The Connecticut Agricultural Experiment Station
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Dr. Kirby C. Stafford III and Dr. Victoria L. Smith
Department of Entomology
The Connecticut Agricultural Experiment Station
123 Huntington Street
New Haven, CT 06511

Phone: (203) 974-8485
Fax: (203) 974-8502
Email: Kirby.Stafford@ct.gov
Website: https://portal.ct.gov/caes

Spongy or LDD Moth

Introduction:
The spongy moth, Lymantria dispar dispar, (LDD moth) (formerly gypsy moth) was introduced into the US (Medford, MA) around 1869 by Etienne Leopold Trouvelot. Some larvae escaped and small outbreaks became evident in the area around 1882. Populations increased rapidly and by 1889, the Massachusetts State Board of Agriculture began a campaign to eradicate the moth. It was first detected in Connecticut in Stonington in 1905 and had spread to all 169 towns by 1952. In 1981, 1.5 million acres were defoliated in Connecticut (Figure 1). During an outbreak in 1989, CAES scientists discovered that the entomopathogenic fungus *Entomophaga maimaiga* was killing the caterpillars. Since then, the fungus has been the most important agent suppressing spongy moth activity.

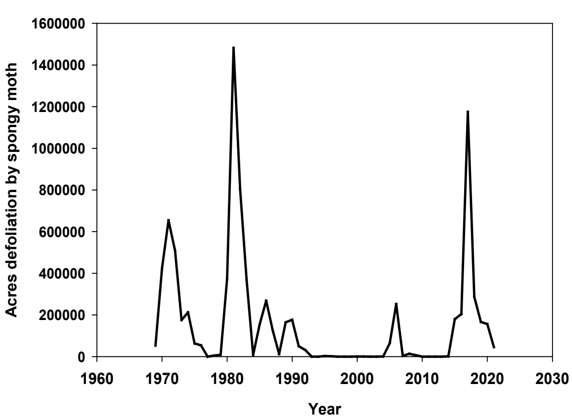

Figure 1. Number of acres defoliated by the spongy moth in Connecticut, 1969-2021.

However, the fungus cannot prevent all outbreaks, mainly during drought, and hot spots in some areas continue to be reported. There was an outbreak in 2005-2006 and a more severe outbreak again from 2015 through 2017.

Life Cycle:
There is one generation of the spongy moth each year. Caterpillars hatch from buff-colored egg masses in late April to early May. An egg mass may contain 100 to hundreds of eggs and may be laid in several layers.

Figure 2. Spongy moth egg masses on a tree and a close-up of single egg mass (inset).

Figures 3-6. Spongy moth caterpillars (top, middle) and pupae (bottom). Top photo courtesy of John Triana, SCRWA.

A few days after hatching, the ¼ inch long, buff to black-colored caterpillars (larvae) ascend the host trees and begin to feed on new leaves. These young caterpillars lay down silk safety lines as they crawl and, as they drop from branches on these threads, may be picked up on the wind and dispersed to other properties.

There are four or five larval stages (instars) each lasting 4-10 days (total ~ 40-days). Instars 1-3 remain in the trees, but the fourth instar caterpillars, with their distinctive double rows of blue and red spots, generally crawl up and down the tree trunks feeding mainly at night. They seek cool, shaded protective sites during the day, often on the ground. However, under outbreak conditions with dense populations of caterpillars, they may feed continuously and crawl at any time. The caterpillars complete their feeding sometime during late June to early July and often seek a protected place to pupate and transform into a moth in about 10 to 14 days.

Male moths are brown and can fly. The female moths are white and, while they have wings, cannot fly. They do not feed and live for only around 6-10 days. After mating, the female will lay a single egg mass and die. Egg masses can be laid on anything; e.g., anywhere on trees, fence posts, brick walls, on outdoor furniture, cars, recreational vehicles, rock walls, firewood, and are often placed in more protected locations. Egg masses are hard. The eggs will pass through the winter and larvae hatch the following spring during late April through early May.

Figure 7. Female spongy moth laying an egg mass.

Impact of Spongy Moth:

While spongy moth caterpillars will feed on a wide diversity of trees and shrubs, oaks are their preferred food plant. Feeding can cause extensive defoliation. Other favored tree species include apple, birch, poplar, and willow. During heavy infestations, the caterpillars may also attack certain conifers and other less favored species.

Figure 8-10. Defoliation caused by the spongy moth, Lyme, CT in 2006 (top) and Totoket Mountain in 2015 (middle), and along the highway 2016 (bottom).

Healthy trees can generally withstand one or two partial to one complete defoliation

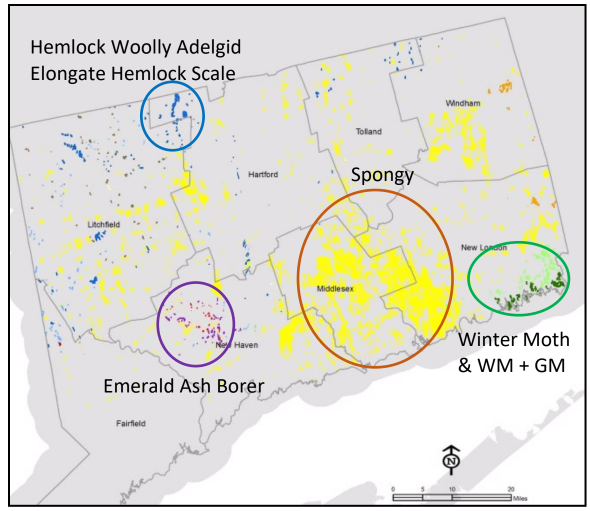

Figure 11. The 2015 aerial survey map for Connecticut showing defoliation; 175,273 acres impacted by spongy moth, 3,109 acres by winter moth, 4,166 acres combined winter moth and spongy moth, 2,456 acres by emerald ash borer, and 6,060 acres by hemlock woolly adelgid and elongate hemlock scale. The state aerial survey is supported by the US Forest Service.

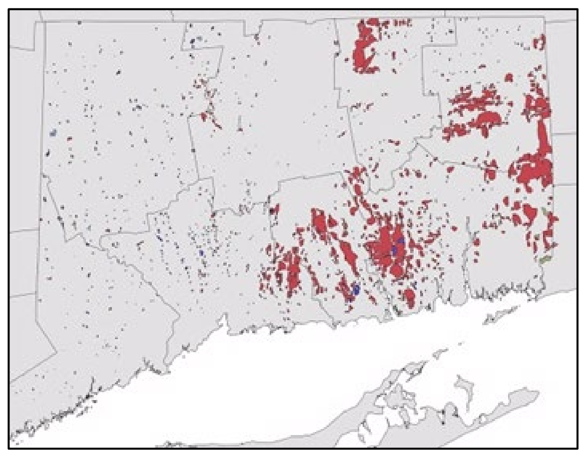

Figure 12. The 2016 aerial survey map for Connecticut showing areas of major defoliation by spongy moth (red) (survey & mapping by Victoria Smith, Tea Blevins, and Zachary Brown).

(>50%). Trees will regrow leaves before the end of the summer, but there can be some thinning or dieback of branches. However, some older trees may be more vulnerable to defoliation, which may cause stress. Drought can compound the problem and some trees may not fully re-foliate and may be lost. Weakened trees can also be attacked by other organisms, or lack the energy reserves for winter dormancy and growth during the following spring. Three years of heavy defoliation may result in high oak mortality. Trees along ridges with thinner soils and less moisture are particularly vulnerable.

The spongy moth caterpillars can also be a problem because they drop leaf fragments and frass (droppings) while feeding, and onto decks, patios, outdoor furniture, cars, and driveways, leaving a mess. Crawling caterpillar can also be a nuisance and their hairs can be irritating. The egg masses, which may be difficult to detect, can often be transported on vehicles to areas where the moth is not yet established. There is USDA quarantines for spongy moth and the leading edge of the established spongy moth ranges from North Carolina to upper Michigan (Figure 13). A slow the spread program helps slow the progress of the insect into new areas. A self-inspection checklist is available online from the USDA (Figure 14). Moving companies must include a completed checklist with a shipment. Nursery stock shipped out of quarantine must be treated or inspected. CAES will inspect certain plant shipments destined to spongy moth free areas.

Spongy Moth Management:
Given the potential impact of the spongy moth caterpillar feeding on shade trees and human activities around homes and businesses, some property owners may elect to treat for spongy moth, rather than wait and see what control the fungus *E. maimaiga* and other natural enemies of the spongy moth may have on caterpillar abundance. The activity of the fungus is highly weather dependent (see below). Control efforts generally target either the eggs or caterpillars and may be physical, biological, or chemical.

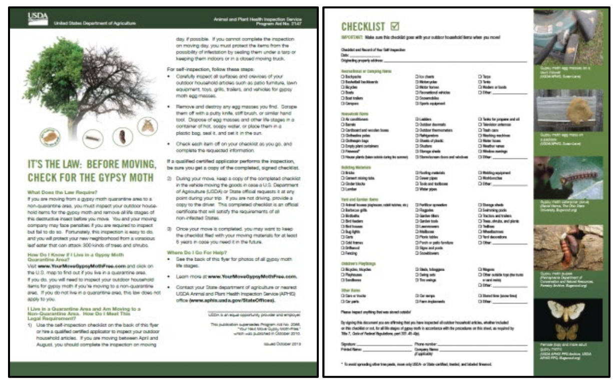

Figure 13-14. Map of the spongy moth management zones and quarantine area (top) and the USDA self-inspection checklist form.

Physical Control
One option is to scrape, remove and destroy any egg masses. However, many egg masses may be located in inaccessible areas (such as high in the trees) and during the spring young caterpillars may be blown in from adjacent infested properties. Removed egg masses can be drowned in a container of soapy water and deposed of. Scrapping them onto the ground will not destroy them. Another method is the use of burlap refuge/barrier bands wrapped around tree trunks to take advantage of the behavior of late-stage migrating caterpillars who descend the trees during the day to seek protective niches and climb back up to feed at night.

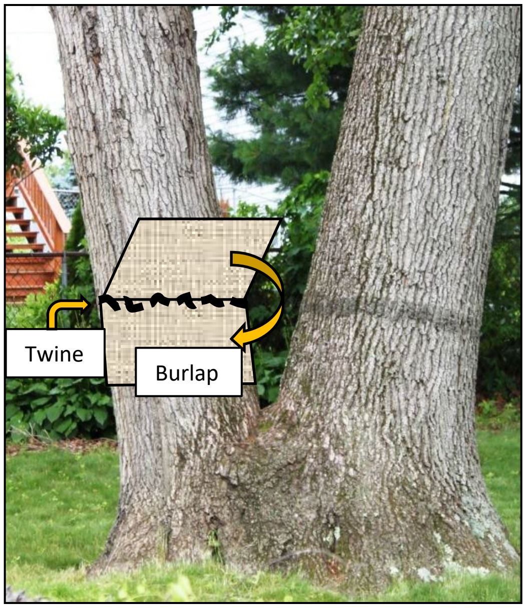

Figure 15. Tree showing remnant of sticky banding for spongy moth from the 1980s (right) and diagram of burlap refuge band (left).

The larvae will crawl into or under the folded burlap or be trapped by a sticky band and can be killed. Some trees may still show signs of earlier bands from the 1980s (Figure 15). Sticky tape should face out and petroleum products such as Tanglefoot should not be applied directly to the bark.

Biological Control:

Microbial Pathogens

The major spongy moth control agent has been the entomopathogenic fungus *Entomophaga maimaiga,* (Figure 16). This pathogen was released in the Boston area in 1910-1911 and no evidence of infection was found. It was discovered during a spongy moth outbreak in 1989. Resting spores of the fungus can survive for more than 10 years. The fungus can provide complete control of the spongy moth, but early season moisture from rains in May and early June are important to achieve effective infection rates and propagation of the fungus to other caterpillars. The dry spring in 2015 and 2016 resulted in little or no apparent fungal inoculation or spread until it killed late-stage

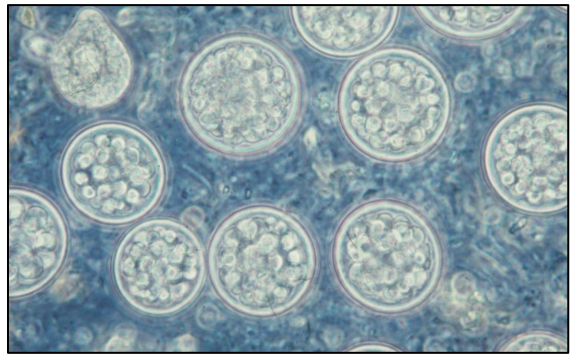

Figure 16-17. Spores of the fungus *E. maimaiga* (top) (CAES) and caterpillars killed by the fungus (bottom - photo by Gale Ridge, CAES).

caterpillars in a few areas of the state, subsequent to most defoliation. Infected caterpillars typically hang vertically from the tree trunk, head down from the tree trunks or other surfaces, but many also die in an upside down “V” position (Figure 17), generally a characteristic of caterpillars killed by the less common spongy moth nucleopolyhedrosis virus (NPV). No evidence of NPV was detected in caterpillars examined in 2015, although some was detected in 2016. Current labeling for the NPV product Gypchek does not require that the product be used under Forest Service supervision, but it is used in managing spongy moth infestations in public pest control programs sponsored by government entities.

The biological insecticide *Bacillus thuringiensis* var. *kurstaki* (Btk) (Dipel, Biotrol, Biobit, Foray, Others – Table 1) is a bacterium that occurs naturally and only affects caterpillars of moths and butterflies.

It must be ingested by feeding caterpillars for the endotoxin to work; Btk is not effective against the pupa and adult of the spongy moth. It may be applied by air for control in areas where there are active suppression programs, but no aerial applications have been conducted in Connecticut, because *E. maimaiga* has generally kept the spongy moth under control (Figure 18). Btk may also be applied by commercial applicators and/or homeowners. It is most effective when applied to young caterpillars; i.e., larval instars 1 and 2. Generally, two applications are made, one during late April (possibly) or early to mid-May to 1st and 2nd instar caterpillars (ca. 25-35% leaf expansion), followed by second treatment about 1 to 2 weeks later.

Figure 18. Aerial spraying of *Bacillus thuringiensis* (BT) in Ledyard, 1985.

Parasitoids and Other Natural Enemies

With the spongy moth parasite introduction program that began in 1905 by the USDA and Massachusetts, ten insect parasitoids and one predator from Europe and Asia were established in Connecticut by 1981. The egg parasitoid *Ooencyrtus kuvanae*, a small black wasp (Figure 19), parasitizes spongy moth egg masses. Female wasps overwinter in the leaf litter, emerge mid-April and attack egg masses prior to the emergence of the larvae in late May. New adult wasps will emerge between mid-July and mid-August to attack the new spongy moth egg masses. While up to 20-30% of the egg masses may be parasitized, the little wasp's short ovipositor only can reach the outermost eggs in a mass. Other natural enemies, other than microbial pathogens, include two large ground beetles, and small mammals such as white-footed mice and shrews.

Figure 19. Egg parasitoids *Ooencyrtus kuvanae*. on egg mass (top and middle) and close-up female wasp. Photographs courtesy of Henry E. Rosenberg, Ph.D., Killingworth, CT. Used with permission (do not reproduce).

Chemical Control

There are a number of crop protection chemicals labeled for the control of spongy moth on ornamental trees and shrubs. Those labeled for spongy moth control on ornamental trees and shrubs are provided in Table 1. There are many individual brands or trade names for the insecticides; not all may be registered for spongy moth. Some products are classified as a Restricted Use Pesticide (RUP), formulated for use only by a licensed applicator, often due to toxicity to aquatic invertebrate animals. Other products are available to homeowners.

Treatment of Egg Masses – An alternative to the removal of spongy moth egg masses is the treatment with insecticidal soap, mineral oil, or a soybean oil product (Table 1). The destruction of each egg mass prevents the hatching of up to 1000 caterpillars. Completely soak each egg mass with the oil or insecticidal soap. Egg masses are present from mid-summer through the next spring, which provides plenty of opportunity for removal or treatment.

Treatment for Larvae – Timing of application for the control of spongy moth caterpillars is important and thorough coverage of individual trees is necessary for good control. Correct treatment of trees > 15 feet in height will require the services and spray equipment of a licensed arborist. An arborist is someone who is qualified to perform arboriculture (tree services) and is licensed by the Department of Energy and Environmental Protection (DEEP). The best results for most products will be obtained after the larvae have hatched, generally between mid-May and mid-June. A single application is generally sufficient to protect trees, but another application may be necessary if the entire tree was not treated or if a property is adjacent to heavily infested woodlands. In the case of insect growth regulators (IGRs) like diflubenzuron or tebufenozide (commercial use only) and *Btk* they are most effective when applied to the early stage caterpillars. Most of the other products for spongy moth control are pyrethroids, some of which are only for commercial use, while other brands or formulations are available to homeowners (Table 1). Four materials are listed by the Organic Materials Research Institute (OMRI) for organic use: Btk mentioned previously, the insect growth regulator azadirachtin, spinosad, and a few pyrethrin or insecticidal soap products. Azadirachtin is the active naturally occurring insecticidal compound in the neem tree. Neem products need to be ingested to be effective and are relatively safe for pollinators and beneficial predators and parasitoids. Spinosad is a natural insecticide consisting of two compounds; spinosyn A & spinosyn D, derived from the fermentation of the bacterium *Saccharopolyspora spinosa* (discovered in sugar cane fields of the Caribbean). It works primarily through ingestion on most targeted pests, but it also can kill on contact. While generally safe for most beneficial insects, spinosad is toxic to bees up to three hours after application. Emamectin benzoate is systemic insecticide which is also labeled for spongy moth control. Used more frequently for control of the emerald ash borer, it is delivered via tree injection by a licensed arborist.

Control of Pupae – There is no chemical specifically labeled for the control of spongy moth pupae. Similar to egg masses, the tear-dropped shaped pupae can be removed and destroyed. The pupal stage is present for only 10-14 days.

Treatment of Adult Moths – While several insecticides are labeled for the control of adult moths, applications against the adult stage are much less effective than targeting the eggs or caterpillars. Individual adult moths live between 6 to 10 days. Similarly, pheromone traps for male moths, which are meant for monitoring purposes, are not an effective control method.

Toxicological and other information for a particular chemical is available online from the U.S. Environmental Protection Agency (EPA) (www.epa.gov), the National Pesticide Information Center (NPIC) (http://npic.orst.edu/), and the Extension Toxicology Network (EXTOXNET) (http://ace.orst.edu/info/extoxnet/). The Pesticide Management Division, Connecticut Department of Environmental Protection, can provide information on laws and regulations governing the application of insecticides, certification of pesticide applicators and arborists, and which products are registered for use in the state (online - Kelly Registration Systems).

The 2016 Spongy Moth Outbreak:
In 2015, there was approximately 180,000 acres defoliated by the spongy moth in Connecticut. In 2016, there was 204,167 acres defoliated (see Figure 21) and most of the defoliation, while sometimes focal, was severe and more extensive with many trees completely stripped of leaves and many spruce, pine, and hemlock targeted in some localities were also completely defoliated. Defoliation was particularly widespread and severe through many parts of Middlesex, New London, and Windham counties. In neighboring Massachusetts, 38,175 acres were defoliated by the spongy moth in 2015, but 352,774 acres were impacted in 2016. An estimated 200,000 acres of forest was severely defoliated in Rhode Island in 2016.

Figure 19. Oak defoliated in Hadlyme, CT in 2016. Photo courtesy Bob Standish, Hadlyme, CT. Used with permission.

Figure 20. Trees defoliated in North Branford, CT, 2016. Photo by Kirby Stafford.

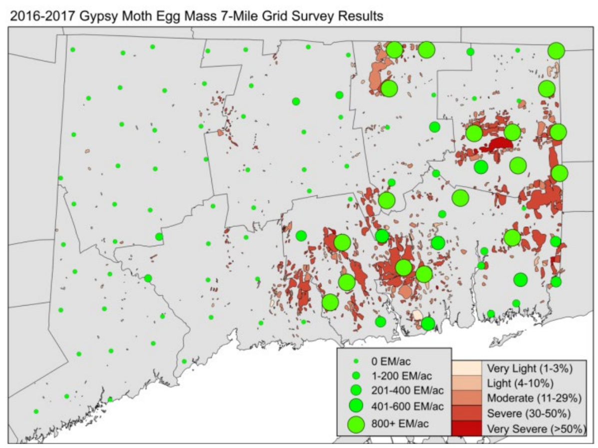

Figure 21. Spongy moth egg mass survey, 2016-2017 with the 2016 defoliation (204,167 acres).

As severe as the outbreak was in 2015 and 2016, it was still way below the 800,000 to 1.5 million acres impacted in Connecticut in the 1970s and 1980s. There was some fungus activity through parts of southcentral Connecticut, mainly in Middlesex County. However, it did not result in high levels of caterpillar mortality in most locations and little or no fungus activity was observed in eastern areas of the state (e.g., Tolland, Windham, and New London counties). The limited or lack of fungus activity and the large spongy moth population in the eastern half of the state was due to the lack of rain in 2015 and 2016 needed to get *Entomophaga maimaiga* infecting the caterpillars and propagating the spores. There has not been an active state program for spongy moth control since the large outbreaks in the 1980s.

The 2017 Spongy Moth Outbreak:
In 2017, the spongy moth outbreak was extensive and severe throughout eastern Connecticut. There were 1,175,000 acres impacted by the caterpillars, the greatest extent of defoliation seen since the early 1980s (see Figures 1 and 22). This was largely a result of nearly three years of drought that prevented or limited fungus activity and therefore control of the spongy moth caterpillars. However, widespread mortality from *Entomophaga maimaiga* was finally observed in June 2017, just prior to pupation by the caterpillars. Reports were received from the public of dying caterpillars from 87 towns and adult moth activity from only 47 towns. Our egg mass survey for 2018 indicates that pockets of egg masses exist that will result in moderate to high caterpillar activity in some localities (see Figure 22). Nevertheless, in 2918 we will not see the same extensive activity and widespread defoliation observed in 2017. Because all the caterpillars that died from the fungus in 2017, there is a lot of inoculum (i.e., *E. maimaiga* resting spores) available in the environment to infect the caterpillars in 2018 and 2019 if we get the necessary spring-early summer rains.

Homeowner and Arborist Applications: Homeowners in those affected areas with egg masses may consider treating their trees for spongy moth around early to mid-May 2018. There is no way to predict if rains will arrive at the right time and amount to get the fungus going in 2018, but we have been receiving a lot of rain this spring so far. A licensed arborist would be needed to spray larger trees. A systemic neonicotinoid insecticide can also be applied as a soil treatment or bark treatment, depending on product or label. Under Public Act 16-17, An Act Concerning Pollinator Health, all neonicotinoids labeled for treating plants were classified as restricted use on January 1, 2018. While most of the deciduous trees defoliated in 2015 should have re-leaved and recovered, many did not, due in part to the drought. This problem was compounded in 2016. Conifers, especially spruce, will not recover if there was extensive needle loss. Nevertheless, depending on the degree of defoliation and drought, many trees hit in 2015, 2016 and/or 2017 did not survive, especially those defoliated again in 2017.

Roadside Applications: A town, city or borough may also consider spraying or contracting for spraying of any roadside or areas within its jurisdiction. The state has contracts for roadside spraying of state property.

Aerial Applications: For larger areas (e.g., larger forested property tracts, homeowner associations, large tracts town lands), aerial spraying is the only practical option. However, aerial spraying for spongy moth is expensive, requires a permit from DEEP, and a company certified to conduct aerial applications in Connecticut. Aerial applications are likely to be unwarranted in 2018 as infestations will be more localized. A permit application and instructions are available on the DEEP website. Except for large forest tracts, permits are only granted for aerial applications by helicopter.

Applications are reviewed by the Pesticide Program to assure that the pesticides are products which are appropriate to the site, will not cause unreasonable environmental effects, and all the affected property owners have been properly notified. Options for aerial application include Btk (Dipel®8L, Foray® 48F, Foray® 48B, Foray® 76B), tebufenozide (Mimic®2LV), diflubenzuron (Dimilin™ 25W). However, only Btk is approved for residential spongy moth control in Connecticut. Dipel is a paraffinic oil-based formulation, while Foray is an aqueous flowable formulation. These can be applied as undiluted ULV or mixed with water for higher volume applications. While Btk can kill non-target lepidopteran larval species (i.e, other caterpillars), few are present at the time of Btk is applied. Gypchek, a nucleopoly-hedrosis virus product, is specific to spongy moth. The virus is produced by the USDA Animal and Plant Health Inspection Service (APHIS) and the Forest Service and is produced from a laboratory strain of reared spongy moths. Supplies are limited and generally used in ground or aerial applications by governmental agencies in slow the spread programs or in areas with sensitive or endangered species of butterflies and moths.

The 2018 Spongy Moth Outbreak:
In 2018, the spongy moth outbreak was much less severe as anticipated based on the egg mass survey. There was only 287,013 acres defoliated, again mainly in the eastern half of the state (Figure 23). The 2018-2019 egg mass survey indicated even lower spongy moth activity for 2019. However, there would still likely be some local "hot spots" of activity. Again, there is a lot inoculum (i.e., *E. maimaiga* resting spores) available in the environment to infect any caterpillars in 2019 if we get the necessary spring-early summer rains. Nevertheless, as a consequence of the drought and spongy moth outbreak, there has been extensive tree mortality, especially of oaks, in eastern Connecticut. In 2019 and 2020, there was 166,636 and 156,000 acres impacted, respectively.

The 2021 Spongy Moth Outbreak:
The caterpillars (*Lymantria dispar*) caused extensive defoliation of trees in northwest Connecticut, centered around Sharon-Cornwall area of CT in 2021. There were 45,548 acres of oak, beech, and aspen defoliated with heavy defoliation of red maple and birch. This wasn't totally unexpected as our statewide 2020-2021 winter gypsy moth egg mass survey found high egg mass counts in the Sharon area. Egg mass counts in the 2021-2022 survey were high indicating a high potential for an outbreak in 2022.

Name Change Entomological Society of America: The previous name, "gypsy moth" was removed due to its use of a derogatory term for the Romani people. The change is the first undertaken by ESA's Better Common Names Project.

Photographs were provided by Chief Plant Inspector Peter Trenchard (now retired) except as noted. Aerial surveys are conducted by Deputy State Entomologist Dr. Victoria Smith and CAES Plant Inspector Tia Blevins. Other photographs provided courtesy of Bob Standish, Hadlyme, CT and Dr. Henry E. Rosenberg, Killingworth, CT.
References include CAES publications The Gypsy Moth by John F. Anderson [2-82]; Anderson & Weseloh. 1981. The Gypsy Moth in Connecticut, CAES Bull. 797; and The Fungus and the Spongy Moth by Ronald M. Weseloh; Frontiers of Plant Science; 54(2) Spring 2002. Other sources include Andreadis & Weseloh. 1990. PNAS. 87:2461-2465; and McManus et al. 1979. The Homeowner and the Gypsy Moth: Guidelines for Control. USDA Home & Garden Bull. No. 227. Reardon et al. Gypcheck–Bioinsecticide for Spongy Moth Control in Forested Ecosystems and Urban Communities, FHTET-2012-01, 2nd ed., March 2016. Egg mass survey by State Survey Coordinator Katherine Dugas, Plant Inspectors Tia Blevins and Jeffrey Fengler, and Zachary Brown; maps prepared by Zachary Brown. Aerial survey is funded by the U.S. Forest Service with the assistance of the Connecticut Civil Air Patrol.

Published August 2015; updated April 2022.

Figure 22. Aerial survey map of Connecticut showing areas defoliated by the spongy moth in 2017 (1,175,000 acres) overlaid with the results of the 2017-2018 CAES egg mass 7-mile grid ground survey. Survey and map produced by the Office of the State Entomologist, CAES. Aerial survey conducted by Deputy State Entomologist Dr. Victoria Smith and Plant Inspector Tia Blevins. Egg mass survey by State Survey Coordinator Katherine Dugas, Plant Inspectors Tia Blevins and Jeffrey Fengler, and Zachary Brown; map prepared by Zachary Brown. Aerial survey is funded by the U.S. Forest Service.

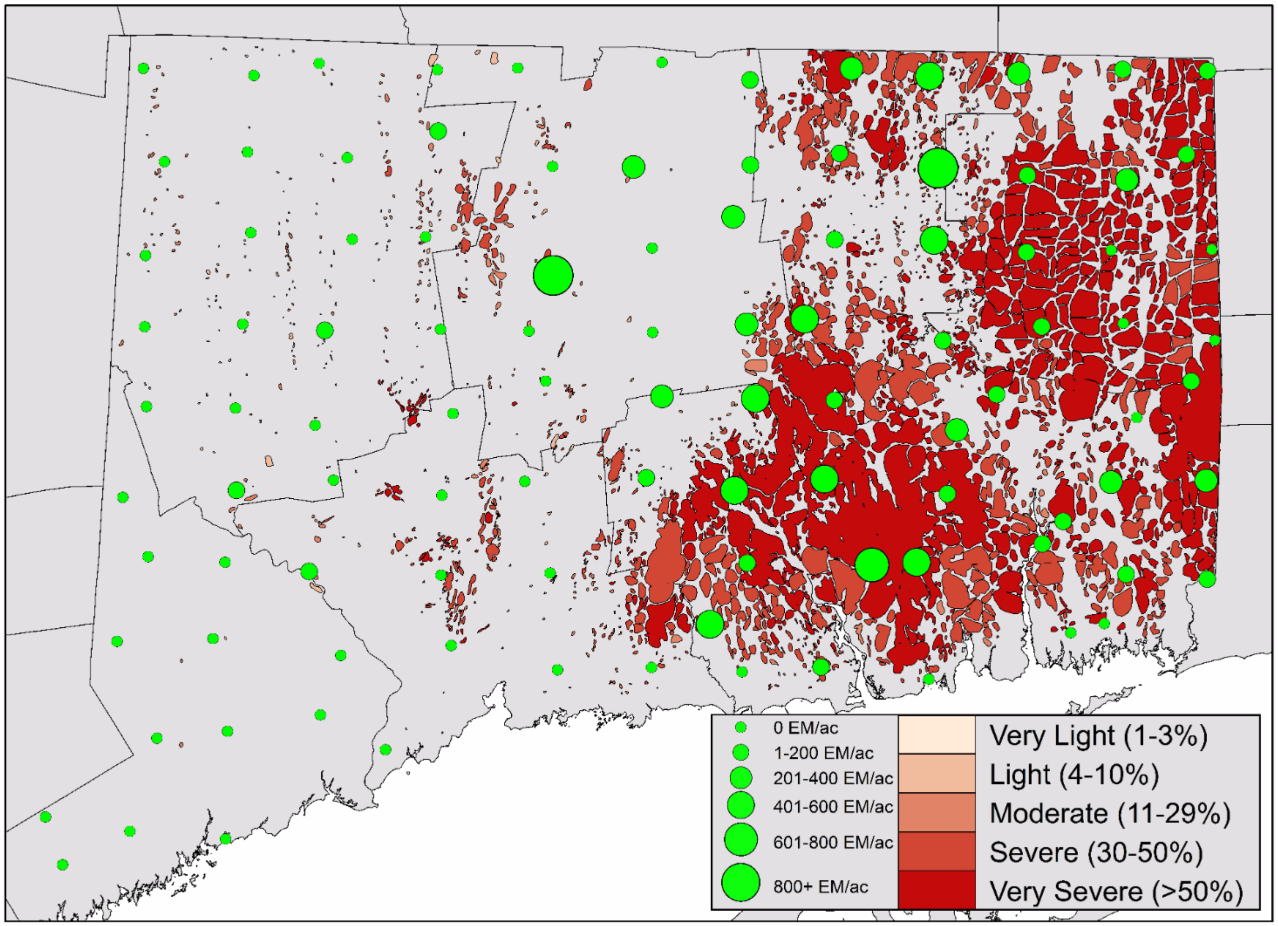

Figure 23. Aerial survey map of Connecticut showing areas defoliated by the spongy moth in 2018 (287,013 acres) overlaid with the results of the 2018-2019 CAES egg mass 7-mile grid ground survey, which provides an indication of activity for 2019. Survey and map produced by the Office of the State Entomologist, CAES. Aerial survey conducted by Deputy State Entomologist Dr. Victoria Smith and Plant Inspector Tia Blevins. Egg mass survey by State Survey Coordinator Katherine Dugas, Plant Inspectors Tia Blevins and Jeffrey Fengler, and Zachary Brown; map prepared by Zachary Brown. Aerial survey is funded by the U.S. Forest Service.

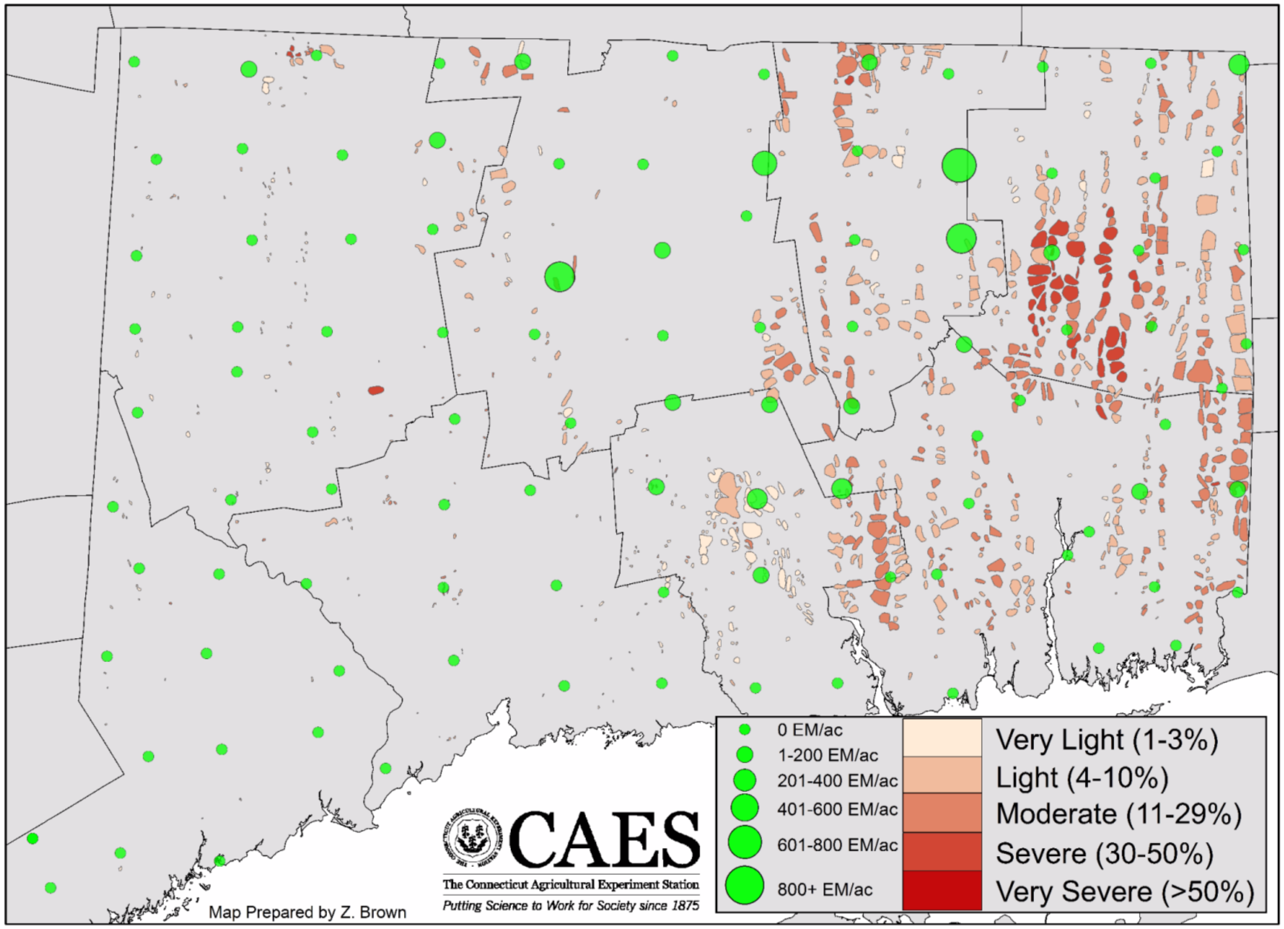

Figure 24. Aerial survey map of Connecticut showing areas defoliated by the spongy moth in 2021 (45,548 acres) overlaid with the results of the 2021-2022 CAES egg mass 7-mile grid ground survey, which provides an indication of activity for 2022. Survey and map produced by the Office of the State Entomologist, CAES. Aerial survey conducted by Deputy State Entomologist Dr. Victoria Smith and Plant Inspector Tia Blevins. Egg mass survey by State Survey Coordinator Gerda Magna, Plant Inspectors Tia Blevins and Jeffrey Fengler. Aerial survey is funded by the U.S. Forest Service.

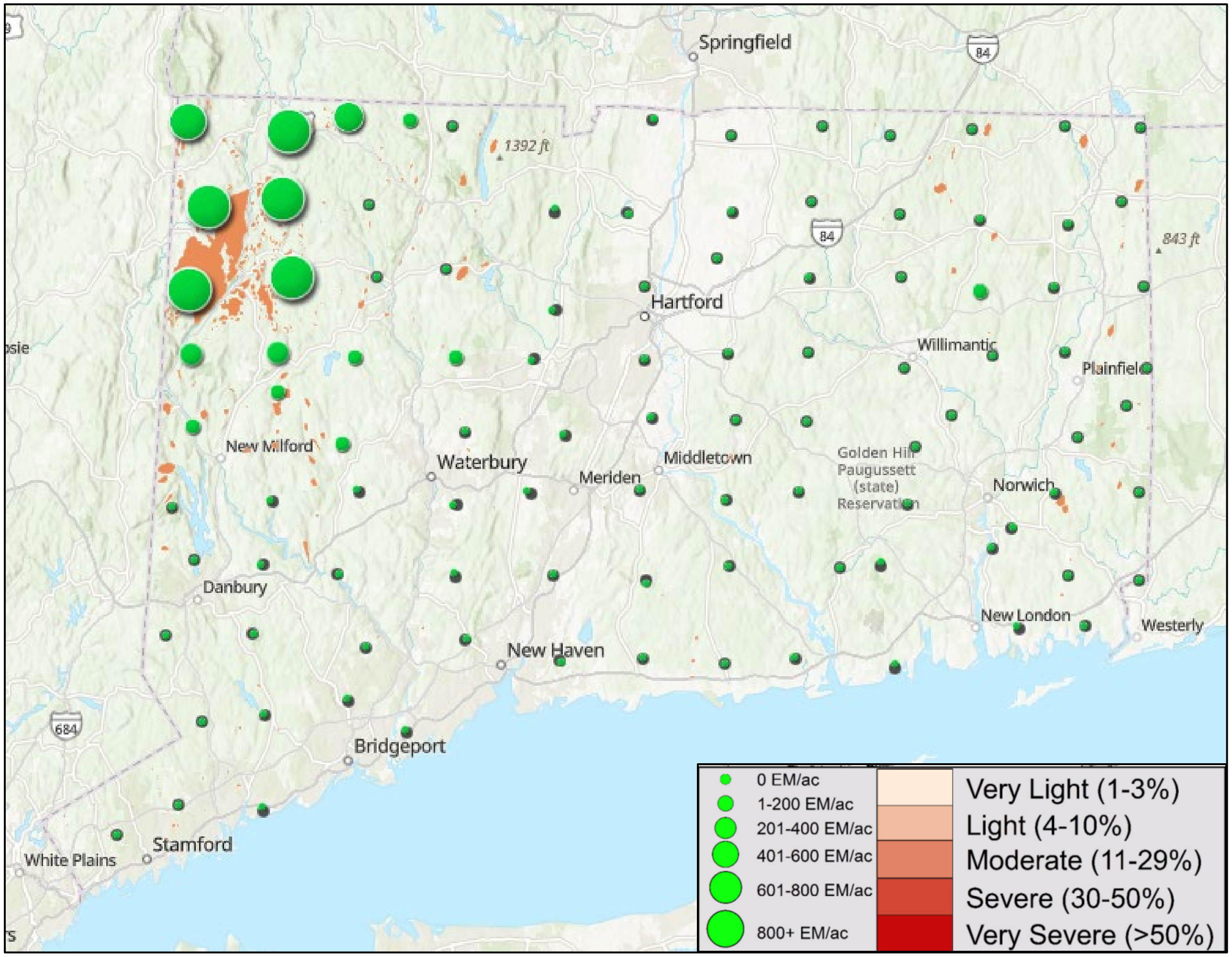

Table 1. Chemical and biological insecticide compounds labeled for the control of the spongy moth on ornamental trees and shrubs by general or restricted use. Chemicals or formulations listed as restricted use may only be used by a licensed applicator. There are 4 products registered for eggs (E), 246 for larvae (L), and 78 for adults (A) of the spongy moth in Connecticut. Many products may contain the same active ingredient and some products contain more than one active ingredient.

Chemical (active ingredient)	Representative Trade Names	Chemical class or type	Stage	Comments
General use				
Acephate	Orthene®	Organophosphate	L	
Azadirachtin	Azatrol®, Azatin®, Azamax®, Ornazin®, Neemix® 4.5, Safer Bioneem®, TreeAzin®	Insect growth regulator (IGR)	L	Neem-based Insecticide, OMRI listed. Some require tree injection by licensed applicator
Bacillus thuringiensis var. *kurstaki*	DiPel®8L, Foray®48B, Foray®76B, Biobit® HP, Safer® Tree, Shrub Conc. Thuricide® BT, Javelin®	Biological	L	A bacterium that kills when ingested, OMRI listed
Carbaryl	Sevin® SL and others	Carbamate	L, A	
Methoxyfenozide	Entrepid® 2F	Diacylhydrazine (IGR)	L	Molting hormone agonist, relatively non-toxic honey bees
Emamectin benzoate	TREE-äge	Derivative of abamectin as salt with benzoic acid	L	Tree injection by arborist
Nuclear Polyhedrosis Virus (NPV)	Gypchek	Biological	L	For use by governmental entities
Pyrethrins plus piperonyl butoxide (PBO) sulfur, or insecticidal soap, etc.	Pyrenone®, Garden Safe	Pyrethrin	L, A	Natural insecticide compounds from chrysanthemum flower. Most products other uses.
Insecticidal Soap	M-Pede®, Safer® Bayer Advanced Natria®	Potassium salts of fatty acids	E, L	Products with synergist PBO are not considered organic
Spinosad	Entrust® SC, Conserve® SC Bull's-Eye™ Bioinsecticide	New chemical class spinosyn A & spinosyn D	L	Bacterial fermentation product, OMRI listed
Canola oil	Bayer Natria® Ortho® Elementals™ (with pyrethrin)	Oil	L, A	Combined with pyrethrin in many homeowner products
Mineral (petroleum oil)	Ortho® Volck® Oil Spray	Oil	E	
Soybean oil	Golden Pest Spray Oil™	Oil	E	or 50% solution oil and water
General or restricted use depending on product				
Cyfluthrin	Tempo®, Bayer Lawn & Garden	Pyrethroid	L	Some products restricted use; some general use
Bifenthrin	Onyx™, Talstar®, Mence™ Ortho® Bug-B-Gon®	Pyrethroid	L	Many products restricted use; some general use

Permethrin	Astro®, Evercide®, Permanone®, Bee Gone® Insecticide	Pyrethroid	L, A	Some products restricted use; most general use
Fluvalinate; tau-fluvalinate	Mavrik®, Bayer Advanced	Pyrethroid	L	Some products restricted use; some general use

Restricted (Commercial) use				
Imidacloprid	Bayer Advanced Tree & Shrub Bayer Advanced (other names)	Neonicotinoid	L	Imidacloprid and other neonicotinoids were classified as restricted use in CT effective January 1, 2017 (Public Act 16-17)*
Dinotefuran	Transtect™ (soil application)	Neonicotinoid	L	Dinotefuran and other neonicotinoids were classified as restricted use in CT effective January 1, 2017 (Public Act 16-17)*
Chlorantraniliprol	Acelepryn®	Anthranilic diamide	L	Commerical use only
Cypermethrin	Cyper TC	Pyrethroid	L, A	Trunk, structural use
Chlorpyrifos	Dursban 50W	Organophosphate	L, A	Certified applicators only
Deltamethrin	Deltagard® T&O, Suspend SC	Pyrethroid	L	Commercial use only
Diflubenzuron	Dimilin™ 25W	Benzophenyl urea (an IGR)	L	Certified applicators only
Lamda-cyhalothrin	Demon® Max, Simitar® CS	Pyrethroid	L, A	Commercial use only, General use products not labeled for GM
Tebufenozide	Mimic®2LV	Insect growth regulator (IGR)	L	Specific to Lepidoptera, apply to 1st, 2nd, or 3rd instars

The list of active ingredients in products labeled for the control of spongy moth is for informational use only and is based on searches of registry databases (e.g., kellysolutions.com/CT) and other sources. List is not comprehensive. Active ingredients and products may change over time. Not all trade names (252 products registered in Connecticut alone) can be mentioned. A list of specific products acceptable by OMRI for organic use is available at https://www.omri.org/. Mention of an insecticide does not constitute a claim of effectiveness or an endorsement by The Connecticut Agricultural Experiment Station. The product label is the legal document for use and homeowners and others applying an insecticide should read and follow the label directions.

*The Commissioner of CT Department of Energy and Environmental Protection (CT-DEEP) has re-classified all Connecticut registered neonicotinoid pesticides, as defined by Public Act 16-17 (An Act Concerning Pollinator Health), that are labeled for treating plants, as “Restricted-Use”, effective January 1, 2017. A restricted use pesticide can only be sold by a restricted use dealer to a certified commercial pesticide supervisor or to a farmer with a private applicator certification. Consumers will be allowed to use re-classified neonicotinoid pesticides purchased prior to January 1, 2018 until January 1, 2019.