Mosquito Control Around the Home

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Mosquitoes are a common summer pest in many communities. In addition to their biting and nuisance behaviors, mosquitoes also can transmit the pathogens that cause West Nile virus disease, Eastern equine encephalitis, La Crosse encephalitis and heartworm disease in our pets. Thankfully, in many cases, residents can significantly reduce the number of mosquitoes around their homes and neighborhoods. By learning the life cycle and preferred habitats of mosquitoes, residents can use an integrated pest management approach and take a vested interest in eliminating the conditions that often contribute to mosquito populations. The core principles of integrated mosquito management include education, source reduction, surveillance, larviciding, and adulticiding; these are covered extensively in UGA Extension Circular 1154, Best Practices of Integrated Mosquito Management. By reading this circular, you're taking the first step in conducting integrated mosquito management around your home.

Figure 1. Mosquito larvae.

Figure 2. Mosquito pupae.

Mosquito Development

All mosquitoes require standing water for their development. Female mosquitoes deposit eggs on the surface of standing water or in places that become flooded or filled with water. After the eggs hatch, the larvae—sometimes called wigglers—develop through four instars, or stages. Under the ideal conditions of warm temperatures and abundant food (e.g., small plants, animals, and particles of organic matter) the larval stage, shown in Figure 1, may last as little as 5–6 days, but typically takes longer. After completing the larval stage, pupation occurs. The pupae (Figure 2), commonly called tumblers, typically require 2–3 days before they emerge from the water as adult mosquitoes and disperse to nearby vegetation. Both male and female mosquitoes feed on nectar and plant fluids that provide energy for flight, but only females seek blood in order to acquire the nutrients they need to sustain egg development. It is this blood-feeding behavior that causes mosquitoes to be such significant pests. Additional information is available in UGA Extension Circular 1155, Mosquito Biology and Behavior.

What Residents Can Do

The most important and effective practice to reduce mosquito populations around the home is the diligent elimination of all standing water on the property and in the neighborhood. Potential larval habitats include any item or debris that holds water for a week or longer. Typical sources include the trays associated with potted plants, any type of tarp or covering, garbage cans (even when upside down), rain barrels, buckets, used tires, gutters, and drainage systems. Anything that holds water has the potential to be a larval mosquito habitat. Many of these habitats can be permanently eliminated by practicing "tip and toss." This simply means dumping standing water out of containers and then disposing of them or positioning them so they won't get refilled. By learning mosquito biology and preventing mosquitoes from developing around our homes, we are taking a proactive approach that will permanently reduce mosquito populations and lessen the need for pesticide applications.

After eliminating all sources of standing water around homes and in neighborhoods, residents should find out what type of organized mosquito control is conducted in their communities by the town or county government

or local health department. The Georgia Mosquito Control Association website is another resource to check for this information. The more comprehensive approach that is undertaken, the more efficient and effective the mosquito control effort will be. By communicating with local authorities, residents may receive help from trained personnel both to determine what is causing mosquito populations to thrive in an area and to reduce the problem. Local mosquito control programs should be supported by residents, as they are the best resource for information and assistance. However, residents always need to take responsibility for eliminating containers and debris that hold water in their own yards.

Controlling Mosquito Larvae

Sites where mosquito larvae (Figure 1) are found that can't be eliminated should be treated with a larvicide approved by the Environmental Protection Agency (EPA). Larvicide and adulticide options are listed in the Georgia Pest Management Handbook. When considering pesticide applications, read the pesticide label carefully and know that all pesticide applications must be conducted in strict accordance with the pesticide label—the label is the law.

Effective larvicide applications require an understanding of the biology of the pest and the characteristics of the larvicide. Mosquito briquettes, or dunks, that are most readily available in feed and seed or home repair stores are best suited for use in small volumes of water, such as rain barrels or catch basins. The active ingredients in these products usually are bacterial proteins (Bacillus thuringiensis subsp. israelensis or Bti) that are very specific to mosquito larvae and pose no risk to plants, pets, or people.

Granular formulations of Bti-based larvicides also are available and are best used to treat roadside ditches or low-lying areas that hold water and have intermixed vegetation. No matter the formulation, Bti proteins must be ingested by larval mosquitoes for these products to be effective.

Granular and tablet formulations of Methoprene, and insect growth regulator, are available in some stores. The active ingredient imitates a hormone that regulates larval and pupal development and interferes with adult mosquito development and emergence. Methoprene is absorbed through the larval cuticle or is ingested, but does not kill the larvae immediately. In some cases, this trait is preferable because it leaves the larvae and pupae in the aquatic food web. Methoprene-based products also are safe for use around pets, people, and livestock.

Controlling Adult Mosquitoes

Sometimes habitats supporting mosquito larvae and pupae are difficult to locate, inaccessible, or expansive. When this is the case, some type of adulticide application may be required. Adulticide applications have been used for mosquito control for a long time. It's common for those working in mosquito control to hear stories about people running and riding bikes behind spray trucks in their youth. This practice was never recommended and thankfully today's adulticide technology, products, and practices are more refined and regulated. When using properly approved and applied products, adulticide applications can be very effective at temporarily reducing adult mosquito populations.

Figure 3. Aedes albopictus.

The two most common types of adulticide applications available to homeowners involve either a spray of fine aerosol droplets, commonly called ground adulticiding, or a residual barrier application. A ground adulticiding application is a version of the traditional technique

where small droplets (10–25 microns) of insecticide are released in the area where adult mosquitoes are actively flying. A residual barrier spray involves the insecticide being applied to surfaces where a mosquito will rest. Both techniques are effective when conducted properly.

When conducting a space-spray application, the insecticide droplets are effective only against the mosquitoes that are present at the time of the application and that come into contact with the suspended insecticide droplets. In most cases the impact to the mosquito population will be short-lived if the nearby larval population is not addressed. Other environmental factors become important when considering a space-spray application. Some concerns that homeowners commonly have include when to treat so that pest populations can be targeted effectively, protecting pollinators by not spraying around plants with active bees or beehives, and preventing insecticide drift onto neighboring properties.

With these concerns in mind, it is imperative that homeowners or commercial applicators document the presence or level of adult mosquito activity prior to an adulticide application. This can be done using a modified landing-rate count. A simple protocol could involve walking in a 20-ft-diameter circle, standing still for a minute, and then counting the number of mosquitoes that land on you over the next minute. If disease transmission is a concern, the mosquitoes could be collected with a standard insect net as they approach the observer conducting the surveillance. A more refined approach would involve using standardized sites and times along with the same individual dressed in navy blue coveralls and not wearing a hat or using cologne, tobacco, or gum while conducting surveillance. The most important aspect of any counting effort is to document the presence of adult mosquitoes prior to conducting an adulticide application. By avoiding unnecessary pesticide applications, residents can save money, reduce the risk of exposing pollinators to pesticides, preserve pesticide susceptibility, and act with environmental sensibility.

It's common for most mosquitoes to be active around dawn and dusk and to rest in vegetation or in protected areas during the heat of the day. These resting areas are commonly called harborages and should be targeted no matter what type of mosquito or adulticide application is conducted. Aedes albopictus, the Asian tiger mosquito (Figure 3), is a common pest across the state and is a species many homeowners encounter because of their daytime biting behavior. Tiger mosquito populations often seem to be most prevalent in the lower (downhill) sections of neighborhoods, often along creek bottoms and drainage swales where privet thickets (Ligustrum japonicum) occur and in areas where thick, low vegetation like English ivy (Hedera helix) are present. Other species of mosquitoes also will rest in vegetation and feed on hosts that approach the vegetation where they are hiding. No matter the species being targeted, spray applications should be conducted in the last hour before sunset or after dark, when thermal currents won't carry the insecticide droplets upward and away from the areas of mosquito activity. By applying adulticides later in the day, we minimize the risk of contact with pollinators, which usually return to their nests or hives by late afternoon.

Aerosol foggers are the most basic space-spray technique residents can use to suppress adult mosquito populations. These devices produce a small spray-cloud of insecticide droplets that can reduce the number of active mosquitoes. However, the effects are very localized and temporary, and this is the least economical approach to adult mosquito control. Small electric, propane, or gas-powered foggers are available from many home supply stores and are a more efficient approach. These devices are basically a miniaturized version of the foggers used for wide-scale adulticide applications and are effective and easy to use. The label is the law for all pesticide applications, and this is particularly true for fogging applications when insecticide droplets are being released into the environment. Particular caution should be used around flowering vegetation and areas known to have beehives. Flowering vegetation should never be treated. It is important that the person making the application carefully read the instructions and safety precautions. More information on controlling mosquitoes while protecting pollinators is available in UGA Extension Circular 1188, The Intersection of Mosquito Management and Pollinator Protection.

Homeowners also can conduct their own adulticide barrier spray or residual application. For these treatments, handheld pump sprayers or motorized backpack sprayers are used to apply a coarse spray to all surfaces of a

harborage where a mosquito may rest. Typical habitats include hedges and shrubbery around pools, decks, and patios, vegetation bordering a yard, and low ground coverings like English ivy. These harborages provide a protected area that allows the adult mosquito to stay in the shade during the heat of the day.

The effectiveness of residual barrier treatment will depend on several factors. Rainfall after an application will reduce the length of time it remains effective. Additionally, the more force that is used during application, the better the spray droplets will penetrate dense vegetation and coat surfaces. For example, applications made with motorized backpack blowers typically will be more effective than those made with handheld pump sprayers. With residual barrier applications it is again critical to avoid all flowering and budding vegetation that will attract pollinators.

Summary and Additional Resources

Residents can do a lot to reduce mosquitoes around their home. Diligently eliminating standing water is the critical first step in mosquito prevention. Residents can apply approved larvicides where mosquitoes are developing if those sites can't be eliminated; they also can conduct targeted adulticide applications when mosquitoes are present and larval habitats can't be found or treated. Residents should also remember to contact their local mosquito control organization or public health department when mosquito populations become excessive. It is possible that these local authorities are unaware of the problem and can help to mitigate the pest population. If no organized mosquito control program is in place in the community, then an independent commercial operator could be an effective option.

The practices described in this circular are a condensed version of practices laid out in Extension Circular 1154, Best Management Practices of Integrated Mosquito Management.

Additional resources can be found online:

- Georgia Department of Public Health (dph.georgia.gov)
- Georgia Mosquito Control Association (www.gamosquito.org)
- Centers for Disease Control and Prevention (www.cdc.gov)
- Environmental Protection Agency (www.epa.gov)

Information on licensed commercial applicators can be found at the Georgia Department of Agriculture website: https://www.agr.georgia.gov/pesticides.aspx

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