

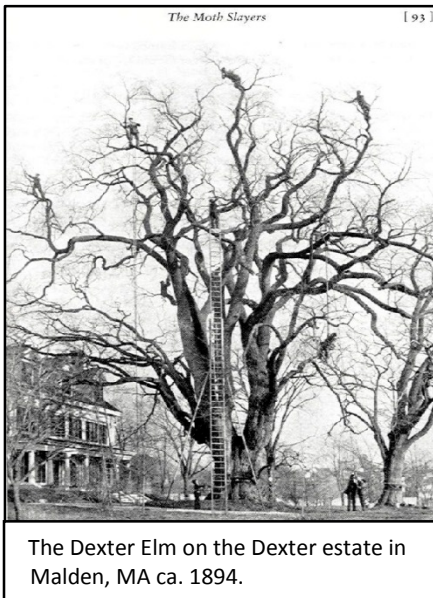
# Rhode Island Department of Environmental Management

## Gypsy Moth in Rhode Island – Control Options



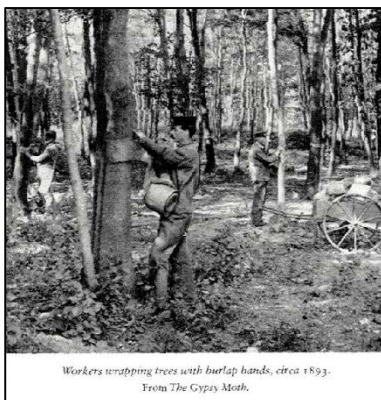
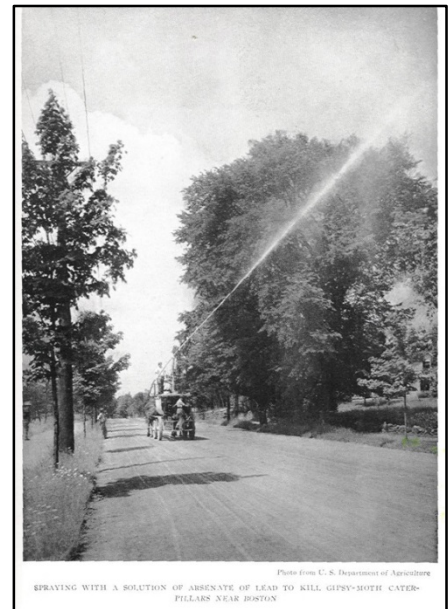
### Background

Gypsy Moth, *Lymantria dispar*, a native of Europe, has become one of North America's most devastating forest pests. When accidentally released into the wild (ca. 1868), gypsy moth found an environment with plenty of foliage to consume, and few natural enemies, and so flourished. Soon thereafter widespread, prolonged defoliations began as caterpillar numbers rapidly increased, and spread.



The initial response to control “outbreaks” began in the 1890s with aggressive attempts to physically remove or destroy egg masses. Infested trees were also burned. When those attempts failed, the liberal use of crude insecticides were employed. The goal was to wipe out (“eradicate”) the invasive pest, but by that time it was too late, and those methods were soon abandoned.

In the early 1910’s attempts were made to introduce European parasites, predators, and diseases of gypsy moth but these efforts also failed to prevent outbreaks and it seemed that there was nothing that could be done to stop the marauders. Gypsy moth continued to slowly spread southward and westward, and populations have regularly fluctuated, occasionally reaching outbreak status, and then inexplicably, crashing.



New pesticides developed in the post-World War II era were utilized to prevent the spread of gypsy moth west of the Hudson River where valuable commercially managed timberlands would be gypsy moths next target. And so it was that DDT was liberally used in that suppression effort for several decades thereafter, until being banned because of its harmful environmental impacts.

In the years following the halt in DDT applications, gypsy moth reached some of its greatest population numbers, with an extensive outbreak in Rhode Island in the early-mid 1980s. At its peak in 1985, 411,800 acres were defoliated. This outbreak is legendary in both forestry and arboricultural circles, turning our forests into ‘January in July’ due to the near-total defoliation of a wide range of tree species. Arborists

were hard-pressed to meet the demands of an increasingly frantic public. Caterpillars covered houses, roads and sidewalks to the extent that they were even blamed for traffic accidents. Thousands of trees died either from the repeated defoliations or because they were unable to repel secondary insect attacks

At the peak of the 1980s infestation, RIDEM was directed to implement an aerial pesticide application program to suppress gypsy moth numbers, and protect tree foliage. Cost aside, this program was highly controversial as there was strong public opposition to the widespread use of the pesticide "[Btk](#)" (*Bacillus thuringiensis* var. *kurstaki*), and concern for its impact on



public health and the environment. The program was also complicated to manage as there were many difficulties, not the least of which was limitations as to where and when the applications would take place. Also, great care had to be taken to accommodate those homeowners who did not wish to have their property sprayed. The program was implemented, and by the end of that Summer the gypsy moth population had collapsed, but there was no proof of the part that the spray program had played in that collapse.

In 1989 researchers recovered the fungal disease *Entomophaga maimaiga* from deceased gypsy moth caterpillars.

*Entomophaga*, had been released several times since 1911 in an attempt to control gypsy moth but this program had been considered a failure as the fungus was never recovered in the wild. Now it is believed to be one of the most important "bio-controls" keeping gypsy moth numbers in check.

While *Entomophaga* has more of an impact *keeping* gypsy moth numbers low, the Nucleopolyhedrosis virus ("[NPV](#)") plays the significant role in gypsy moth population control when larval numbers and densities are high because optimum conditions will exist for caterpillar to caterpillar transmission of the virus. During an outbreak, NPV can cause an "epizootic" episode (massive die-off). Unfortunately this usually doesn't occur until the latter stages (mid-late June) of the defoliation event.



Caterpillar cadavers killed by NPV (l) and *Entomophaga* (r).

People will often seek information on gypsy moth control during a gypsy moth outbreak desperately hoping to protect their trees and get relief from the many significant inconveniences caused by this obnoxious pest. Unfortunately studies have shown that human interventions have limited ability to protect trees from defoliation when gypsy moth have reached outbreak status. Collection and destruction of egg masses, use of sticky bands to prevent larvae from climbing trees, and removal of larvae that congregate under burlap/fabric skirts placed around trunks of trees, often recommended as approaches homeowners can take to manage gypsy moth, often have poor results. The proper use of these methods are included [here](#) because there may be situations when homeowners feel they can be used successfully.



Proper selection and use of pesticides can successfully reduce caterpillar numbers and protect foliage of high value trees and plants. To be effective the entire crown must be treated, and multiple applications may be necessary. Spraying soon after leaves have fully expanded, but before they are consumed, will deliver the best results.

Within accessible landscaped areas homeowners may be able to spray to the top of a tree's canopy using handheld or backpack garden sprayers. Tall trees often require specialized equipment and the services of a [Licensed Arborist/Commercial Pesticide Applicator](#).

Because of the potential impact on non-target species, widespread pesticide application is not recommended. The use of pesticides should be limited to small scale use to protect high value landscape trees and other plants. See [Pesticides](#) section below for further information.

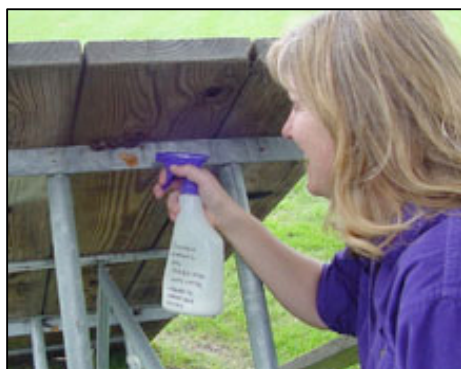
## Control Options

Gypsy moth control measures for homeowners fall into the following broad categories: 1) physical collection/destruction of egg masses or larvae, 2) applying over the counter pesticides, either chemical, or biological, and 3) use of pheromones to trap males or to disrupt mating behavior.

Some pesticides are registered in Rhode Island as “**restricted use**” and not available to the general public. Only a person possessing a “Pesticide Applicator’s” Certificate issued by the RIDEM Division of Agriculture can apply these chemicals. Click [here](#) for more information on hiring outside help.

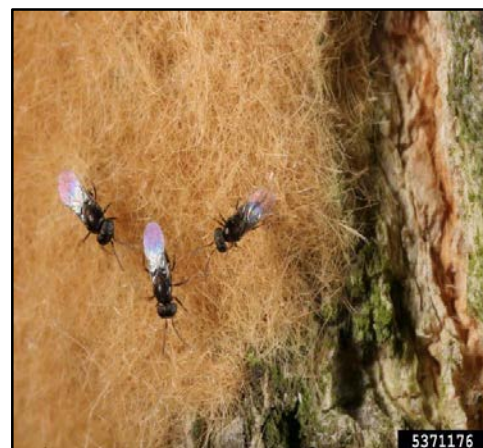
### Physical

#### Collection and destruction of eggs.



Egg masses can be soaked with agricultural soap or horticultural oil approved for use on gypsy moth, anytime from when egg masses are laid on the tree (August) to before eggs hatch (mid-April). However if you wait until after the first hard freeze of fall, parasitic wasps and flies will have the opportunity to destroy up to 40% of the eggs

in a mass for you! Applications are relatively easy to apply using spray bottles, garden sprayers, and even super-soaker squirt guns for hard to reach locations. These products are unlikely to cause any environmental harm. Adding food coloring to the mixture can help you identify which masses have already been treated.



Egg mass being parasitized by *Ooencyrtus kuvanae* wasps.

Egg masses can also be scraped off surfaces into a bucket of soapy water using a narrow flexible spatula, butter, putty knife, or similar tool, and allowed to soak for at least 24 hours. Eggs scraped to the ground will survive temperatures to -30 degrees Fahrenheit so try to capture them all.

#### Sticky bands/barriers.

These measures are intended to prevent roaming caterpillars from climbing up into trees not already infested. Sticky tape is applied (sticky side OUT) and



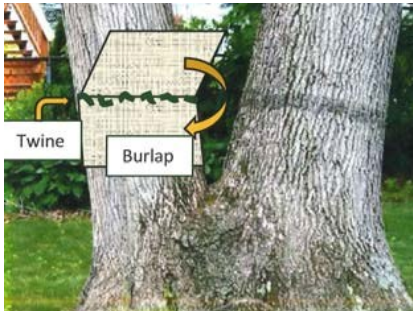
materials like cotton balls or batting is/are used to fill gaps that would allow caterpillars to crawl up behind the tape. As tape loses its effectiveness tree banding barrier adhesives are applied to maintain effectiveness. Petroleum jelly can be used but it is thinner, less sticky, and will “run” at lower temperatures. NEVER apply adhesives, grease, or other products directly to tree bark as they can be absorbed causing the tree harm. Barriers require daily checks and occasional maintenance as caterpillars



can quickly overwhelm them, making the bands ineffective. Commercial barrier products are also available but can be expensive.

### Burlap/fabric skirts.

Burlap bands wrapped around the lower trunk of trees can attract large numbers of gypsy moth larvae, which hide under them during the day, when they are not feeding. This tactic can be



useful for detecting the presence of gypsy moth populations when populations are low and may be useful for protecting small, isolated trees from defoliation.



Sticky tape applied inside out with cotton balls filling gaps.

Wrap a strip of burlap 12–18 inches wide around the tree at chest height, and tie a string around the burlap 6 inches from the top. Let the top 6 inches flop over and form a skirt. Check the bands every day from mid-afternoon to about 6 P.M. Use a knife to flick caterpillars into a cup of soapy water. Don't handle the caterpillars as their hairs can cause a rash!



Caterpillars seeking shade under flap of burlap sack.



### Mass trapping

Pheromone-baited traps are used to monitor low-level gypsy moth populations and are not an effective control tactic. While many hundreds or thousands of adult male moths may be captured, this will have little impact on the population as females represent the reproductive potential of the population and there will still be many males available for them to mate with.

### Mating disruption

Pheromone flakes are sometimes disbursed over large areas to males and disrupt their ability to find and mate with females. This technique is only affective in very small geographic areas and not appropriate during a large outbreak.

### Pesticides - Chemical

There are many chemicals labeled by the EPA for use to control gypsy moth, but only four are allowed under the Federal Environmental Impact Statement (FEIS) that guides all *publicly funded* gypsy moth treatments. These four chemicals are *Bacillus thuringiensis* var. *kurstaki* ("Btk"), Diflubenzuron ("Dimilin"), Tebufenozide ("Mimic"), and Nucleopolyhedrosis virus ("Gypchek"). Because the potential to harm other species is considered too great, the others are not currently recommended.

[USFS: Federal Environmental Impact Statement](#)

Homeowners, or *non-publicly funded* entities, are not restricted to the use of these four chemicals. If a pesticide applicator recommends the use of a different pesticide, the homeowner should verify that it has been approved by the EPA for its intended use. Ask to see, and read the product label.

[How to read a pesticide label.](#)

**Dimilin** is a synthetic hormone that inhibits molting in immature insects, thereby killing them. It is very effective. Because it also affects aquatic species, it is rarely used by government agencies.

[EPA Fact Sheet - Diflubenzuron "Dimilin"](#)

**Mimic** is an insect growth regulator. Tebufenozide, the active ingredient, mimics the action of a natural insect hormone that induces premature molts of the gypsy moth caterpillar, resulting in death. Mimic impacts most lepidopteran larvae, but does not impact other orders of insects.

[USFS: Human health and ecological risk of "Mimic"](#)

### **Pesticides - Biological**

**Btk** (*Bacillus thuringiensis var. kurstaki*) is a naturally occurring virus, and is an ingredient commonly found in both commercial and over the counter pesticides. When eaten, Btk kills only certain butterfly and moth caterpillars, and is considered "safe" for use in gypsy moth control. It does not harm humans or animals. For best results Btk is applied as a foliar spray in the second week after caterpillar emergence, and again two weeks later. Due to its relative environmental safety, Btk is the product most widely used by government agencies, and is an ingredient in many products readily available for homeowner use.

[National Pesticide Information Fact Sheet - Bt](#)

**Gypcheck** is manufactured for the USDA Forest Service from the Nucleopolyhedrosis virus. It is specific to gypsy moth so there is no concern for harm to non-specific species such as bees or butterflies. Because it is difficult to produce, and only available in small quantities, it needs to be ordered well in advance. It is most often used in Federal/State partnerships. Because of its limited availability, it is not available for private or commercial use.

Two other EPA registered products successfully used for gypsy moth control are Golden Oil Pest Spray (to smother eggs), and products containing the active ingredient "[Spinosad](#)" (foliar application to kill late instar caterpillars) were not included in the FEIS, but are generally accepted as having few negative impacts. Both are readily available at many garden centers, and hardware and big box stores.

### **Get Outside Help – Hire an Arborist/Commercial Pesticide Applicator**

Local tree care companies are a great resource for homeowners to contact for assistance. Not only do they have the specialized equipment often needed, but they also employ arborists licensed by the State Rhode Island. Licensed arborists have demonstrated their ability to diagnose tree problems and to recommend solutions to these problems. It is not just about what works - safety and awareness of environmental concerns are a critical part of the testing that arborists go through. This awareness applies to the use of insecticides. Arborists are expected to be experts in treatments they use as well as in their knowledge of trees and pests. Use the link below for access to a list of local businesses that (self) report employing licensed arborists.



[Link to local businesses who employ arborists \(self-reported\)](#)

When hiring an arborist be sure to verify that he/she is insured and licensed, and ask to be provided copies of those documents. To *verify* that he/she is licensed contact the DEM Division of Forest Environment at (401)222-2445 ext. 2055

Some arborists are also Rhode Island *certified pesticide applicators*. As part of this certification they have the authority to prescribe and apply “restricted use” pesticides that are not available to homeowners. There are also commercial pesticide applicators (non-arborists) who may be certified to apply “restricted use” pesticides. For questions about Rhode Island’s Pesticide Rules and Regulation contact DEM Division of Agriculture at (401)222-2781.

Use this link for guidance on [“Questions homeowners can ask when contracting for tree spraying services”](#)

Remember that trees are generally resilient, and can tolerate some defoliation. However, even healthy trees can only survive a limited number of defoliations before they succumb, having used up their energy stores re-foliating after the initial defoliations. Due to how they store their energy, hardwood trees are more likely to survive defoliations than evergreens which may die from a single defoliation event. When trees are stressed by other factors such as drought, exposure, or poor growing conditions, their likelihood of survival decreases.

Gypsy moth continues to spread slowly along its frontal boundary. They are also occasionally discovered in new locations throughout the country far from their current range. Most often they were unintentionally brought there from infested areas as egg mass “hitchhikers”, attached to outdoor lawn furnishings, equipment, RV’s, and/or firewood. Most of these populations have either been eradicated or they have disappeared without intervention. Strong measures, including quarantines are in place to try to prevent the spread of gypsy moth into the remaining un-infested areas of North America.

For more information on the gypsy moth quarantine area, and how to comply with the associated restrictions, click the following link: [Gypsy Moth Quarantine Information](#)