

## **The Best Way to Control Mosquitoes** **Integrated Mosquito Management Explained**

The perfect control for mosquitoes would protect us immediately from bites and mosquito-borne diseases, and it would be simple, inexpensive, and safe for the environment. Initially, when modern pesticides were first introduced for control of public health pests in the middle of the 20th century, some thought the perfect control had been discovered. Unfortunately, despite some early successes, pesticides ultimately proved to be the less-than-perfect solution for long-term mosquito control.

Experience has shown that pesticides alone rarely produce complete or lasting control of pests, whether battling cockroaches in kitchens or mosquitoes in marshes. This observation is the basis of a control strategy called “integrated mosquito management” (IMM).



Mosquitoes are controlled most efficiently with an approach that blends the use of both chemical and non-chemical control measures. This is the essence of IMM, the preferred

approach for governmental mosquito control programs. Integrated mosquito management works best when done over a large area, like a neighborhood, community, or county.

### **COMMUNITY MOSQUITO MANAGEMENT**

Most community mosquito control programs are coordinated by city or county health departments. Because of the high profile of most mosquito spraying operations, with their truck-mounted fogging machines and highly publicized treatment schedules, many people assume that mosquito control is essentially spraying. But spraying is

only a small part of an IMM program. Chances are that your area health departments are actively involved in all aspects of IMM. The acronym SSLAP is sometimes used to describe the essential parts of an integrated mosquito management program. SSLAP is *Surveillance, Source Reduction, Larval Mosquito Control, Adult Control, and Public Education*.

**Surveillance.** Without a well-designed sampling and surveillance program, it is difficult to know what is really going on with mosquitoes in your community. Knowing what species of mosquitoes are active provides clues as to where breeding is occurring and whether public health is threatened. In addition to monitoring mosquito population changes, surveillance programs may monitor the presence of health-threatening viruses in wild animal and bird populations. This information is useful in determining whether and when spraying is needed, and allows health departments to issue health alerts and target awareness programs to affected parts of the community.

**Source Reduction.** Mosquitoes lead two separate lives. Most people think of mosquitoes as the delicate winged insects that fly about biting humans and pets. But before reaching the adult stage, mosquitoes live in water. Without these aquatic breeding sites, there would be no adult mosquitoes. Locating and eliminating the breeding sites of mosquitoes is one of the most important parts of a community mosquito control program.

**Larval mosquito control** means treating water breeding sites that cannot be drained, filled or otherwise eliminated. Typically the largest portion of community mosquito



control budgets is devoted to larval mosquito control. Mosquito larvae can be controlled biologically or through the use of low-impact pesticides that selectively kill only mosquitoes. Biological control of mosquitoes is usually done by releasing *Gambusia* (mosquito) fish, or similar minnow species, into water where mosquitoes are breeding. Mosquito fish are excellent predators and, where established, can quickly bring mosquitoes under control. Mosquito fish releases are usually made into creeks that periodically dry up and lose their fish populations.

Certain pesticides may also be used to control mosquitoes in small bodies of water that are inaccessible or impossible to drain. Included are the methoprene granules (Pre-Strike™ or Altosid®) or the bacterial insecticides *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*.



(sold in “dunks,” granules, or liquids). Special polymers (e.g., Arosurf® SF, or Agnique® MMF) or oil formulations (e.g., Golden Bear (GB-1111)) are

sometimes used to coat the surface of water breeding sites, making it difficult for mosquito larvae to attach to the surface of the water to breathe.

**Adult Control.** When source reduction proves inadequate, surveillance programs are used to direct health department to parts of your community at highest risk of mosquitoes or mosquito-borne diseases. There are several good reasons to limit the use of sprays for adult mosquitoes. Besides the high cost of such programs, the widespread use of insecticides often leads to community health concerns (especially among highly sensitive individuals) and the inevitable impact on beneficial insect species. Overuse of insecticides can also have the unintended effect of increasing the risk of insecticide resistance among target mosquito species. For these reasons, adult mosquito control is usually the action of last resort for most health departments.

**Public Education.** Most of us know how painful and annoying mosquito bites can be, but many people are still unaware of health threats posed by these insects and what individuals can do to prevent mosquito problems. At least 25% of mosquito complaint calls can be traced to the caller’s property. Learning how to recognize mosquito breeding sites, how to report suspected breeding sites, and how to protect oneself from bites are important learning objectives for community education programs.

## **BACKYARD MOSQUITO MANAGEMENT**

Despite the desirability of community-wide mosquito control, sometimes the best place to start is in your own backyard. As a homeowner you have access to all potential breeding sites in your yard and can start your own IMM program. The ingredients for a backyard IMM program are similar to those used by community health departments.

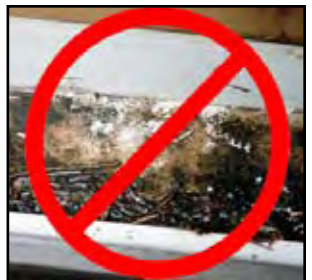
**Source Reduction and Larval Control.** The first step in developing a backyard integrated mosquito management program is to make sure you aren’t contributing to your own problem. Take a walk through your yard looking for potential mosquito breeding sites.



All a mosquito needs to breed is a few leaves or small amount of organic material (which provides the microorganisms mosquito larvae use as food) and water. In as little as a week, this water can pro-

duce mosquitoes. Mosquito breeding sites are more common in your backyard than you might think, and at least one site can be found in nearly every backyard during the warm months.

Backyard source reduction starts with “dump it, clean it, drain it, or fill it.” Buckets, wheel barrows, cans, tarps over pools or boats, or anything that holds water should be dumped and stored. Gutters should be cleaned regularly, and bird baths cleaned at least weekly. Cisterns or rain barrels should be tightly sealed and screened. Tire swings should have holes drilled at the bottom to allow them to drain, and low areas or ditches should be drained or filled with soil or gravel. Several products (e.g., mosquito dunks and methoprene granules) are available to consumers for treating standing water that cannot be easily drained or filled.



**Adult Control.** Adult mosquitoes typically rest on foliage during the day, coming out in the evening to bite. Many professional pest control companies now offer backyard spray services to control adults resting on foliage and in shady areas around the home with long-lasting, residual insecticides. Such treatments can provide 4 to 6 weeks of suppression of mosquito biting rates. Aerosol, do-it-yourself treatments are also available.

Some pest control companies and independent installers offer permanent, outdoor insecticide misting systems for

season-long control of mosquitoes around residences. Pyrethrum, the principal active ingredient used in these systems, is a proven general purpose insecticide with relatively low toxicity to humans and short life in the environment. Besides the initial cost of installation, the biggest concerns about these systems include impacts on beneficial insects, the potential for insecticide overuse, and possible unwanted drift into neighboring properties.

You can temporarily suppress mosquitoes by applying short-lived, non-residual fogs to the yard and surrounding foliage. Such treatments have the advantage of temporarily suppressing biting activity with little long-lasting effect on beneficial insects like butterflies and honey bees. Relatively inexpensive propane- or electric-powered foggers can be purchased at many discount and hardware stores. These units are ideal for fogging just before a picnic or other special event in the backyard.

Other backyard devices sold for mosquito protection include candles, bug zappers, ultrasonic mosquito repelling machines, and mosquito suction devices. Citronella candles and torches have been shown to provide relief from mosquito bites in the areas where the smoke wafts. But wind can limit the size of the protection zone and disrupt candle effectiveness. Research has shown that bug zappers provide little mosquito control and actually kill more beneficial insects than pests. Despite extensive research, there is no evidence that electronic devices sold to repel mosquitoes via sound really work.

Electric or propane-powered suction traps for mosquitoes have been tested and found to work to varying degrees. Unfortunately, according to the American Mosquito Control Association, advertising claims for these devices are sometimes “overstated” in the size of the area protected by a single unit. Under the right conditions it appears that these devices can significantly reduce biting mosquito numbers. If you desire to test one of these in your backyard, ask the seller about a satisfaction guarantee.

**Pest Proofing and Personal Protection.** The first line of defense against mosquitoes is screened windows and doors. Make sure all house windows are screened and that screens are in good repair. Protecting yourself and your family from nighttime biting mosquitoes is as important for your health as it is for getting a good night’s sleep.

Limiting your outdoor activities during evening and morning hours when mosquitoes are most active is another effective practice. If you must be outdoors during these times, wear protective clothing (long-sleeved shirt and pants) or a proven insect repellent. The longest

lasting, most widely sold, and effective repellent is DEET (N, N-Diethyl-3-Methylbenzamide). DEET provides up to 6 hours of high protection from mosquitoes and has an excellent safety record. People who dislike the smell or oily feel of DEET can choose from two excellent new repellents. Lemon oil of eucalyptus (an aromatic, plant-derived repellent) and picaridin (odorless) provide excellent, though somewhat less long-lived protection than DEET.

As in community-wide management programs, it's best to rely on more than one control tactic when treating yourself or your backyard for mosquitoes.

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