellents to ward off mosquitoes, such as Skin-So-Soft or Herbal Armour. Reapply often. Herbs that repel mosquitoes include cedarwood, garlic, lemongrass,



Poster designed and illustrated by Grant Jerding (www.grantjerding.com) for the Maryland Pesticide Network (www.mdpestnet.org).

frankincense, cinnamon, geranium, eucalyptus, basil, rosemary, cloves, peppermint, lemon balm (citronella), onions, feverfew, thyme, and marigold.

- Essential oils of the herbs listed above are also good repellents, though most are volatile organic compounds and will bother someone who is sensitive to scents. To mix your own essential oil repellent, add 10 drops of essential oil to 2 tablespoons of vegetable oil, stir, and dab a few drops on your skin or clothing. Pregnant women should consult their doctors before using essential oils.
- Neem oil, used as a mosquito repellent cream and composed of 2% crude neem oil is a highly effective repellent. In various studies, its protection against the *Culex quinquefasciatus*, *Aedes* sp. and *Mansonia* sp. is greater than 75%.

Avoid repellents containing DEET, which is quickly absorbed through the skin and has caused effects ranging from large blisters to brain damage in children, with three deaths in the last 40 years tied to exposure. Studies have also found adverse effects from DEET mixed with permethrin, an insecticide commonly used for mosquito control, especially in spray programs. The combination of products caused the death of a large number of brain cells within the cerebral cortex, which controls muscles and movement, the hippocampal formation, which controls memory, learning and concentration, and the cerebellum, which synchronizes body movements. (For more information about DEET, see the ChemicalWATCH factsheet on pages 9-10.)

Household Prevention

- Maintain window screens and doors, closing all opened doors.
- Remove or regularly drain all water-retaining objects, such as tin cans, pet dishes, buckets, holes in trees, clogged gutters and down spouts, old tires, birdbaths, trash can lids, and shallow fishless ponds.
- Stock permanent water pools, such as ornamental ponds, with mosquito larvae eating fish.
- Check for standing water in plastic or canvas tarps used to cover pools and boats. Arrange tarps to drain water and turn canoes and small boats upside down for storage.
- Fix dripping outside water faucets.
- Enhance the drainage of flood canals, irrigation ditches and fields; keep street gutters and catch basins free of debris and flowing properly; and enhance drainage or create permanent deep pools in marshes.
- Remove or treat sewage leaks and lagoons, which provide excellent breeding conditions for certain species.

Monitoring

- Check ponds and sources of water for signs of mosquito larvae.

Control

- Burn **citronella candles** and torches to control mosquitoes in the immediate vicinity when there is no wind.
- The **Mosquito Magnet**, a machine much like a gas grill, burns propane gas that sends out a plume of carbon dioxide. The carbon dioxide attracts mosquitoes, which are then sucked in and killed. One magnet can control adult mosquitoes over an acre of land, though different levels of success have been reported. For more information see www.mosquitomagnet.com or call American Biophysics Corp. at 877-699-8727.
- Stock ornamental ponds with **mosquito larvae-eating fish**, such as mosquito fish of the *Gambusia* genus. They should be stocked in enclosed water so they will remain in the area in need of control. Only indigenous species should be used. Mosquitofish have a number of advantages over such things as goldfish and koi for biological mosquito control in ponds and other water sources: they actually eat mosquito larvae; they are voracious surface feeders with upturned mouths specially designed to get mosquito larvae where they live; they prefer the cover and protection of shallow overgrown areas along the shore which are also the preferred environs of mosquito larvae; and, since they give birth to live young (they are in the guppy family), they don't need any special sand or other substance for spawning. They are self-sustaining and self feeding. You can order mosquito fish through J. Reilly, 5000 Trenton Street, Metairie, LA 70006, 504-887-3666; Natural Pest Controls, 8864 Little Creek Drive, Orangevale, CA 95662, 800-873-1252; or Richmond Fisheries, 8609 Clark Road, Richmond, IL 60071, 815-675-6545.
- **Bacillus thuringiensis var. israelensis** is one of the most popular and most effective least-toxic biological controls. It is a bacterial strain that, when sprayed into larval pools, is ingested by feeding larvae and kills them. You can buy a product called Mosquito Dunks™ at your local lawn and garden store, in hardware stores, and in some catalogs and on line from Real Goods, www.realgoods.com, 800-762-7365 and Peaceful Valley, www.groworganic.com, 888-784-1722. The dunks are safe for birdbaths, rain barrels, ponds, ditches, tree holes, roof gutters, unused swimming pools — anywhere water collects
- **Horticultural oils** (vegetable based) are effective in killing larvae in water and sinking egg rafts on the surface. They also can kill non-target organisms including some mosquito predators that breathe from the surface.

Contact Beyond Pesticides for examples of successful community IPM programs for mosquito control.

Resources

- Beyond Pesticides. 2002. *Least Toxic Control of Pests In the Home & Garden: A series of pest control & chemical factsheets*. Washington, DC.
- Floore, Tom. 2002. "Mosquito Information." American Mosquito Control Association. <http://www.mosquito.org/mosquito.html>.
- Olkowski, Helga, Daar, Shiela, and Olkowski, William. 1991. *Common-Sense Pest Control*. Newtown, MA: The Taunton Press, Inc.
- Quarles, William. 1996. "Botanical Mosquito Repellents." *Common Sense Pest Control* 12(4): 12-19. Berkeley, CA.