

GYPSY MOTH

Lymantria dispar (Linnaeus)

The gypsy moth, was accidentally introduced into Massachusetts in 1869. By 1902 this pest was widespread in the New England states, eastern New York, and regions of New Jersey. The gypsy moth was first detected in Luzerne and Lackawanna Counties in northeastern Pennsylvania in 1932. Pennsylvania's infestation progressed south and westward following the mountain ridges. During the late 1970s and early 1980s the leading edge of the infestation advanced into Centre, Blair, Huntingdon and Clearfield Counties. Heavy defoliation and subsequent tree mortality has occurred along mountain ridges in forests comprised primarily of oak. It is the most important insect pest of forest and shade trees in the eastern United States.

DESCRIPTION

Egg masses are light tan, and the eggs inside are black and pelletlike. Each mass may contain 400-600 eggs. The larval stage (caterpillar) is hairy, and a mature larva is 50-65 mm long with a yellow and black head. Behind the head on the thorax and abdomen are five pairs of blue spots (tubercles) followed by six pairs of brick red spots (Fig. 1a). The pupal stage is dark reddish-brown and is held in place to some object by small strands of silk. Male moths are dark buff (Fig. 1b) and fly readily during the day. Females are white with black, wavy markings (Fig. 1c); they have robust abdomens and do not fly, and their wingspan can reach 5 cm.

LIFE HISTORY

Egg masses deposited by females during July overwinter on trees, stones, and other substrates. Eggs hatch from late April through early May with most eggs hatching by mid-May. Small first instar larvae do not feed right after they hatch and can be dispersed by wind. Young larvae feed on foliage and remain on host plants night and day. In late May when about half-grown, larvae change their behavior and usually feed in the trees at night, and move down to seek shelter in bark crevices or other protected sites during the day.

Larvae reach maturity from mid-June to early July. Migrating caterpillars are often a nuisance during the last two weeks of June. Pupation takes place during late June and early July. The pupal cases may be observed attached to tree bark, stones, buildings, and other similar sites. Adults start emerging in late June with peak emergence in mid-July. This pest produces one generation a year in Pennsylvania.

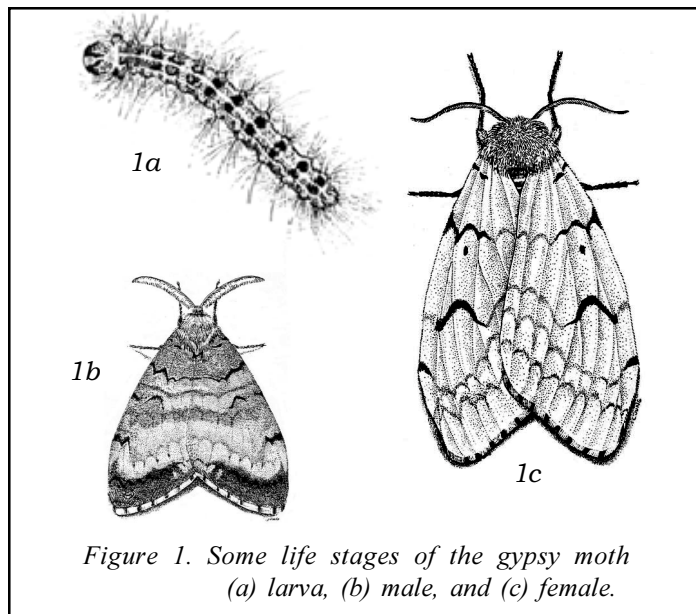


Figure 1. Some life stages of the gypsy moth
(a) larva, (b) male, and (c) female.

DAMAGE

This key pest is indirectly responsible for causing mortality of susceptible host trees. Heavy defoliation by the larval stage of this pest causes stress to infested host plants. Secondary organisms such as the twolined chestnut borer, *Agilus bilineatus*, and shoestring root rot, *Armillaria* spp., successfully attack stressed trees causing mortality.

Preferred host plants for all larval stages include alder, *Alnus* spp., aspen, *Populus* spp., gray birch, *Betula populifolia*, white birch, *B. papyrifera*, hawthorn, *Crateagus* spp., larch, *Larix* spp., linden, *Tilia* spp., mountain ash, *Sorbus* spp., oaks, *Quercus* spp., Lombardy poplar, *Populus nigra*, willows, *Salix* spp., and witch-hazel, *Hamamelis* spp. Plants favored by older larvae but not by young larvae include beech, *Fagus* spp., red cedar, *Juniperus* spp., chestnut, *Castanea* spp., hemlock, *Tsuga* spp., plum, *Prunus* spp., pine, *Pinus* spp., and Colorado blue spruce, *Picea pungens*.

Host plants not preferred by the larval stage of this pest include tuliptree or yellow poplar, *Liriodendron tulipifera*, arborvitae, *Thuja* spp., ash, *Fraxinus* spp., balsam fir, *Abies balsamea*, catalpa, *Catalpa* spp., cedar, *Cedrus* spp., dogwood, *Cornus* spp., holly, *Ilex* spp., honeylocust, *Gleditsia triacanthos*, horsechestnut, *Aesculus* spp., juniper, *Juniperus* spp., black locust, *Robinia pseudoacacia*, mountain laurel, *Kalmia latifolia*, mulberry, *Morus* spp., and sycamore, *Platanus* spp.

Light defoliation is defined as 0 to 30% loss of foliage and has little effect on the health of trees. Defoliation is barely detectable. Moderate defoliation is described as 31 to 50% loss of foliage. At this level caterpillars may be abundant enough to be a nuisance in an area if not managed. Trees will have enough foliage remaining to stay green and little mortality is expected. Heavy defoliation is when 51% or more of the foliage is removed from a tree. Tree mortality may result from one year's defoliation to hemlock, pine, and spruce. Deciduous trees can normally withstand one year of defoliation, but two or more successive years may result in moderate to high mortality. Around the 50% defoliation level, most deciduous trees produce auxiliary leaf buds and new foliage by mid-August. Refoliation in the same growing season creates a stress to an infested tree.

A normal outbreak pattern for this pest may be described as two years of light infestation with minimal defoliation followed by two years of moderate to severe defoliation with population collapse after the second year of heavy defoliation. Infestations may flare up in future years; however, caterpillar density and level of defoliation will probably not be as severe or widespread as encountered during an initial infestation.

Some people are dermally allergic to the caterpillars. The urticating hairs cause skin rashes on some humans. This is most noticeable in May when larvae are small. Children appear to be more prone to this problem than adults.

MANAGEMENT

Air temperatures of minus 20°F or colder during the winter will destroy exposed eggs. Unfortunately, numerous egg masses are deposited on rocks, near the base of tree trunks and these may be covered with an insulating blanket of snow. Freezing temperatures in early May, after hatch, may also kill many larvae.

Nonchemical - When the caterpillars are half-grown, many of them feed at night and crawl down the tree in the morning to seek shelter during the day. Tree trunks may be encircled with a 14-18 inch wide piece of burlap or similar material. Place it at about chest height and arrange it so it hangs apronlike around the tree trunk. Tie off the center of the burlap band with string and fold the top portion down over the string. This burlap apron provides a place under which larvae rest and can later be killed. The apron must be checked daily, and all "trapped" larvae and pupae should be destroyed. This technique works best in light to moderate infestations from late May through early July or until males begin to fly. This management method is usually effective enough to keep defoliation levels less than 50% of the tree's crown. A few shade trees can be well protected with this method. Do not expect this technique to be effective on trees that are part of a heavily infested forest.

Male moths readily respond to the female's sex pheromone. Males can be attracted to traps baited with a synthetic pheromone; however, such traps are not effective control measures. These traps do assist in monitoring an area for low level populations of this pest.

Biological Control - There are some native predators and parasitoids that attack life stages of this key pest. Several introduced species of fly and wasp parasitoids of the gypsy

moth are established in Pennsylvania. Parasitoids and predators do not provide an immediate solution to an infestation. However, once a gypsy moth population collapses, their value is exhibited by helping maintain populations at low levels for extended periods of time. These parasitoids and predators appear to be contributing to stabilizing the gypsy moth population in several areas of the state. Native predators, such as birds, white-footed mice, and ground beetles assist in keeping this key pest at tolerable levels.

A naturally occurring virus called the "wilt" has resulted in massive mortality of caterpillars causing populations to collapse in areas of severe defoliation. Although the virus is always present, it seldom affects the larval stage until they are under stress, due to overcrowding or reduced food availability. In recent years during wet spring weather, the fungal insect pathogen, *Entomophaga maimaiga*, has also caused collapse of heavy infestations of this pest in many areas of Pennsylvania.

Chemical - Several insecticides are registered for effective management of this key pest. Applications should be made according to label directions after the majority of eggs have hatched during early to mid-May, when larvae are small. Be sure that small larvae have dispersed and they have begun to feed causing the characteristic shothole injury to host plant foliage. To maintain good plant health, applications should be made before serious defoliation occurs.

WARNING

Pesticides are poisonous. Read and follow directions and safety precautions on labels. Handle carefully and store in original labeled containers out of the reach of children, pets, and livestock. Dispose of empty containers right away, in a safe manner and place. Do not contaminate forage, streams, or ponds.

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