

Update

NPMA LIBRARY UPDATE

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Mosquito Control

A New Era for PMPs

In the past year, more and more PMPs have been expanding services to include mosquito control. Opportunities for mosquito control are widespread, including schools, hospitals, office complexes, communities, recreational areas, apartment complexes, and homes.

Many states have unique requirements for companies performing mosquito control, including special permit requirements for applications to bodies of water. For specific state requirements, contact your state's pesticide regulatory agency.

Training of employees handling mosquito control is also important. Products and use information is available through your supplier.

Mosquito Health Threats

Due to increased public awareness of these diseases, there is more demand for mosquito control today than ever before.

Outbreaks of West Nile virus and encephalitis have caused concern among the public, and PMPs are ready to assist.

The frightening reality is that these diseases may originate nearby or from as far as twenty miles away.

Due to media attention, West Nile virus is probably the most recognizable disease associated with mosquitoes. West Nile was first detected in the U.S. in 1999. West Nile virus and St. Louis encephalitis are



transmitted to humans by the house mosquito, *Culex pipiens* L.

Other important mosquito-borne encephalitis viruses include:

- Eastern equine encephalitis (EEE) spread by *Aedes* spp. and *Ochlerotatus* spp.,
- Western equine encephalitis spread by *Culex tarsalis* Coquillet
- LaCrosse encephalitis spread by *Oc. triseriatus* (Say)
- Viruses that cause dengue and yellow fever spread by the Asian Tiger mosquito *Aedes albopictus* (Skuse) and related species.
- Malaria, which within the past few years has been found in northern Virginia in at least three cases. In these instances, malaria acquired locally, probably through mosquito *Anopheles quadrimaculatus* (Say).

Breeding

Breeding occurs in standing water. Each group has preferred breeding sites.

Aedes and *Ochlerotatus* spp. breed in almost any small to medium-sized containers of fairly clean water. Typical sites include: cans, bird baths, tires, cemetery

urns, flower pots, tree holes, wading pools, clogged gutters, soft drink cups, and discarded foam containers.

Anopheles spp. breed in open, clean water which has vegetation in it. Typical sites include: grassy roadside ditches, pond or lake edges, and flooded fields.

Culex spp. breed in small to large containers with lots of decaying organic matter in them, including storm drains, tires, and water-filled trash cans.

Female mosquitoes usually seek blood meals either mainly during daylight or mainly during the night. Some "day biters" may stay active through dusk and some "night biters" may start seeking a blood meal before full dark and stay active until past dawn.

Some mosquito species will take blood from only one, or a few closely related, species; but others may feed on a very wide range of hosts. *Culex pipiens* and some other vectors of WNV, feed equally readily on birds or humans.

Breeding occurs in OR NEAR standing water.

Feeding Behavior

Typically, a female mosquito seeking a blood meal will detect a host from a distance (120 ft. or more) downwind, fly up the odor plume, and land nearby but not on the host. After a brief rest, she will fly the short distance to the host, land, and feed. After she has taken her fill, she will fly a short distance away (usually less than 10 ft.) and rest on a vertical surface for more than an hour while she eliminates about half of the water from that blood meal before she flies off to a typical breeding site, to finish developing and laying her eggs. This is done by almost every species of human-biting mosquitoes.

Residual insecticide treatments on



Mosquito Biology

Mosquitoes have four stages: Eggs, Larvae, Pupae, and Adults.

Eggs are laid in or near water. Not all mosquitoes lay eggs on stagnant water. Asian Tiger Mosquitoes and their relatives (*Aedes* or *Ochlerotatus* spp.) lay single eggs either in or on moist organic matter (like old leaves) or mud at or near the normal surface of some water body or standing water. House Mosquitoes and their relatives (*Culex* spp.) lay their eggs stuck together in "rafts" on the surface of standing water. Malaria Mosquitoes and their relatives (*Anopheles* spp.) lay single eggs directly on the surface of standing water.

Larvae of nearly all species feed on tiny bits of organic matter they strain out of the water, using brushes on their mouths. They usually move by jerking their body, end-for-end, in a sideways whipping motion. Nearly all species must come to the water surface fairly often, where they breathe atmospheric air through a special tube (siphon) or plate at their back end.

Pupae are a non-feeding, but active stage that must stay in the water to live. They also must breathe air at the water's surface through special tubes (trumpets) on their backs.

Adults emerge from pupae in the water. If water is not calm enough, they may not emerge normally; and may get stuck or drown. They have to sit on top of the water until their body and wings dry and harden. They fly to nearby plants and feed on nectar or juices, getting energy from the sugars in those. Males need about 24 hours after they emerge before they can mate. After mating, females find vertebrate hosts and take a blood meal which provides protein for their eggs. Each full blood meal usually provides enough protein and energy for the female to produce about 100 eggs.

Adults usually rest on vertical surfaces like tree trunks, twigs, or walls with their head upward. Treating vertical surfaces with a residual insecticide may kill them or repel them, forcing them to rest elsewhere.

such surfaces may help reduce the mosquito population. A few species will sometimes land directly on their hosts before feeding, but after feeding, almost all species make a short flight and then rest on a vertical surface while reducing the blood meal volume (usually to <50% of the volume taken in).

Most local-breeding mosquitoes (including the main vectors to humans of WNV, dengue, and malaria) will routinely feed within 200 feet of where they emerged as adults. However, nearly all of these same species can fly as far as a ½ mile radius to feed; and then return to the same breeding site to lay their next batch of eggs (a few days later).

Surveillance

Surveillance is very important in developing a control program when inspecting a site for mosquitoes.

First, search for sites for larvae of any mosquito species of concern, based on their known preferences. Don't forget gutters, flower pots, pets' water dishes, or any other standing water.

Check all temporary containers of water, looking for any mosquito larvae.

Advise the customer as soon as possible about any breeding found and advise them about corrective or preventive measures they can take.

If appropriate, spot treat breeding sites that cannot be emptied or removed. Use properly labeled bacterial or IGR larvicide as directed by the contract.

Keep a good record of survey results for future reference and to support the need for any treatments applied.

Adult Surveys will help you determine the severity of a mosquito population. Surveys are not required but are a good tool for monitoring.

Advise the customer as soon as possible about any presence of adult mosquitoes collected, and advise them about corrective or preventive measures they can take, including personal protective measures.

If you need identification services, send specimens collected to a university for identification. Be sure to include collection information like location, date, type of trap, and collector's name.

Keep a good record of survey results for future reference and to substantiate any need for treatments based on nuisance populations.

Control Strategies

The "classical" strategies of extensive larviciding; area adulticiding by ULV (or fogging) treatments; systematic community inspections; and aerial spraying by ULV chemicals are usually not practical, nor affordable, for individual residences or small businesses. These are most often the functions of government agencies or tax-supported Mosquito Abatement Districts.

The fact is that most local or "individual site" control efforts **cannot totally prevent all mosquito biting**; and can never guarantee that any person or pet will not be infected by a mosquito-borne disease.

Despite that, there are several control methods which PMPs can effectively use. These methods work for individual residences, gated communities, special events, and commercial properties. These methods also can significantly reduce local-breeding mosquito populations depending on the species and biology of that species. These may also reduce risks of potential disease and annoyance spread by such vectors. These control measures include:

- 1. Source Reduction** - The elimination of breeding sites: dumping water-filled containers; removing trash, tires, or other containers which can hold water; draining or filling surface puddles; and cleaning out gutters. Bird baths should be emptied, brushed out, rinsed and refilled *at least once weekly*.
- 2. Larviciding** - Applying any material which kills larvae or pupae in their water habitats. Materials used may be: bacterial products (like B.t.i.); IGRs (like methoprene); surface films (oil, or MMFs); or in some states chemical pesticides (like Fenthion™ in Fla.).
- 3. Aerosol (or ULV) Treatment** – Involves a chemical insecticide dispersed by aerosol or by ULV into a partially closed space like a storm drain, out building, below ground window well to kill adult mosquitoes. Synergized pyrethrum or synthetic pyrethroids are the typical chemicals used. Some pest control companies are using this method in outside living areas such as near patios and pools.
- 4. Residual Adulticide Applied to Walls, Tree Trunks, or Bushes** – can kill female mosquitoes which rest on

those before going to a host to feed or when resting there after feeding.

For specific treatment programs and materials, contract your product supplier. The manufacturers of the technologies and materials for best control practices have briefed your suppliers. There are also some homeowner products, such as traps, being currently marketed.

Customer Education

Customer Education is a necessary part of any successful residential pest management effort. It is essential for your customers to understand as much about mosquitoes as possible, because they play a big role in protecting themselves. It is also very important for them to understand, that you **can** help greatly reduce local breeding and population numbers; but that you **cannot** guarantee that there will be no mosquitoes biting, nor that they will not become infected with a mosquito-borne disease. However, your program can significantly reduce these risks.

The elements of a good customer education program may include:

- 1. A handout** which briefly covers the importance, biology, breeding sites, key behaviors, and main elements of effective control of a few locally important potential disease vector species. It should include personal protective steps and source reduction steps they can take themselves. It should include one or a few key references, contact points, and web site addresses for local and maybe state public health and educational sources they can contact if they wish. It should include the strategies the pest control firm will use.
- 2. An information contact and follow-up system** - so they can contact you to get questions answered. Coordination, especially with local, regional, and state Public Health agencies and, if they exist, also with Mosquito Control (or Abatement) agencies is essential. Those agencies may already have a lot of current, and historic, data on mosquito species presence, distribution, prevalence, and a lot of useful local, regional and national

disease information. They may also be willing to cooperate in providing at least limited monitoring or ID support.

Contracts

In developing a mosquito management program, companies need to remember that mosquito control requires different steps and scheduling than regular pest control. This means that your contracts that cover general pest control probably will not be adequate for mosquito control work.

Some states require specific contracts for pest control services and mosquito control contracts may have some minimum language required by the state. Always follow state regulations regarding contracts. If your state has no regulations, work with your attorney to develop a mosquito contract.

The contract should include cost, frequency, work to be performed, customer responsibilities, call back details, length of the contract, disclaimers, and signatures of all parties.

Also, there are two areas of disclosure that should be considered for any mosquito control contract.

The first disclaimer explains that even under the best situation, the property will not be mosquito free. The biology of mosquitoes prevents complete eradication. The program will certainly reduce populations, but a mosquito-free environment is not generally possible.

The second disclaimer explains to the customer that mosquitoes carry disease and that the company is not responsible for any diseases carried by mosquitoes.

Both disclaimers can be found at www.pestworld.org. Also the *NPCA Field Guide* has some information on mosquitoes. A Mosquito video is available for sale from NPMA.

Conclusion

Mosquito control is a valuable add-on service for you and your customer. No other industry understands the needs of the customer like this industry. As with any IPM program, inspection, identification, control measures, and interaction with the customer are all important parts of the program. 🐛