

Residential Mosquito Control and Beneficial Insects

With the threat of new emerging infectious diseases in the United States (West Nile virus, Malaria, Dengue), the clamor for novel personal protection/vector control devices has increased significantly over recent years. The two new tactics that have been introduced for controlling disease-carrying insects in a residential setting consist of fogging the vegetation surrounding the home with long-lasting insecticides and the installation of residential misting systems that spray the desired area with an insecticide on a daily basis. There have been some preliminary studies conducted that show that these tactics can have some effect on the mosquito populations in the backyard setting. However, these new control tactics and devices may have an adverse effect on the beneficial insects providing natural biological control of pest species in the areas subjected to the chemical treatments.

Beneficial insects include all the organisms that occur in the environment (may be augmented by the homeowner) that help to keep pest arthropod populations low, pollinate various plant species, and prevent major damage to backyard landscaping. Beneficial insects are subdivided into categories based on how they attack their prey. If the insect actively feeds on the pest species, it falls into the predator category. The second category, or parasitoid category, consists of insects that utilize other insects as hosts to complete their life cycle usually resulting in the death of the host insect. The host species in this case



are often themselves important economic pests. The adult female parasitoid oviposits (lays her eggs) in or on a life stage

(egg, larvae, nymph, pupa, adult) of the host species. The larvae hatch from these eggs and burrow into the host species' body where they feed on internal tissues, grow, and complete their life cycle.

Some common beneficial insects found in the backyard settings include:

Predators

Lady Bugs or Ladybird Beetles

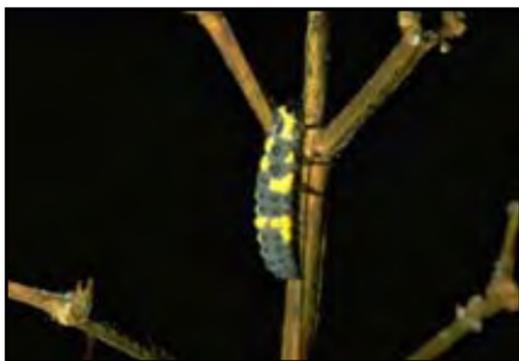
(*Coccinellidae*) –

These are small, convex, oval-shape, and often brightly colored beetles (many have distinct patterns used for



Lady Bug – adult

identification). Both the larval and adult stage are predaceous on small soft-bodied insects (whiteflies, thrips, mites, small caterpillars), most notably aphids. The larval stages are 3/8 of an inch long, slender, moderately flattened, and resemble small alligators. The adults will hibernate (overwinter) in large groups in caves and attics



Lady Bug – larvae

and can be considered a pest based on the location they choose to hibernate. Some species can be obtained from commercial sources to augment the local populations.

Green and Brown Lace Wings

(*Chrysopidae* and *Hemerobiidae*) – The

larval stage of this insect is predaceous on a number of soft-bodied insects, chiefly on aphids (the larvae are often called aphid lions).



Green Lace Wing – larvae

The larvae are long, slender insects that are



Green Lace Wing – adult

equipped with large, sickle-shape mandibles that they use to actively hunt prey. Some adults are predaceous but most feed on pollen or honeydew. Some

species can be obtained from commercial sources to augment the local populations.



Syrphid – adult



Syrphid – larvae

Syrphid Flies or Flower Flies (*Syrphidae*) – Many species of syrphids are predaceous on other insects (chiefly aphids) during their larval stage. The larvae are long, slender, and “maggot-like” in appearance. The adults are important pollinators for a variety of backyard plants.

Assassin Bugs, Ambush Bugs, and Thread-Legged Bugs

(*Reduviidae*) – This large group of true bugs encompasses 160 North American species that vary in size and coloring. These bugs are predaceous on other insects and feed by stabbing the prey insect with its modified “straw-like” mouthparts. These insects can inflict a painful



Assassin Bug – adult



Wheelbug – adult

bite and should not be handled. These insects inhabit a diverse number of habitats in the environment (field crops, leaf litter, orchards, flowers, and garden plants).

Minute Pirate Bugs (*Anthocoridae*) – These are small (2-5 mm) oval-shaped bugs with many species sporting black and white markings. These true bugs feed on small insects and insect eggs and are found on flowers and in leaf litter.

Damsel Bugs

(*Nabidae*) – These are small true bugs (3.5-11 mm) that feed on a variety of insects including aphids, cotton flea



Damsel Bug – adult

hoppers, lygus bugs, mites, and caterpillars. These insects

play an important role as natural predators in several commercially grown crops (cotton and sorghum).

Ground Beetles

(*Carabidae*) – This family encompasses a large number of species (2,200+) that range in size and color and can be found in a multitude of habitats (under stones, logs, leaves, bark). Both larvae and adults are generalist predators and feed on a wide assortment of insects. One of the most common carabids seen is the metallic-colored beetles belonging to the genus *Calosma* and often called caterpillar hunters.



Caterpillar Hunters – Carabids – adult

Praying Mantids

(*Mantodea*) – Are long, slender insects with modified raptorial front legs. These insects feed on a variety of insects including other mantids. They usually lay in wait for their prey with their front legs held in a characteristic upraised position. This behavior has given the rise to their common name “praying mantids.”



Praying Mantid – adult

Spiders (*Araneae*) – While spiders are not insects, they are arthropods that play an important role in controlling pest species. Spiders are generalist predators, with their diet including a wide variety of insects.

Parasitoids

Tachinids

(*Tachinidae*) – These insects belong to a diverse family of flies that consists of 1,300+ species. These flies most commonly deposit their



Tachinid – adult

eggs directly on the host's body. The eggs hatch and the larvae burrow into the host's body and feed internally usually resulting in the death of the host. Tachinids will attack butterflies, moths, sawflies, beetles, true bugs, grasshoppers, and crickets.

Ichneumonids

(*Ichneumonidae*) – These wasps vary in size, coloration, and form but tend to be slender in appearance with long, many-segmented antennae and a long ovipositor which can be longer than the insect's body. The female wasp uses her long ovipositor to penetrate plants or other substrates to deposit her eggs on, in, or near the chosen host species.



Ichneumonid – adult

Braconids (*Braconidae*) – These wasps resemble ichneumonids in appearance. Depending on species, the female wasp oviposits her eggs in a variety of hosts and life stages (egg, larvae, nymph, pupa, or adult). Often the size of the wasp and length of ovipositor depends on the type of insect the female lays her eggs on.

Pollinators



Honey Bee – adult



Bumble Bee – adult

Honey Bees and Bumble Bees (*Apidae*) – These insects belong to an extremely important family that provides pollination for a number of field crops, orchards, as well as backyard plants. Bumble bees are larger, more robust, and are characteristically black and yellow in coloration. Honey bees are smaller in size and are typically golden brown and black in coloration.

Fig Wasps (*Agaonidae*) – The fig wasp's life cycle is closely tied to the fig trees they inhabit with the fig tree relying exclusively on this insect for pollination. The female wasp pollinates the fig tree when laying her eggs, usually losing her life in the process.

The loss of these predators, parasitoids, and pollinators due to chemical treatments can significantly affect the backyard ecosystem leading to a variety of problems. Most pest species are able to reproduce at a quicker pace and produce more offspring per reproductive cycle than most beneficial insects. These advantages allow pest species to recover faster from chemical applications than beneficial insects; and without the natural control agents present, large outbreaks of these pest species can occur.

Another problem occurs when an insecticide application results in all of the insects (both pest and beneficial) being eliminated. This creates a void in the ecosystem that a secondary pest can exploit. A secondary pest is a species that is usually suppressed by the other insects (both pest and beneficial) present in the ecosystem but can cause significant damage when no competition or natural control is present. Additional insecticide treatments may then be required to stop the outbreak of these secondary pests. A final problem that can occur from continuous residential chemical applications is the development of resistance to the insecticide not only in the mosquito populations targeted for control but the other pest species present in the backyard. This causes the pest insects to become more difficult to control with the insecticide being used and may require an increased dosage or an alternate insecticide to be employed. Additional information on resistance and its management can be found in the publication titled “Avoiding the Super Mosquito: What You Need to Know About Insecticide Resistance in Mosquitoes.”

To preserve the beneficial insects currently located in the backyard and retain the positive effects they provide, a conservative approach to chemical applications should be followed. Chemical applications should only be made as a last resort and only if the application is justified. The best solution is to practice an integrated pest management program that includes multiple tactics (cultural, mechanical, biological, physical, legal) to control the target pest without losing the beneficial effects that these insects provide. Additional information on integrated mosquito management can be found in the publication titled “The Best Way to Control Mosquitoes: Integrated Mosquito Management Explained.”

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Photos

Courtesy of Dr. Bastiaan “Bart” Drees (Professor, Entomologist, Regents Fellow, Texas A&M University)

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