Gypsy Moth
Michigan State University Extension Service
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The gypsy moth is not new to North America. It was first reported in 1870 in New England where it was "spreading with great rapidity." In 1954 the first gypsy moths were reported in Michigan. The infested area included the northwest corner of Ingham County and adjacent parts of Clinton and Eaton counties. Since then the Michigan Department of Agriculture (MDA) has conducted yearly surveys to determine the extent of gypsy moth infestation.

Aerial spraying was the standard control method. When no gypsy moths were found, as was true for 1958, 1961, 1963-1966, and 1968-1972, no sprays were applied. The state also used other methods to control the insect's spread, including state and area quarantines, mass trapping, and natural enemy releases. This intensive program slowed the spread of the gypsy moth, so that it is now confined to one area in central Michigan. Visible defoliation in 1983 totalled about 500 acres.

Resting gypsy moth larvae and associated feeding damage.

An unusually heavy deposit of gypsy moth egg masses on a trailer wheel.

Female gypsy moth adult laying eggs.

Life Cycle of Gypsy Moths

The gypsy moth, like most forest defoliating insects, has one generation each year. In July and August, females lay 100 to 1000 eggs in buff-colored clusters on trees and rocks. The eggs pass through the winter and begin hatching in early May. The caterpillars, about 1/8-inch long, crawl toward bright light, eventually making their way to branch tips in the tree crown. Here they spin a single strand of silk and dangle until a strong wind breaks the strand and launches them into space. The tiny caterpillars are covered with long hairs, making it possible for them to "sail" for some distance. About half will travel 1/5 of a mile, the rest will travel up to one mile before settling on a tree and beginning to feed.

For the next 40 to 50 days, the caterpillars consume tree leaves at night and rest clustered on tree trunks during the day. During this period, male caterpillars will molt four times, until they are about 1 1/2 inches long. Female caterpillars molt five times, becoming up to two inches long. When full grown, they stop feeding.

Although large caterpillars will feed on almost any tree species, including white pine and hemlock, small larvae are more selective. Oak, alder, birch, apple, poplar, and basswood are the preferred foods. Only when these foods are exhausted will they consume leaves of other trees. The caterpillars finish feeding in late June through early July, then they attach themselves to tree branches, trunks, stones, and forest debris and pupate. Two weeks later, adult moths emerge.

The female moth is white with dark markings on its wings. It possesses a heavy body laden with eggs and cannot fly. The male moth is drab-colored with darker markings, has a light body, and is a strong flier. The feather-like antennae of the male moth are highly sensitive to a chemical odor, or pheromone, that is

[1]Photos in this bulletin courtesy of the United States Department of Agriculture, the United States Forest Service, and the Animal Plant Health Inspection Service.

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Dispersing first stage gypsy moth larvae.

Mating gypsy moth adults.

Larva and pupa of the gypsy moth.

Tree infected with shoestring root rot. Note white fanlike structures under bark.

Hatching first stage gypsy moth larvae.

released by unmated females. Males locate females by following a pheromone trail through the air. After mating, the female remains close to where it pupated. It lays eggs in large clusters covered by hair-like scales from the abdomen, which gives the eggs their cream or buff color. The new generation then passes through winter as eggs.

The gypsy moth has a number of natural enemies. White-footed mice, other mammals, and many birds feed on the larvae and pupae. It is believed that these predators "learn" how to find gypsy moths when gypsy moth populations are low. Some birds are good predators because they eat the very hairy caterpillars. When gypsy moth populations are high, viral and bacterial diseases reduce the populations to very sparse levels. Parasitic and predacious insects also attack the gypsy moth at various life stages. Although these insects do not effectively regulate gypsy moth populations, they contribute to gypsy moth mortality.

What Damage Can Gypsy Moths Do?

The gypsy moth is a "defoliator" — it eats leaves. When the caterpillars hatch from eggs in the spring, they begin feeding. Leaves are necessary for photosynthesis, which produces carbohydrates. Carbohydrates are stored as starches in the root system and are used during the year for growth and maintenance. Stored carbohydrates also are used for growth the following year.

Generally, a broad-leaved tree can lose up to half of its leaves each year with no apparent ill effects. This, of course, varies depending on the kind of tree and the tree's level of stress. Broad-leaved trees that have lost two-thirds of their leaves refoliate through a growth flush in mid-summer. Such a flush, however, draws heavily on the starch reserves in the root system, weakening the tree. The following spring the tree will not be as healthy. If the tree is heavily defoliated the second year, its growth and maintenance potential is further reduced. By the third year, the tree is so weak, it is susceptible to attack by many other pests such as the two-lined chestnut borer and shoestring root rot. This combination kills the tree.

Why are Gypsy Moths a Concern in Michigan?

Many areas in Michigan are dominated by oak forests — one of the

Worker setting up gypsy moth pheromone trap.

Late stage gypsy moth larvae.

preferred foods of the gypsy moth caterpillar. Other areas contain birch and aspen — additional foods of the gypsy moth. Thus, extensive areas could be damaged by the insect.

Forest industries and tourism are important to Michigan's economy. The gypsy moth, due to its high reproductive potential, could quickly and thoroughly defoliate many areas in Michigan forests. In a few years, widespread tree mortality could severely affect the tourism and forestry economy.

In suburban areas, the gypsy moth is a periodic and substantial nuisance. They defoliate shade and ornamental trees, and cluster on shade trees, outdoor furniture, garages and houses. Some people are allergic to their hairs and get skin rashes when they touch the caterpillars.

Where do Gypsy Moths Come From?

In Michigan, gypsy moths come from existing infested areas within Michigan and places outside the state. Pupae, eggs, and female gypsy moths cannot fly, but people transport them. Often gypsy moths are transported with material or equipment that is carried from the northeastern U.S. into Michigan. In fact, the original 1954 population was brought to Michigan on a vehicle used on a vacation trip to the northeast. Another population, in the 1970's, was traced to a trailer carrying eggs from Connecticut. Two recently discovered areas, one near Traverse City and one near Grand Haven, were traced to equipment moved from Connecticut and Pennsylvania. In some suburban areas of Michigan, sources of gypsy moths have been traced to firewood brought south from infested areas in Isabella, Gratiot, Midland, or Montcalm counties.

How are Gypsy Moths Handled in Michigan?

The Michigan Department of Agriculture (MDA) and the United States Department of Agriculture, Animal, Plant Health Inspection Service (USDA/APHIS) have the primary responsibility for controlling gypsy moths. The MDA works within the state to:

1. prevent gypsy moth populations from increasing to a public nuisance level and to moderate serious economic losses,
2. eradicate incipient infestations in otherwise non-infested areas, and
3. regulate the movement of articles through or from quarantined areas.

Its major responsibilities are as follows:

1. establishing and enforcing quarantines,
2. eradicating isolated infestations,
3. advising federal, state and municipal governments on the need for applying pesticide or biological controls,
4. releasing exotic gypsy moth parasites,
5. conducting a trapping survey using traps baited with a synthetic pheromone to determine population trends,
6. providing guidelines to civic bodies so that defoliation potential may be anticipated, and
7. supplying technical information to communities that have nuisance-level populations of gypsy moths.

Forested urban areas are given highest priority for gypsy moth control. Second priority is forested recreational areas, followed by economically productive timberland.

The United States Department of Agriculture, Animal and Plant Health Inspection Service (USDA/APHIS) is responsible for preventing or moderating the spread of the gypsy moth from infested states. Many areas of Michigan free of gypsy moths are not federally regulated. When isolated infestations are detected, the MDA and USDA/APHIS conduct a cooperative eradication program. In some parts of Michigan, where gypsy moths occur over large contiguous areas, eradication is no longer feasible. These areas are under a USDA quarantine that restricts the movement of regulated articles. For

White-footed mice feeding on gypsy moth larvae.

A beetle, *Calasoma frigida,* feeding on gypsy moth pupae.

specific information regarding quarantine requirements and areas under quarantine, contact the MDA or your local county Cooperative Extension Service. Recommendations for managing the gypsy moth are available through county extension offices when gypsy moth infestations threaten serious defoliation.

What Can We Expect in the Future?

The gypsy moth is not an immediate threat to our forests and shade trees. We should be neither greatly concerned and emotional nor ignorant and complacent about it. Since 1954, the insect has become established in several mid-Michigan counties. Its continued spread will be slow and steady despite our best efforts, and within 10 years, we may see extensive areas of defoliation. In about 20 years, the gypsy moth will be a permanent resident in areas of the state with favorable habitat.

Interestingly, Michigan has conditions that favor the insect, yet it also has conditions that make it difficult for the gypsy moth to survive. Michigan has millions of acres of oak, birch, and aspen forests ("preferred" foods), and a well-developed highway system with much movement north to assist the insect in "hitch-hiking." In addition, thousands of acres of scattered farm woodlots harbor the insect and hundreds of thousands of tourists each year come from infested areas in the northeastern region of the U.S. In contrast, Michigan has severe winter weather with temperatures often below -30°F (lethal to gypsy moth egg masses), flat terrain that discourages larval dispersal, acres of prime agricultural lands routinely sprayed with insecticides lethal to the gypsy moth and dedicated workers who annually survey with pheromone traps and routinely treat "hot spots" where egg masses have been found.

What Can We Do to Help?

Two things to do of great help would be to (1) avoid moving life stages of the gypsy moth into and around Michigan and (2) fully cooperate with the Michigan Department of Agriculture. If you live in the counties where the general infestation exists (Gratiot, Isabella, Saginaw, and portions of Montcalm, Mecosta, Clare, Midland, and Bay), contact your nearest MDA office if you expect to move materials such as firewood, nursery stock, Christmas trees, and recreational vehicles. Further, if you wish to bring in materials or objects from areas of known infestations, contact your nearest MDA office. They may wish to inspect the materials after they arrive. Even the smallest objects can carry gypsy moths — a clothespin basket brought egg masses into the Detroit area from Massachusetts. By working together cooperatively, we can probably avoid serious gypsy moth problems.

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