



## 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. Some preliminary studies have been conducted that show 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 use other insects as hosts to complete their lifecycle, usually resulting in the death of the host insect. The host species in this case are often in themselves important economic pests. The adult female parasitoid oviposits (lays her eggs) in or on a life stage (egg, larva, 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 lifecycle.

## **Common Beneficial Insects Found in the Backyard Settings**

### ***Predators***

#### **Lady Bugs or Ladybird Beetles**

(*Coccinellidae*) – These are small, convex, oval and often brightly colored beetles (many have distinct patterns used for identification). Both the larval and adult stages are predacious on small, soft-



***Lady Bug - adult***

bodied insects (whiteflies, thrips, mites, small caterpillars), most notably aphids. The larval stages are 3/8-inch long, slender, moderately flattened and resemble small alligators. The



***Lady Bug - larvae***

adults will hibernate (overwinter) in large groups in caves and attics 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*) – At larval stage this insect is predacious on a number of soft-bodied insects, chiefly on aphids (the larvae are often called aphid lions). The larvae are long, slender insects equipped with large, sickle-shaped mandibles that they use to actively hunt prey. Some adults are predacious but most feed on pollen or honeydew. Some species can be obtained from commercial sources to augment the local populations.



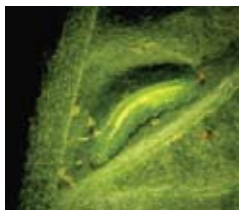
*Green Lace Wing - larvae*



*Green Lace Wing - adult*



*Syrphid - adult*



*Syrphid - larvae*

**Syrphid Flies or Flower Flies** (*Syrphidae*) – Many species of syrphids are predacious 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.



*Assasin Bug - adult*

**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 predacious on other insects and feed by stabbing the prey insect with its modified “straw-like” mouthparts. These insects can inflict

a painful 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).



**Wheelbug - adult**

**Minute Pirate Bugs** (*Anthocoridae*) – These are small (2-5 mm) oval 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 Bug - adult**

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

## **Spiders (*Araneae*)** –

Although not insects, spiders are arthropods that play an important role in controlling pests. 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 eggs directly on the host’s body. The eggs hatch, and the larvae burrow into the host’s body and feeds internally usually resulting in the death of the host.



*Tachinid - adult*

Tachinids will attack the butterflies, moths, sawflies, beetles, true bugs, grasshoppers and crickets.

## **Ichneumonids**

(*Ichneumonidae*) – These wasps vary in size, coloration, and form but tend to look slender with long, many-segmented antennae and a long ovipositor that can be longer than the insects body. The female wasp uses her long ovipositor to penetrate plants



*Ichneumonid - adult*

or other substrates to deposit her eggs on, in or near the chosen host species.

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

## **Pollinators**

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



***Honey Bee - adult***



***Bumble Bee - adult***

**Fig Wasps** (*Agaonidae*) - The fig wasp's life cycle is closely tied to the fig trees they inhabit with the fig tree relying exclusively of 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 because of chemical treatments can significantly affect the backyard ecosystem, leading to 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 dosages or an alternate insecticide to be employed.

Additional information on resistance and its management can be found in the publication, "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, "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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