



# Gypsy Moth in Virginia: An Update

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Most Virginians are aware that the gypsy moth is a serious pest of hardwoods in our state. Although this insect has maintained a low profile the past few years, there was a general resurgence in moth populations in 2000. This population increase serves as a reminder that, in areas where gypsy moth has become established, this pest is still present in the environment even when populations are too low to be noticed.

Gypsy moth is a native of Europe, Asia, and northern Africa. It was accidentally released in the U.S. over 130 years ago by a Frenchman who wanted to cross it with native silk moths. From its original introduction near Boston, Massachusetts, this pest has spread into the mid-Atlantic and Midwestern states (Fig. 1).

Virginia experienced its first gypsy moth defoliation in 1984. Since that time, nearly 4.5 million acres have been defoliated in the state (Table 1). Of the 71,000+ acres defoliated in 2000, Shenandoah and Bath counties suffered the most damage (Table 2). Most of Virginia currently falls into the federally regulated area (Fig. 2). This area is considered to be generally infested and is governed by certain state and federal regulations regarding gypsy moth monitoring and control as well as the transport of articles which possibly could harbor gypsy moth life stages.

**Table 1.**

Historical gypsy moth defoliation in Virginia

Year	Acres Defoliated
1984	374
1985	5,200
1986	27,259
1987	67,695
1988	191,000
1989	215,987
1990	594,000
1991	616,200
1992	748,000
1993	589,100
1994	452,475
1995	850,000
1996	0
1997	0
1998	0
1999	0
2000	71,122
<b>Total</b>	<b>4,428,412</b>

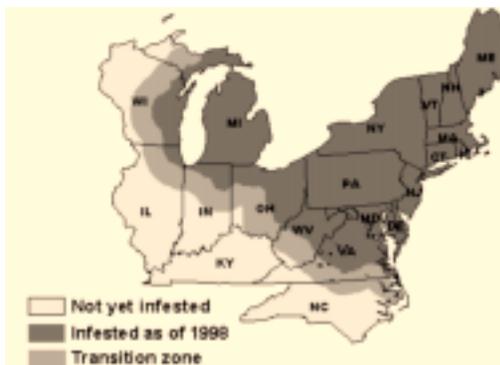


Figure 1. Area of general infestation of gypsy moth in 1998

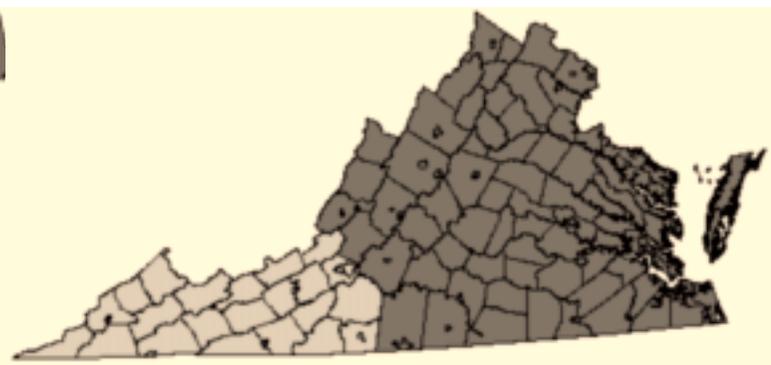


Figure 2. Gypsy moth federally regulated area in Virginia as of 1999 (darkened counties)

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**Table 2.**

Gypsy moth defoliation in Virginia in 2000

County	Acres Defoliated
Alleghany	5,134
Amherst	367
Bath	18,244
Bedford	3,706
Botetourt	1,397
Clarke	4,114
Fauquier	2,417
Frederick	9,869
Loudoun	2,115
Page	911
Prince William	189
Rockbridge	549
Rockingham	1,954
Shenandoah	15,200
Warren	4,957
<b>Total</b>	<b>71,122</b>

## Life history

The gypsy moth has one generation per year. Eggs hatch in early spring at about the time oak leaves begin to develop. Newly hatched larvae (caterpillars) climb high in trees and are dispersed by the wind, most being carried less than 200 meters. This is the primary means of natural dispersal. As the larvae mature they undergo a series of growth stages called instars. Although feeding activity of young larvae may not be noticed, older larvae are voracious feeders and can grow to a length of over 2.5 inches (Fig. 3). It is estimated that a gypsy moth caterpillar consumes about one square meter (over ten square feet) of foliage in its lifetime. Mature larvae form a pupal stage, from which the adults emerge one to two weeks later. The female moth does not fly; she releases a chemical attractant that the male detects and uses to locate the female for mating. A synthetic version of this attractant pheromone is used as a lure in the common gypsy moth traps seen on the roadside during the summer. After mating, the female lays an egg mass containing from a few hundred to nearly one thousand eggs (Fig. 4). These eggs are the overwintering stage of the insect. Egg masses usually are laid on tree

trunks, the underside of branches, or rocks around the base of the tree. It is usually the egg mass that is inadvertently moved by people on cars, trailers, campers, firewood, and outdoor equipment and furniture.

Gypsy moth larvae are quite hairy and can be distinguished by pairs of blue and red dots along their backs (Fig. 3). They sometimes are confused with eastern tent caterpillar or fall webworm, but the gypsy moth does not form large silken webs and has entirely different behavior and seasonal development from these insects. The egg masses are buff colored and covered with hairs from the female's abdomen. Adults do not feed and live only a few days after emergence and mating. Gypsy moth will feed on many tree species, but its preferred hosts include oak, aspen, willow, birch, apple, and basswood. Young larvae are much more discriminating than older ones, which will feed readily on less preferred species such as maple, hickory, elm, and many conifers. Usually, these less preferred species are fed upon only when insect populations are high and preferred food sources become scarce. Some trees are never fed upon, the classic example being tulip (yellow) poplar.

## Population cycles

Gypsy moth is an outbreak pest. It can remain at low levels for several years and then undergo large population increases in a very few years. Unless areas are actively monitored even moderate gypsy moth populations can exist unnoticed. Thus, population outbreaks sometimes appear to occur in only one or two years. Although these cycles are influenced by numerous factors, the low populations in Virginia in recent years generally are believed to be the result, at least in part, of a gypsy moth disease caused by the fungus *Entomophaga maimaiga*. This fungus was introduced into the U.S. as a possible control agent in the early 1900s but never appeared to become established. However, it was "rediscovered" in 1989 in New England and has since been found throughout a large portion of the generally infested area, including Virginia. Dry weather in the winter and spring of 2000 perhaps was unfavorable for the fungus, and this might have contributed to the increased activity of the gypsy moth. The unusually



Figure 3. Fifth instar gypsy moth larva



Figure 4. Female gypsy moth laying an egg mass

wet summer this past year should be favorable for the fungus, so it is possible that some populations in 2001 will be lower than originally expected due to mortality caused by this disease. Gypsy moth populations are also affected by another disease caused by a virus. The virus is the usual cause of mortality in high populations, whereas *E. maimaiga* serves as a control agent at both low and high pest densities. Maps of moth counts from pheromone-baited traps are located at [www.ento.vt.edu/~sharov/stsdec/results1.html](http://www.ento.vt.edu/~sharov/stsdec/results1.html).

## Damage caused by gypsy moth

Predicting tree mortality as a result of gypsy moth infestation is difficult because many factors contribute to determining tree responses to defoliation. These include site and stand characteristics, species composition, individual tree health, the susceptibility and vulnerability of the tree species, drought conditions, and the extent and frequency of defoliation. When trees are heavily defoliated, they produce a second set of smaller, lighter colored leaves. This refoilation causes additional stress on the tree. Healthy trees can withstand one or two severe defoliations, while unhealthy trees might die after one defoliation episode. On a forest stand basis, a rule of thumb is to expect 15 to 35% average mortality when gypsy moth first invades an area. Some stands might have very low mortality while others might have mortality approaching 75% or even greater. The actual cause of death in trees attacked by the gypsy moth is not the defoliation itself but is from secondary organisms which invade the weakened tree. The most common of these is the shoestring root rot fungus and the twolined chestnut borer. A guide to silvicultural control is provided by K. W. Gottschalk, *Silvicultural Guidelines for Forest Stands Threatened by the Gypsy Moth*, USDA Forest Service General Technical Report NE-171. To receive a copy, call 740-368-0123 or download it from the Internet at [www.fs.fed.us/ne/home/publications/scanned/gtr171.pdf](http://www.fs.fed.us/ne/home/publications/scanned/gtr171.pdf).

## Control options

Treatment against gypsy moth usually is by aerial application of insecticides applied to young larvae. While several insecticides are registered for this pest, the most commonly used treatments are a bacterium, *Bacillus thuringiensis* var *kurstaki* (Btk), and diflubenzuron (Dimilin®). Btk is a stomach poison and is toxic only to moths and butterflies. Aside from being the most commonly applied aerial insecticide against gypsy moth, it is also one of the options available to the homeowner. Dimilin®, an insect growth regulator, interferes with the caterpillar's ability to develop normally and is a restricted

use insecticide which can be applied only by licensed pest control operators. Some homeowners attempt to protect individual trees by removing egg masses or by killing larvae collected from beneath bands placed around trees. These methods are sometimes effective but are tedious and do little to reduce the overall pest populations. Drenching egg masses with a 1:1 soybean oil and water solution may be effective in protecting trees from gypsy moth in the following year, but this works best only on a few isolated trees.

## What is being done

Gypsy moth management is conducted at the federal, state, and local levels. Federal agencies are responsible for detection and management of gypsy moth infestations outside the regulated area. The USDA Forest Service Slow the Spread Project is a large integrated pest management project that targets low level populations in the transition zone (Fig. 1). The Virginia Department of Agriculture and Consumer Services (VDACS) has a cost-share program, the Virginia Cooperative Suppression Program, which assists localities by providing up to 50% of the costs of gypsy moth management. For more information on this program, contact Larry Nichols, Office of Plant Protection, VDACS, 804-786-3515. The guidelines to this program are available from The Gypsy Moth Server at the Virginia Tech web site (see below).

## Advice for landowners

The article mentioned above by K. Gottschalk is a good source of guidelines for landowners with forested stands. Persons concerned with yard trees will need to rely on keeping abreast of pest populations in their areas and coordinating with municipal, county, or homeowner groups for monitoring and treatment. Contact your local arborist, Virginia Cooperative Extension agent, or the VDACS offices in Richmond to obtain the latest information on the gypsy moth situation in your area. The VDACS cost-share document mentioned above contains information on how to assess the gypsy moth threat to your property.

## Selected online resources

The Gypsy Moth Server at Virginia Tech: [gypsymoth.ento.vt.edu/vagm](http://gypsymoth.ento.vt.edu/vagm)

The Slow the Spread Project: [www.ento.vt.edu/STS](http://www.ento.vt.edu/STS)

Gypsy Moth in North America: [www.fs.fed.us/ne/morgantown/4557/gmoth](http://www.fs.fed.us/ne/morgantown/4557/gmoth)

