

The Gypsy Moth

Gypsy moth is the most important insect pest of forest and shade trees in the eastern United States. The larval or caterpillar stage frequently strips entire trees and even forests of their leaves over wide areas. When deciduous trees are stripped of their foliage, many species will try to re-leaf (grow new leaves) during the hot, dry midsummer. Consecutive years of severe defoliation can weaken trees, leaving them more susceptible to other stresses, such as drought, disease, and other lethal-insect pests such as borers. Trees that are already weakened may be killed and evergreen plants may not survive the first year's defoliation. **Oak trees are most vulnerable to gypsy moth devastation**, though caterpillars have been found to feed on leaves of more than 500 species of trees and shrubs.

Gypsy moth caterpillars can also be a significant nuisance when populations are high. They have a tendency to congregate on the sides of homes and other structures, as well as produce large quantities of frass (fecal pellets), which fall from tree canopies onto yards and patios below. Some people may experience discomfort when they contact the many hairs covering the body of caterpillars.

Gypsy moth is native to Europe and was originally introduced into Medford, Massachusetts in 1869 by Leopold Trouvelot, a French astronomer with an interest in insects. Trouvelot wanted to develop a strain of silk moth that was resistant to disease as a part of an effort to begin a commercial silk industry. However, several gypsy moth caterpillars escaped from Trouvelot's home and established themselves in the surrounding areas. Despite all control efforts since its introduction, gypsy moth has persisted and has extended its range. States with gypsy moth include Pennsylvania, New York, and down across Maryland to Virginia. It is also established in Michigan. In Ohio, gypsy moth is present along the eastern forest areas. Several counties in Wisconsin and Indiana, as well as Cook, DuPage, Lake and McHenry Counties in Illinois, now have gypsy moth infestations.

Life Cycle of the Gypsy Moth

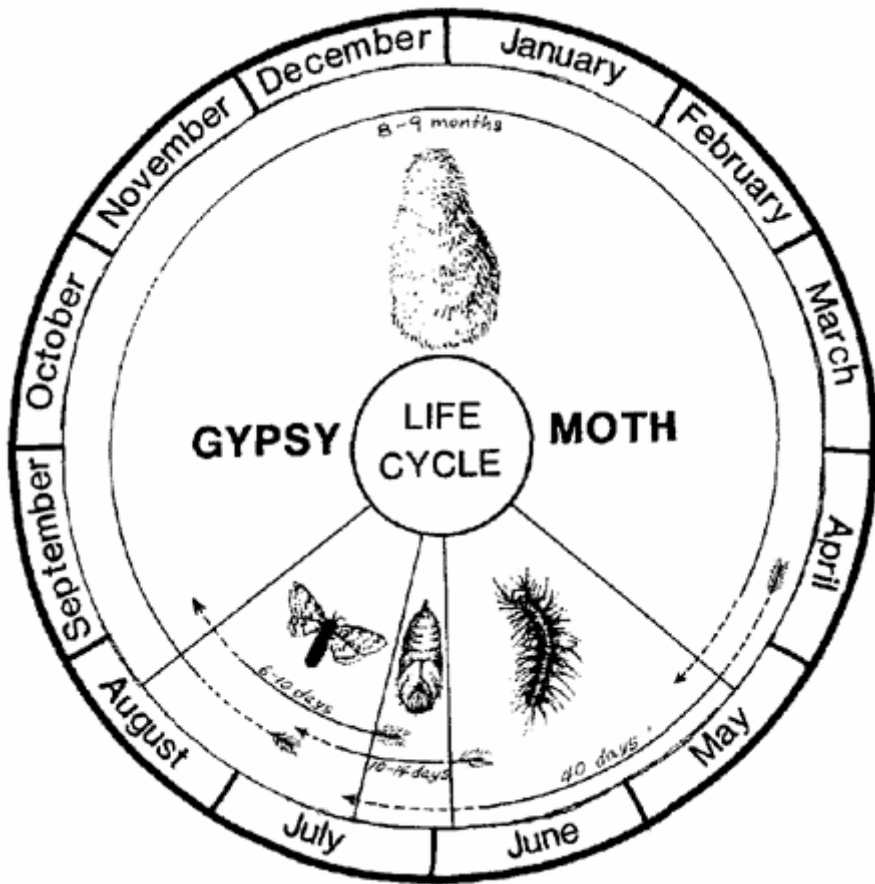
The gypsy moth survives the winter in the form of eggs laid in masses with as many as 1,000 eggs or more per mass. Eggs hatch in April or early May into tiny (about 1/4 inch long), black, hairy caterpillars. Newly hatched caterpillars climb into tree canopies and begin feeding. If their first tree is not to their liking, they will produce a silken thread, which carries them like a balloon on wind currents to more suitable hosts. The caterpillars continue feeding throughout the rest of the spring, undergoing five to six molts (instars). The first three caterpillar instars have black heads and generally black bodies. By the fourth instar, the caterpillars are about one inch long, have mottled brown heads, bodies covered with black and brown hairs, and a series of five pairs of blue spots followed by six pairs of red spots on the tops of the bodies. The greatest feeding damage is done by older caterpillars during the last two weeks of June, sometimes making it appear as if trees are stripped of leaves practically over night. After they have completed feeding in late June or early July, caterpillars enter the pupal stage from which adult moths emerge after 10 to 14 days. **Adult moths do not feed.** The brownish male moth flies about during the day in search of females with which to mate. Whitish females do not fly, but attract males to them by means of a chemical 'perfume', or pheromone. Each adult female produces only one egg mass which can be attached to trees, rocks, houses, lawn furniture, and just about any other convenient object. The egg mass is covered with tan or buff-colored hairs. Egg masses deposited during mid- to late July will hatch the following spring, completing the life cycle.



Egg masses
with hatching
caterpillars



Larger size caterpillar
(5th instar)



Adult female moth



Adult male moth

Gypsy Moth in Illinois

Because mature female moths cannot fly, it has taken more than a century for large gypsy moth populations to move as far as Illinois. Since the 1970s, hundreds of small gypsy moth populations have been eradicated in Illinois. However, as gypsy moth populations have increased in neighboring states, movement into the state was inevitable and Illinois now has several areas with infestations within the counties of Lake, McHenry, Cook and DuPage.

Although they migrate slowly, gypsy moths are impossible to totally eradicate once they are established. The moths have few natural predators in North America, and pesticides have only been able to eradicate small populations. Instead, the goal is to suppress their numbers with various tactics.

Gypsy Moth Control in Downers Grove

The reaction to gypsy moth invasions and tree defoliation ranges from complete horror to a total lack of interest. However, almost everyone has some level of concern when gypsy moth caterpillars cause noticeable defoliation of trees, drop their frass (feces) on everything under the trees, or when the hairy caterpillars begin to crawl over everything in sight. At this point, people are willing to spray almost anything that they think will eliminate these caterpillars from their daily routines. While most pesticides registered for caterpillar control will kill gypsy moth, there are also concerns about the effects of these pesticide sprays on the environment, non-target insects, and human residents. While the actual "risk" from registered pesticides is usually misunderstood and overemphasized, the fact that most people "prefer" to not come into contact with pesticides is understandable. To avoid contact with synthetic pesticides and yet control the gypsy moth, a biological product has been found to be effective. It is derived from a naturally occurring, soil dwelling bacterium, called *Bacillus thuringiensis*, or "BT" for short. The Village of Downers Grove has contracted for the spraying of a portion of the Village with BT in the spring of 2009.

What is BT?

In 1915, *Bacillus thuringiensis* (BT) was discovered from diseased flour moth caterpillars, but few experiments or attempts to use this bacterium occurred until the 1950s. By 1961, the first BT product was registered for control of caterpillar pests, mainly in agricultural crops. Since that first registration, dramatic discoveries have occurred in identifying BT strains. Now there are BT products that affect caterpillars, leaf beetles, and mosquito larvae.

How does BT work?

The actual mode of action of BT is simple. The bacterium produces a crystal protein toxin that kills the cells lining the insect gut. When ingested, the bacterial cell wall is digested which releases this toxin. Since insects have guts that are only one cell layer thick, this toxin literally "eats" a hole in the gut, causing an infection in the body cavity. The interesting thing about BT is that only certain insects digest and are affected by the protein toxins. In most insects, as well as people, birds, fish, and other animals, the BT proteins have no effect. Insecticides made from BT and its toxins are usually called microbial or biological insecticides. With the development of fermentation technology, the BT bacterium can be grown in artificial media and gallons can be produced economically.

Do BT sprays harm People, Pets, Livestock, Migrating Birds, Honey Bees or the Environment?

As stated above, neither BT bacteria nor the protein toxins have any effect on people, pets, livestock, migrating birds, or honey bees. In fact, there is a BT product that is specifically registered to control the honey bee infesting caterpillar, the wax moth. The BT strain *kurstaki* or BTK, is effective against Lepidoptera (Moths and Butterflies) and is used to control numerous defoliating lepidopteran species. Indeed, BTK sprays will kill most of the young caterpillars that may ingest it as they feed on treated plant leaves. Both damaging caterpillars, such as the gypsy moth, as well as harmless caterpillars of other butterflies and moths that are present at the time of BTK application can be killed. However, in general, BTK and its toxins are destroyed within three to five days by sunlight and other microbes. Caterpillars killed by BTK stop feeding, drop to the ground, and decay harmlessly. The BTK applied in a spray does not multiply or accumulate in the environment.

When is BTK Most Effective?

Because of the way that caterpillars grow, only the younger caterpillars have gut linings thin enough for the BTK toxin to effectively penetrate. For gypsy moth, once the larvae have gotten larger than 5/8-inch long, they are rather difficult to kill with BTK. Therefore, the best time to apply BTK is after all the eggs have hatched and while the caterpillars are no larger than third instars. The third instar is the caterpillar stage that has molted two times after hatching. Third instar larvae are usually 1/2- to 5/8-inch long and still have black heads.

When will BTK be sprayed and what will it be like?

Using low flying helicopters, there will be 2 applications of BTK approximately a week apart. The first spray will occur around the middle of May, depending on the weather conditions and timing of caterpillar emergence. The second application will follow in a week. The helicopters will fly just over the tops of trees and the spray will be a fine mist sufficient to lightly cover the foliage.

Who will apply BTK?

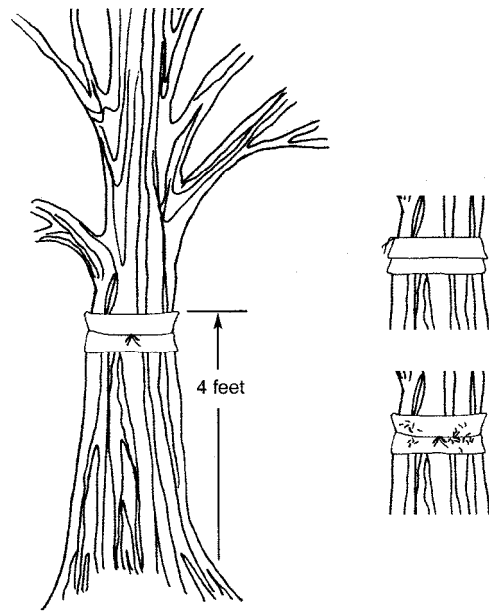
The Village of Downers Grove has developed a contract with Hendrickson Flying Service of Rochelle, Illinois, to apply BTK. Hendrickson has performed gypsy moth spraying activities for numerous municipalities and counties in northern Illinois.

What area will be sprayed?

The map at <http://www.downers.us/page/view/152> shows which part of the Village will be sprayed in 2009.

How else will gypsy moth be monitored and dealt with?

To monitor the effectiveness of the BTK sprays and overall gypsy moth populations, the Illinois Department of Agriculture (IDA) will be placing gypsy moth traps out in early July, counting the number of catches and then mapping results. Public Works Forestry staff will also be monitoring gypsy moth levels. An effective method of determining the presence of and catching numerous caterpillars is with burlap banding. As gypsy moth caterpillars become larger and more noticeable on foliage, they begin a daily trek from the canopy of the tree down to daytime hiding places such as leaf litter and bark crevices. Toward evening, the caterpillars come out of hiding and migrate up the trees to feed. Using burlap and some twine, an artificial hiding place can be created on the tree trunk. The bands are placed about chest high, tied as pictured, and the upper portion folded down. Best results are when the burlap is slightly ruffled and loose. Caterpillars congregate between the folds and also between the burlap and the tree trunk. Bands are checked every 1 to 2 days and any caterpillars either crushed or swept into soapy water buckets. Bands are put up after caterpillars are about a half-inch in length and are removed as caterpillars begin to pupate in July.



During outbreaks or when gypsy moth populations are high, two other biological natural controls (a fungus as well as a viral organism) can randomly occur and will aid in destroying the gypsy moth caterpillar population. State and local forestry professionals are studying and monitoring the presence of either the fungus or virus in hopes of possibly introducing either one into an infested area.

Additional gypsy moth information

Flyers are available at Public Works at 5101 Walnut Avenue, phone 630-434-5460. For those who have Internet access, several sites contain gypsy moth information including <http://www.fs.fed.us/ne/morgantown/4557/gmoth>.