

Questions and Answers: New name, familiar pest: Preparing for *Lymantria dispar* (formerly known as Gypsy moth)

This NotMISpecies webinar aired on Thursday, April 14, 2022, 9:00 a.m. We ran out of time to address viewer questions, so the panelists have provided the following responses to questions received during the webinar.

Note: The Entomological Society of America no longer recognizes the common name of “gypsy moth” for Lymantria dispar. The Michigan Department of Natural Resources is currently addressing the name change by altering its website and outreach materials to reflect the new common name, spongy moth. Given the novelty of the name change and to maintain consistency for those who have been dealing with this pest over the last few years, the webinar and this document utilize the previous name, gypsy moth.

The pathogens that cause gypsy moth outbreaks to collapse: Nucleopolyhedrosis virus (NPV) and *Entomophaga maimaiga*

Will the fungus and virus that kill gypsy moths also kill other caterpillars? Were these diseases introduced by humans to combat the gypsy moth?

*The gypsy moth NPV pathogen (virus) is species-specific. It arrived with gypsy moth and has driven GM dynamics for 150+ years. In lab tests, the fungus was able to infect a few other species, but this does not happen outside the lab – the timing and behavior of GM caterpillars result in fungal infection in spring. The native species have different behavior patterns that prevents them from becoming infected. Thus, the fungus is also effectively species-specific. The *E. maimaiga* fungus was introduced in the 1920’s for GM, but there was no evidence it became established. In the late 1980’s, the fungus was found to be killing GM caterpillars in New England. Nobody actually knows whether the fungus mutated and became more virulent or if the fungus was somehow reintroduced. But it spread naturally and by people moving dead cadavers or soil with the resting spores of the fungus into new areas to establish it in more locations. It was introduced into Michigan in 1990-1991. We no longer move soil, but cadavers can still be collected and moved to new areas. Cadavers can be placed on soil under oaks or other GM host trees (clear away the leaf litter). When the cadavers break down, the fungal spores will remain in the soil.*

Do the two diseases occur simultaneously?

Both the NPV virus and E. maimaiga fungus can affect the same population, and dead NPV and fungus-killed caterpillars can be on the same tree. The virus is naturally occurring in the population and builds up during outbreaks as caterpillars become stressed and come into contact with each other more than at endemic (low density) levels. The fungus does not require a high density of GM to build up, but it is very dependent on spring weather. It requires wet - but not too wet - soil and cool - but not too cool - temperatures.

Can irrigation be used to help increase the fungus availability and, if so, when, how much, etc.?

Irrigation can help, but only in a very localized area. The caterpillars will crawl up and down trees and move across the ground. This provides an opportunity for the fungal spores in the soil to infect young caterpillars. They will die, produce spores and those will infect large caterpillars. Damp soil or irrigating the lawn around oaks and other GM hosts can sometimes help the fungal spores in the soil germinate and infect the young caterpillars. Occasional irrigation in the evening might be a good idea – certainly can't hurt. Don't apply too much water- you don't want to saturate the soil.

Should landowners who see the infected caterpillars on their site, leave these individuals to spread the virus or fungus to the rest of the population?

This is a great question. It is good to leave those dead caterpillars if you can or spread them at the base of oaks at the edge of your yard. This will help build up spore levels on your property, increasing the chance that the fungus can infect young caterpillars the following spring or even in the next outbreak. Some spores germinate every year, but others remain in the soil for 5-6 years or maybe longer. Let the cadavers decompose naturally – that's the best way of keeping NPV particles and fungal spores in the area.

Have there been any studies that show negative effects of the fungus on native species?

In lab tests, the fungus was able to infect a few other species of moths, but this has not been observed outside the lab. This is largely because of the timing and behavior of GM caterpillars that results in fungal infection in spring. The native moth species have different behavior patterns that prevent them from becoming infected. Thus, the fungus is also effectively species-specific.

The fungus is now widespread in the upper Midwest, Northeast and other regions of the US and there has been no evidence of negative effects on other species. E. maimaiga is considered quite species-specific.

The NPV virus has been used as a pesticide in other countries for *Helicoverpa* species, has this process been examined domestically for spongy moth management?

NPV stands for nucleopolyhedrosis virus. Many insect species are affected by their own species-specific NPV pathogen.

The gypsy moth NPV only affects gypsy moths. Some individual GM may carry sublethal loads of NPV – this is why egg masses are often smaller at the end of an outbreak, for example.

*Inadequate amounts of food, competition for places to rest, and increased contact with other GM caterpillars will increase the amount of NPV in a GM population, causing it to collapse. I suspect the same is true for *Helicoverpa* species such as bollworms or corn earworms.*

Using *Bacillus thuringiensis* var. *kurstaki* (Btk)

Is Bt still advised in areas where there is evidence of the virus or fungus affecting caterpillars, or is it better to just let nature take its course?

*Cadavers killed by the virus and/or the *E. maimaiga* fungus are a good indication that the population is collapsing. However, it is not a guarantee that you won't have caterpillars this summer. It is a good idea to look for healthy egg masses in the fall after leaves drop or even now, before leaves expand. Egg masses that are larger than a quarter in size, tan or brownish in color, firm to the touch and do not have pin size holes are most likely healthy egg masses. Egg masses smaller than a quarter are a sign of unhealthy egg masses. This often occurs when NPV is building up in the population. If you are checking egg masses, do not count old egg masses from last year. These are usually whiteish in color, may be falling apart and/or will have pin-size holes in the mass.*

Where can a homeowner purchase Btk to spray several trees around the house or cabin to reduce the droppings?

There are a number of Btk products that are sold at big box stores, garden stores or even at some local convenience stores. Stores that sell lawn care supplies often have product with Btk. You can also find Btk products available online - just google Btk for gypsy moth. Note that products that contain Btk will have a name like Foray, Dipel, Thuricide, etc.

Should you hire someone to spray BT aerial for best results? How helpful is it if your neighbors do not spray also?

If I treat my tree and my neighbors don't. Will spraying my trees help. Won't the moths just walk over?

An aerial Btk spray applied properly at the right time of the season will reduce the density of the caterpillars, but Btk sprays (and sprays with other insecticides) won't eliminate gypsy moth in your area. It's possible some caterpillars could move from a neighbor's property to your land. A lot depends on the specific situation – what are the tree species, the tree size and the distance from your trees to those on the next property over. How large is your property? There is no good reason to spray woodlots or forested areas – the goal is to reduce the density of caterpillars around your house. You may be able to hire an arborist to spray Btk from the ground if only a few trees need to be treated. You can use bands to help protect individual trees too.

Oak trees are commonly 80+ feet tall. Hoses/sprayers only reach 30-40ft max. Any suggestions for spraying foliage above 30 feet for homeowners?

I don't have a sprayer to spray 20 to 30 feet in the air. Can you put BT on the grass around the tree?

This is a common question because Bt must be on the leaves and consumed by the caterpillars to be effective.

Some people have tried using a power washer with a soap dispenser to get the spray up higher into the canopy. Professional arborists may be able access large trees near a road with a bucket truck.

You may want to check into AceCaps. These resemble vitamin capsules, but they contain an insecticide called acephate. It is the same insecticide that is sold as Orthene. This product is applied by drilling holes into the sapwood on the trunk of the tree then shoving a capsule into the drilled hole. The insecticide moves up to the leaves within a few days and will kill the feeding caterpillars. Obviously, you will want to read the label and follow all the directions for use. You do not want to use this on a fruit tree or a nut tree – the insecticide will move into the fruit and nuts. Also, I would not use it more than 2 years in a row. This is one of the very first options developed for injecting insecticides into the tree. Sometimes, the sapwood around the drilled hole dies, and if you get too many dead spots, it can girdle the tree. But using AceCaps for a year or two should be fine.

There are other systemic insecticides such as imidacloprid that can be applied to the soil around the tree trunk or injected into the base of the tree. These work for various insect pests including some beetles and some sap-feeding insects such as scales, emerald ash borer, hemlock woolly adelgid, etc. Unfortunately, these products don't work very well for controlling caterpillars.

You can use burlap strips to catch caterpillars and scrape them into a bucket of soapy water to kill them. It takes a few minutes a day to do this and can help protect individual trees. I would not recommend doing large numbers of trees like this, but maybe a few near the house to help keep the unpleasant caterpillars away from your homes and some leaves on shade trees in your yards.

How long does Btk stay viable in the container?

Check the label. It will depend on the formulation and how the container is stored.

For Steve - How many different species of insects or other arthropods does Bt kill besides Lymantria?

Btk bad for monarch butterflies? bees?

Btk is specific to caterpillars and must be consumed to be effective. It does not affect bees or other groups of insects. It has a half-life of 4-7 days, which means that after two weeks, there is not much left. Targeting young gypsy moth caterpillars between mid or late May and early June limits the potential non-target effects on native moth or butterfly species.

If you have a small garden plot where you grow plants for butterflies, you may want to cover those plants if you are spraying Btk on nearby trees. Aerial applicators can turn spray nozzles on and off, limiting drift or the chance that Btk would land on areas outside designated spray blocks.

If you are one of the folks interested in monarch butterflies, it's good to know that most monarch activity occurs well after Btk sprays would be applied for gypsy moth. In other words, monarchs typically arrive in lower Michigan after most Btk sprays would have occurred. This is another reason for ensuring that Btk sprays are applied early in the spring to target small gypsy moth caterpillars.

Spray Programs

Working for Extension we get many phone calls asking, "When are we going to spray for gypsy moth like we did years ago?" My response has been that they should take up the issue with their township/county government to perform widespread aerial sprays and to discuss the issue. Is this still the recommendation to give?

In many cases, I share techniques individuals can use to help lessen the nuisance of this pest as outbreaks will naturally collapse after 2-3 years. See Michigan State University's [Gypsy Moth IPM webpage](#) for more information.

With that said, it is unlikely that a program like what Michigan had back in the 1990s will ever occur again. Gypsy moth is a naturalized pest in Michigan now. Outbreaks will continue to occur occasionally in local areas and yes, every now and then, we will have extensive outbreaks like the current one. While an outbreak is not pleasant for people in an affected area, GM outbreaks are rarely a problem for healthy trees and forests. There are some counties or townships that have programs helping residential areas set up Btk sprays when outbreaks occur. These usually involve a millage. This can help reduce the costs for those in residential areas, but often are not available to those that live in rural or more isolated areas. Egg mass surveys should be conducted prior to spraying to determine if spraying is necessary and if so, to delineate spray blocks in residential areas where egg mass counts are high. A few counties have long standing millages already in place to help survey and spray residential areas when needed.

Our lake community is considering an aerial spray campaign using Foray 4B. Is that a safe and effective treatment?

Yes, Foray 4B is a Btk product that is commonly used in aerial application. It is effective when sprayed at the proper time – i.e., when most or all of the egg masses have hatched, the caterpillars are young and small, and oak leaves are expanding and large enough to capture spray droplets. Usually, Btk is sprayed in mid to late May or early June, depending on location and how quickly the spring warms up.

According to our township, there is no money from the state to spray in Muskegon County. Are there other sources of money to tap into?

No. Sometimes communities, neighborhood or lake associations or similar groups may cooperate on an aerial Btk spray or may hire an arborist or tree service to treat trees near residential areas. This can reduce costs. There are some townships in a few counties that have imposed a millage to cover costs of a gypsy moth suppression program. That typically includes egg mass surveys and a Btk spray. Residents/property owners must be allowed to opt out of the spray, so it can get complicated. Keep in mind that by the time a millage is set up and a gypsy moth program is developed, the outbreak is likely to be over or close to being over.

What steps is National Forest Service doing to protect the forests adjacent to our lands?

The Huron-Manistee National Forest to date is not spraying Btk on national forest land because of costs and perhaps potential effects on native caterpillars (although research on the Manistee

Forest specifically has shown Btk sprays have negligible impacts on populations of native Lepidopteran species). In a few cases, landowners residing on property directly adjacent to NFS lands can discuss options with the local Ranger Districts. In some cases, neighboring property owners can treat a small buffer strip to reduce GM densities around their homes.

Other Controls

I have observed what I believe is natural death of the caterpillars last fall possibly due to what I think was the higher amount of rain (spread of virus). I am in my third year of defoliation in Muskegon County, so I am quite concerned. Last year they started going after white pine and other trees. Are there natural predators (birds or animals) of the caterpillars?

*Seeing dead caterpillars (cadavers) is a good sign that populations may be collapsing because of the fungus and/or NPV pathogen. An array of natural predators feed on caterpillars ranging from predatory insects to birds and some mammals such as white-footed mice or shrews. There are also specialized wasps and fly species that are parasitoids of gypsy moth eggs, caterpillars or pupae. Larvae of these parasitoids develop by feeding on the gypsy moth, often internally. An egg parasitoid called *Ooencyrtus kuvanae*, for example, is a common and important parasitoid of GM eggs. While parasitism and sometimes predation rates increase during an outbreak, these natural enemies are overwhelmed during outbreaks. The two pathogens will eventually cause the outbreak to collapse. Other natural enemies do help control GM populations between outbreaks.*

Are egg masses generally reachable, or can they get too high for easy access?

Egg masses can be anywhere - at eye level, up at the top of trees, in hard-to-reach places like under decking or between rocks. Female moths lay them in all kinds of places. You only need to scrape egg masses that you can easily reach. No matter what you do, you will not get them all and you can go crazy trying too hard. Every egg mass you get could reduce next year's population by 200 to 1000 caterpillars, so you can make a dent in the local population if you have time. We also only recommend scraping around your home, yard trees and the edges. It is not worth trying to scrape everything in your woodlot, as you will still have defoliation if an outbreak occurs. This technique can help you reduce the nuisance of the pest around your home but isn't going to affect the progress of the outbreak.

How safe is it to commercially spray for *Lymantria dispar*? Does using dawn dish soap and water on the trunks of trees help?

Knocking caterpillars into a bucket of soapy water will kill them (Dawn, Palmolive – pick your favorite!). But spraying bark with dish soap won't do anything to the caterpillars – it will kill lichens, which are not harmful at all!

Trichogramma minutum: patches placed on trees promoted/ sold by Arbico Organics...effective in your opinion? And, with aerial spraying of btk - what's the right timing expected this year/2022? Thank you.

Trichogramma wasps are sold as parasitoids of moth eggs. They are generalists! They will attack eggs of many native species of moths and butterflies, but research has shown they WILL NOT attack GM eggs (nor tussock moth eggs). Btk sprays are best applied after most of the egg masses have hatched and the caterpillars are still small (less than 1 inch) (1st or 2nd stage). Leaves on oaks also need to be at least partly expanded so the droplets of Btk will land on them. Caterpillars have to consume the droplets on the leaves for Btk to have an effect. Simply walking across leaves or other surfaces that were sprayed will not affect them. Once the caterpillars are about halfway grown, the Btk may make them sick, but some can recover and resume feeding. In much of lower Michigan, Btk sprays are best applied between mid or late May and early June.

Precautions

PLEASE warn people to cut and loosen tape bands after 1-2 growing seasons; left for years they girdle trees!

Thanks for pointing this out. Like anything else you wrap around tree trunks, burlap or tape bands can eventually injure and even completely girdle your trees. This may take a couple years on large trees but can occur faster on younger, vigorously growing trees. Put the bands on in May and take them down in July.

I had a comment that seemed relevant for those managing spongy moth caterpillars at home, it is important to know the coloring difference, so you don't accidentally touch White-Marked Tussock Moth Caterpillar

People who are sensitive to caterpillar hairs can get an itchy rash from the hairs on gypsy moth caterpillars as well as caterpillars of tussock moths and pretty much any hairy caterpillar species. If you start developing a rash, you'll want to wear long sleeves and gloves, especially if you are knocking caterpillars off your trees and into a bucket of soapy water.

Outbreak cycles and what to expect for 2022

Why haven't there been outbreaks like there was in 1980?

In a way, this is the holy grail of forest entomology. It is very difficult to predict outbreaks of most native forest insects despite decades of monitoring and research. The "release" of GM populations (and other defoliator species) happens quickly, usually over a one to two-year period. It likely involves a combination of weather factors but not necessarily the same weather factors each time. Natural enemies, along with weather, eventually cause defoliator outbreaks to collapse, including GM. The major GM outbreak from about 1992-1996 was the first "big" outbreak. Since then, localized areas have experienced outbreaks occasionally. The big outbreak currently underway will eventually collapse (hopefully soon!) but GM populations will continue to cycle up and down. It's naturalized and part of the forest and urban forest ecosystems.

What year are we in then with this outbreak?

Based on aerial surveys, much of northern lower Michigan has experienced two or three years of defoliation. We are at the end of a typical outbreak cycle, which is why many areas seem to be collapsing. However, other areas, such as Jackson, may be in the 1st year of the outbreak and will likely experience another year or two of high GM densities.

So, are we expecting a decline in spongy moth this season for lower Michigan?

From DNR surveys across the state and information from partners, we are expecting a decline in gypsy moth/spongy moth activity in much of Lower Michigan. However, a few areas had large, healthy egg masses this spring, so decline will not be across the board. Areas in Jackson County and parts of Southwest Lower Michigan, for example, may have high density populations again this summer.

What did you see specifically in the most recent Newaygo County survey? When did that survey take place?

Surveys at a few locations in Newaygo County occurred in fall 2021. Evidence of both the fungi and NPV were observed. Dead caterpillars were present in mid or late June and early to mid-July, and a number of cocoons did not produce moths. In addition, many egg masses were small (< a quarter in size) with few to no large, healthy egg masses. Also, many egg masses were parasitized. Lots of old egg masses were also observed, but those will not produce caterpillars in 2022.

Your map shows most of the gypsy moths in the northern part of the state. I live near Saugatuck in Allegan County and had never seen gypsy moths until 2020 when I saw a lot. Is this unusual, or did you just not survey in the southern part of the state?

This is not especially unusual. Previous outbreaks (e.g., in the 1990's) began in northern lower Michigan, then built up in the southwest. Also, note that Ottawa County (SW), along with Ingham County, Washtenaw County, and other areas in SE lower Michigan had high GM populations in 2018 and 2019. The DNR conducted aerial surveys over roughly 24 million acres in 2021 and mapped what was visible from the air. Sometimes obvious defoliation from the ground is not visible from the air simply because host trees are scattered. The Saugatuck area was mapped in 2021, but not 2020 due to COVID restrictions. Aerial surveys are limited in SE Michigan because of the DTW airport.

Any plans to survey Alcona and Iosco counties this year?

Alcona and Iosco counties will be surveyed aerially in 2022. Ground surveys are much harder to predict and will be based on what we find from the air and the availability we have during the season, but it is possible we will do some up that way if defoliation continues.

Otsego County in Pigeon River State Forest has a growing population. Check it out. I have been scraping eggs all winter, spring.

Thank you for the information. Although many areas seem to be collapsing, some are not, and egg mass scraping can give you a good idea about how the population is doing in your area.

Managing outbreak effects

What advice do you have for landowners who are seeing significant defoliation of broadleaf trees in Year 3 of an outbreak?

This outbreak seems likely to collapse soon, ideally this summer (although there may still be abundant caterpillars). A good starting point would involve surveying egg masses in your neighborhood or on your property. Are there lots of egg masses? If so, are they mostly small – nickel sized? Few egg masses and/or small egg masses indicate the population is collapsing because the NPV pathogen is increasing. Have pesticides been sprayed on the property? If so, what kind? Broad spectrum insecticides are not specific to gypsy moth and may be killing more than just the caterpillars like beneficial predators and parasitoids that help control gypsy moths. These could also be keeping population levels just low enough to prevent the NPV and fungus pathogens from building up. Every situation is different. If heavy defoliation occurs again this summer, give an expert a call to see if we can help walk you through your situation.

Can you have your property evaluated for invasive species? I live in Montague Township and have seven acres of land and some of our trees are not as healthy as they use to be. What is the cost of this advice?

Initial forestry assistance may be available through your local conservation district if it has a Forestry Assistance Program forester on staff. Find your conservation district at MACD.org/find-your-district. Help with invasive species is available through your regional Cooperative Invasive Species Management Area (CISMA). You can find your CISMA at Michigan.gov/Invasives/take-action/local-resources. You may also wish to hire a consulting forester to survey your property. Visit MichiganACF.org for a list of consulting foresters in your area. A consulting forester may have suggestions for increasing the health of the trees on your property and/or ideas about regenerating young trees.

What rules or regulations are in place to prevent movement of spongy moth beyond the current area of infestation?

This is a federally quarantined pest, so there are many regulations and rules in place to limit the likelihood of movement into uninfested areas. Anyone shipping plants from nurseries, or Christmas trees, logs, etc. out of an infested area and into a state without GM must abide by these various regulations. You can find this information at the USDA APHIS Gypsy Moth website. Also, a national program called [Slow-the-Spread](#) or STS is designed to slow the expansion of spongy moth along the leading edge of the currently infested area, including places like western Wisconsin, eastern Minnesota and northern Illinois.

If an oak or pine gets gypsy moths on it, will they always defoliate the tree?

Endemic gypsy moth populations (between outbreaks) will not cause heavy defoliation of pines or even oaks (even though there may very well be a few GM around your property). During outbreaks, oaks, aspen, birch or other highly preferred host trees usually get defoliated first, followed by other hosts like white pine or spruces that are near the defoliated oaks. The good news is that caterpillars normally feed primarily on older white pine needles. If the new (current year) needles are not consumed, the tree will often survive defoliation.

What about Chestnut tree? I have a couple of young trees I was going to plant asap, but I am afraid they may be eaten up by the gypsy moths.

I have seen chestnuts be totally defoliated in the past, but they recovered (reflushed – produced a second set of leaves). In other cases, there was some feeding but not severe defoliation. Chestnuts are supposed to be moderately preferred hosts, so it likely depends on the availability of other preferred hosts and the density of caterpillars. A good reference would be [USDA General Technical Report NE-211, 1995](#).

Can defoliation of oak make them more susceptible to Oak Wilt?

No, oak wilt infects a tree via open wounds that are deep enough to expose the sapwood. It does not matter if the oak is healthy or stressed. Gypsy moth only feeds on leaves and does not cause any wounds that oak wilt (or other fungal pathogens) could use to infect a tree.

How far to the caterpillars travel to get to food?

Young caterpillars can blow in the wind 0.5 miles or so. Older caterpillars might crawl 100 or a few 100 yards – maybe as much as 0.25 miles. That is not common, and very few caterpillars would do that. Generally, they go a few yards and try to feed on whatever they find.

Webinar follow-up

Do you get a CEH credit for this webinar? Do you have an ISA CEU code?

You will get a certificate of completion for the webinar via email.

I got on late and this may have already been covered but can we get copies of the PowerPoints from today's presentations?

PDF versions of the PowerPoint presentations have been emailed to all who registered for the webinar.

Will the webinar be posted online?

The webinar recording is now available on the [NotMISpecies Webinar page](#). Those who registered also have received an email containing a link to the recording.

Hello Deb and James, from Jeremy Lowell in Bay County

Excellent information, all. Look forward to utilizing the recorded version for my staff. Thanks again!

Thanks, appreciate the feedback!

