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April 5, 2021

Karen Brower
Harper Lake Association
PO Box 53
Irons, MI 49644

RE: Gypsy Moth—Harper Lake Association

Dear Ms. Brower:

At your request, I visited Harper Lake on March 31, 2021 to inspect the incidence and severity of gypsy moth. We discussed the recent experiences of residents and visitors to Harper Lake, as well as the observations of you and other members of your association. I visited several areas of highest density of egg masses and collected some information to help understand the impacts of gypsy moths and expected 2021 populations level. In this letter, I report background information on gypsy moths, my observations, and recommendations.

Gypsy moth (*Lymantria dispar* L.) is an invasive pest that first swept through Michigan several decades ago. In the initial infestations, high gypsy moth populations caused severe defoliation of trees and in some cases tree death. Oak trees (*Quercus spp.*) are their favorite host, but they can feed on other trees and plants. In the recent past, populations have remained relatively low due to predator and disease pressures on gypsy moth caterpillars. While gypsy moth are always present at background levels, populations can spike due to weather conditions, disease prevalence, predator-prey relationships, or factors inherent to gypsy moth biology.

Over the last several years, isolated areas of Michigan have experienced an increase in gypsy moth populations. While many factors go into insect population dynamics, two important drivers of gypsy moth population control are a nucleopolyhedrosis virus (NPV) and *Entomophaga maimaiga*, a fungal pathogen. NPV can significantly impact a gypsy moth population once levels are high and the virus can easily spread. *E. maimaiga* was originally introduced to Michigan by the State and requires cool, wet springs favorable to the growth of the fungus. The presence of NPV can be seen in dead caterpillars that hang in an upside-down V on a tree, whereas caterpillars killed by *E. maimaiga* hang straight down. Both diseases tend to build in high gypsy moth populations and favorable conditions to naturally drive populations downward.

Regional Office
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248 221 0439

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The current outbreaks in Michigan appear primarily tied to weather patterns that limit the spread of *E. maimaga*, and therefore have allowed for greater survival of caterpillars. In such outbreaks, gypsy moth populations build at a gradual rate before accelerating and then crashing. Generally, gypsy moth populations may remain high for 1 to 3 years, before natural disease pressure causes a population collapse -- but gypsy moths never fully disappear.

Usually, gypsy moths are not a critical tree health concern. In most cases, reasonably healthy trees can withstand one or even several years of complete defoliation. However, multiple, successive years of defoliation, combined with other tree stress factors (e.g. drought), can have negative and sustained impacts to tree health and may lead to tree death. For this reason, it's important to monitor gypsy moths to understand gypsy moth population dynamics, the impact of gypsy moth feeding on trees, and how the trees are responding to these and other stressors.

In forested settings where gypsy moth are having an unacceptable impact on tree health, the application of a pesticide containing *Bacillus thuringiensis* (Bt) is often the most appropriate treatment option. Bt is a bacteria that occurs naturally in the environment. When ingested by caterpillars, it can lead to sickness and, in many cases, caterpillar death. Young caterpillars are more susceptible than those in later stages of development, so timing of Bt application is critical.

However, Bt can be challenging to use. The insecticide must be applied when caterpillars are feeding, but before they become too large to survive illness. Caterpillars begin hatching in early to mid May, are fairly developed by early to mid-June and usually begin to pupate in July. Further, the insecticide must be applied where it will be ingested by caterpillars. This often requires application by helicopter or with ground-based high-pressure spray rigs. Timing can be extremely difficult, as favorable weather is required and there are limited contractors available to perform aerial application. Moreover, Bt is not terribly persistent and breaks down in sunlight within a few days; any rain after application will wash it from the leaves. Combined, these factors often render applications of Bt marginally effective, if at all.

Additionally, Bt impacts all caterpillars, not only gypsy moths. Moreover, particularly the natural disease NPV is population sensitive. Using Bt to artificially reduce gypsy moth populations, may prolong an outbreak. While caterpillar populations may be somewhat reduced by Bt, the populations may also not rise to the point where NPV becomes widespread, helping to naturally control gypsy moths. For these reasons, the application of Bt should be carefully considered and limited to those situations where tree health impacts due to gypsy moth infestations reach unacceptable levels and the population is expected to continue building.

To support the monitoring of Harper Lake's gypsy moth outbreak, visual observations of egg masses were performed in several areas around the lake to obtain a sense of the density and breadth of gypsy moth. Isolated egg masses were found throughout the association, but the population seemed spotty and inconsistent. In several locations, egg mass density appeared elevated, but not overly concerning. However, a high density of egg masses appear in the vicinity of 9934 and 9946 West Harper that warrant continued monitoring. In this location, more formal egg mass surveys were performed to understand the likely 2021 gypsy moth impacts and determine if the population is building or declining. Unfortunately, the time of year

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is a little late for reliable surveys (November - January is preferred). Yet, the surveys that were performed indicate the population of gypsy moth is likely growing and may lead to some tree defoliation in 2021 in this location.

Based on these observations, it is recommended that Harper Lake continue to monitor the gypsy moth population. Midsummer (July) observations should attempt to understand the scale and breadth of feeding activity and any defoliation around the lake. The extent of defoliation will help the association understand how impactful gypsy moth may be to tree health. At this time, caterpillars impacted by NPV or *E. maimaiga* should also be evident, helping to understand the extent to which these diseases are taking hold in the population. Should these observations lead to growing concern, additional egg mass surveys can be conducted in the Winter of 2021/22 to estimate the expected population for 2022 and whether and where a more rigorous approach to treatment may be warranted.

For isolated, high-value trees of concern, Bt can be applied to individual trees. Concerned residents and property owners are encouraged to contact a reputable tree service that provides plant health care solutions for more information. On isolated trees, sticky bands or burlap sacks can be placed around trees. Gypsy moth caterpillars either have difficulty traversing these contraptions, or hide in the burlap. Both can help decrease and manage, but not eliminate caterpillar activity. These methods are not effective in forested settings.

I am happy to answer any questions or provide further background information to support your efforts. Feel free to contact me directly by phone at 248-221-0439 or via email at lee.mueller@davey.com.

Regards,



Lee S. Mueller, CF

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