

Control of European Gypsy Moth Outbreak in the City of Toronto

Date: March 17, 2017

To: Parks and Environment Committee

From: General Manager, Parks, Forestry and Recreation

Wards: 3, 4, 5 and 13

SUMMARY

European Gypsy Moth (*Lymantria dispar*) is an invasive alien pest that was first found in Ontario in 1969. If left unchecked, populations can grow to outbreak levels which can lead to tree defoliations and ultimately affect the health of the urban forest canopy. The European Gypsy Moth population fluctuates in relation to environmental and biological controls. This pest cannot be eradicated. In 2006, 2007, 2008 and 2013, Toronto implemented control measures when European Gypsy Moth populations attained outbreak levels. Those measures were successful in reducing the population to acceptable levels. Current survey data collected in the fall of 2016 and analyzed in January 2017 indicate European Gypsy Moth population levels have reached outbreak levels in some areas of Toronto, requiring intervention in order to mitigate the impact of this forest health threat. This report presents the results of the survey along with recommended control measures, which include an aerial spray of *Bacillus thuringiensis* subspecies *kurstaki* (Btk) in the larger outbreak areas.

At present, aerial spraying is proposed to treat a total of 135 ha of land in Wards 3, 4, 5 and 13. Ground based spraying, tree injection and egg mass removal is proposed for other locations within these wards to treat approximately 40 additional individual trees. This control strategy is expected to reduce the European Gypsy Moth population and expected levels of defoliation, resulting in prevention of tree loss or significant decline.

RECOMMENDATIONS

The General Manager of Parks, Forestry and Recreation recommends that:

1. City Council authorize Urban Forestry staff to implement, where necessary in Wards 3, 4, 5 and 13, an integrated pest management (IPM) program involving aerial and ground spraying of a biological control agent, *Bacillus thuringiensis* subspecies *kurstaki* (Btk), injecting individual trees with TreeAzin™ and mechanical egg mass removal.

2. City Council direct Urban Forestry staff to consult with Toronto Public Health, Transportation Services and Toronto Police Service to coordinate implementation of the proposed aerial and ground based application of the biological control agent Btk.
3. City Council authorize the City Solicitor to introduce a by-law to implement a control strategy for European Gypsy Moth infestation through ground based and aerial spraying.
4. City Council authorize staff to enter into a non-competitive procurement contract with Zimmer Air to conduct aerial spray operations as part of the overall European Gypsy Moth control program.

FINANCIAL IMPACT

The 2017 Council Approved Operating Budget for Parks, Forestry and Recreation includes funding for Urban Forest Health as part of the current service levels and provides funding for outbreaks and response program such as this.

The control measures outlined in this report are estimated at approximately \$150,000 excluding HST, or \$152,640 net of HST recoveries. Funding for this expenditure is available in the Urban Forestry Natural Area management account P00034/4409.

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

DECISION HISTORY

In 2007, 2008 and 2013 there were elevated levels of infestation of European Gypsy Moth in the City of Toronto, requiring implementation of various control methods. Approval by City Council was required in order to apply these measures.

At its meeting held on February 5, 2007, City Council adopted item PE1.4, entitled *European Gypsy Moth Outbreak in some areas of the City of Toronto*.

City Council Decision Document

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2007.PE1.4>

At its meeting held on January 29, 2008, City Council adopted item PE12.4, entitled *Forest Health Care – Invasive Exotic Pests*

City Council Decision Document

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2008.PE12.4>

At its meeting held on November 27, 2012, City Council adopted item PE17.2, entitled *Control of European Gypsy Moth Outbreak in the City of Toronto*.

City Council Decision Document

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2012.PE17.2>

Control of European Gypsy Moth Outbreak in the City of Toronto

COMMENTS

The European Gypsy Moth (*Lymantria dispar*) has been present in North America since the late 19th century when it was inadvertently released into the environment in the state of Massachusetts, USA. This leaf-eating pest steadily advanced westward throughout New Brunswick, Nova Scotia, Quebec and Ontario, in addition to the northeast and mid-west USA. The first population of European Gypsy Moth (herein referred to as Gypsy Moth) in Ontario was detected on Wolfe Island in Lake Ontario in 1969. Outbreak conditions causing visible damage over large geographic areas occurred in southeastern Ontario during the mid-1980s, the early-1990s and the early-2000s.

The Gypsy Moth's preferred hosts are all species of oak trees (*Quercus* spp.) however it will also attack maple (*Acer* spp.), spruce (*Picea* spp.), birch (*Betula* spp.), aspen (*Populus* spp.) and many other species of deciduous and coniferous trees. Gypsy Moth populations are known to fluctuate over time, with long periods of low population levels climbing rapidly to outbreak conditions, then collapsing to pre-outbreak levels. The cyclical nature of outbreaks makes control difficult as the pattern is not predictable.

Gypsy Moth has four life stages: egg, larva (caterpillar), pupa and adult. The caterpillar stage is the destructive form. At this stage of the life cycle, larvae feed on tree leaves for a period of about seven (7) weeks. With potentially thousands of caterpillars feeding on an individual tree, a tree can be quickly defoliated. Light levels of defoliation of about 30% – 40% of the leaf area of an individual tree are noticeable and will cause added stress to individual trees. Moderate to severe defoliation can occur during outbreak conditions, with repeated defoliation resulting in twig, small and large branch death and/or whole tree mortality.

Normally, Gypsy Moth is always present in low numbers. Naturally occurring fungal pathogens and insect viruses cause disease in Gypsy Moth larvae and eggs, providing effective biological control. Two natural biological controls that kill Gypsy Moth larva are a fungal pathogen referred to as *Entomophaga maimaiga*, and a virus referred to as *nucleopolyhedrosis*. Naturally occurring parasitic wasps also kill Gypsy Moth eggs and predators such as birds and mice feed on larvae. These naturally occurring biological controls aid in keeping the population levels low.

When Gypsy Moth population levels climb rapidly, the biological controls that naturally suppress population outbreaks are not effective. As a result, large numbers of larva causing repeated defoliation can lead to tree mortality. Given time, biological controls will naturally bring population levels down. However, it is important that treatment programs be applied strategically to areas with high Gypsy Moth population density so that susceptible trees are protected from lethal damage, but at the same time, populations of fungi, virus and parasitic wasps that depend on Gypsy Moth insects for their reproduction, are also sustained and allowed to build up. Treatment programs must balance the health of trees against the health of natural biological control populations.

Natural Gypsy Moth outbreaks may last from two to four years before natural biological controls or cold weather cause Gypsy Moth populations to crash. At light levels of defoliation, individual trees can respond to early defoliation by producing a second flush of leaves and as a result, the stress to the tree is mitigated. However, in combination with other stresses, repeated defoliation can cause tree mortality.

Outbreak in Toronto

The Gypsy Moth has been in the City of Toronto for more than 20 years, but until 2004, populations have been at very low levels and defoliation was not very significant. However, in 2004, 2005, 2006 and 2012, population levels were detected to be increasing and Urban Forestry received an increasing number of calls of concern from the public. As a result of the increasing population levels observed, Urban Forestry implemented control programs in 2006, 2007, 2008 and 2013 that were ultimately successful in reducing the Gypsy Moth population to tolerable levels.

In the years 2004-2006 and again in 2012, many concerned residents and Urban Forestry staff used Integrated Pest Management (IPM) techniques to control caterpillars. The methods used included:

- burlap wraps around tree trunks, collection and daily removal and destruction of the caterpillars that hide under the burlap;
- pheromone traps or lures to catch or confuse male moths; and
- scraping away or vacuuming and destroying egg masses.

These methods have worked with limited success. Burlap bands only work while caterpillars move up and down the tree in the early infestation stages. Pheromone traps are very effective for monitoring at low population levels, but provide little control in high populations. When high numbers of egg masses are located in the upper canopy of the tree, and where the tree bark is very rough, many egg masses may be missed during mechanical scraping operations. The spraying of individual trees is effective in destroying caterpillars that feed on individual trees, but has little to no impact on the overall Gypsy Moth population at the landscape level.

In 2007, 2008 and 2013, in addition to other IPM techniques, Urban Forestry conducted aerial spray operations using the biological control agent Btk. The sprays were very successful and populations of Gypsy Moth were reduced to tolerable levels.

Recent Surveys and Control Measures Proposed for 2017

Throughout the spring and summer of 2016, Urban Forestry staff identified a number of Gypsy Moth "hotspots". In mid-November, after leaf fall, Urban Forestry initiated egg mass surveys in areas of potential Gypsy Moth outbreak. Egg mass surveys were completed in January 2017. Results clearly demonstrate that a number of locations will require pesticide treatment in the spring of 2017. Presently, seven (7) separate sites totalling approximately 135 hectares (ha) are proposed for aerial spray treatment as identified in Table 1 below.

Table 1. Areas under Threat and Proposed Treatment Option(s)

Location	Ward	Expected threat	Spray area (ha)	Proposed treatment option
Princess Gardens	3	Moderate to severe defoliation	20	Aerial spray of Btk.
Thorncrest Road	4	Severe defoliation	1	Aerial spray of Btk.
North Drive and Valecrest Drive	4	Moderate to severe defoliation	15	Aerial spray of Btk.
Edenbridge Drive and the Kingsway	4	Moderate to severe defoliation	12	Aerial spray of Btk.
Bloor Street and Royal York	5	Severe defoliation	40	Aerial spray of Btk.
Baby Point	13	Moderate defoliation	5	Aerial spray of Btk.
Bloor Street and Jane Street	13	Severe defoliation	42	Aerial spray of Btk.

Note: In addition to the areas noted above, Urban Forestry plans to treat an additional approximately 40 trees on public land within the four affected Wards. These trees are outside the major spray areas and will be treated using a combination of ground spray and injection methods.

In addition to Toronto seeing a significant rise in the level of Gypsy Moth populations, the City of Mississauga and the Town of Oakville have also reported higher than expected levels of Gypsy Moth in 2016. At the time of writing this report, these municipalities are considering what control measures are required in 2017.

Prior to implementation of spraying control strategies, Urban Forestry will work with staff in Strategic Communications to develop and execute a communications plan. This plan will include meetings with Councillors and residents as well as updates to the City and Urban Forestry websites, regular media releases, notices to residents in the affected areas and signage posted along streets and in public areas such as libraries.

Engagement of Contracted Services Required to Implement a Control Program

In 2007, the City of Toronto partnered with the City of Mississauga to implement Gypsy Moth control using BioForest Technologies to plan the spray timing and application rates and Zimmer Air to obtain provincial permits and implement the spray program. This co-operative approach was repeated in 2008 when the City of Toronto partnered with the Town of Oakville, Halton Region Conservation Authority, the City of Burlington, the Royal Botanical Gardens and the City of Hamilton to utilize these same private companies to plan and implement the spraying program.

The spray implementation is highly specialized (low-level, aerial spraying over residential areas), requiring the use of a double-engine helicopter, as well as federal and provincial permits. As a result, staff anticipate that it will be necessary to enter into a non-competitive procurement contract with Zimmer Air as was done in 2007, 2008 and 2013. No other contractors have been found that can perform this work as specified. Costs will be reduced through development of a partnership with other municipalities.

Urban Forestry Natural Area Management Program

As part of the annual Operating Budget process, Urban Forestry plans for potential outbreaks that may arise as a result of annual inspections. Each year Urban Forestry conducts surveys in given areas and when outbreak levels are reached, a mitigating control program is planned. This expenditure will not impact or defer any other 2017 planned activity.

Based on the preliminary estimates of areas and numbers of trees requiring treatment, the cost of this control program is approximately \$150,000 and can be accommodated within the existing Approved Operating Budget for Urban Forestry.

Bacillus thuringiensis Subspecies *kurstaki* (Btk)

Bacillus thuringiensis subspecies *kurstaki* is a biological control agent which, when applied under proper conditions to the foliage of preferred host plants, results in the death of butterfly and moth larvae feeding on leaves. The active ingredients in Btk work only in the gut of moth and butterfly larvae and is not harmful to humans, mammals, birds or other animals. The timing of the application is critical as there is normally a period of approximately 14 days in the early development of the Gypsy Moth larvae when Btk is most effective. Once Btk treated leaf material is ingested, the normal operation of the gut of the caterpillar is disrupted resulting in a cessation of feeding causing death by starvation or lethal blood poisoning from the bacterium entering the host.

The commercial formulation that was used has the registered trade name of Foray 48B produced by Valent BioSciences Limited. Foray 48B is registered and approved for use by the Pest Management Regulatory Agency of Health Canada (PMRA) against Gypsy Moth in Canada, applied aerially or from the ground for forestry, woodland and residential use. Btk is considered to be extremely safe and is a Class 11 bio-pesticide having low risk under the *Ontario Pesticides Act*.

TreeAzin™

Recently, TreeAzin™ received permanent registration from the PMRA. As a result, TreeAzin™, a pesticide product also used by the City for control of Emerald Ash Borer, is now available for use to be injected against Gypsy Moth. The active ingredient in TreeAzin™ is Azadirachtin is also a Class 11 pesticide under the *Ontario Pesticides Act* and is considered to be extremely safe and is not harmful to humans, mammals, birds or other animals.

Why Spray Privately Owned Trees?

At outbreak levels, hundreds or perhaps thousands of trees could be lost, representing significant environmental and financial costs to the City and Toronto residents. The environmental and health benefits of trees in an urban environment are well known and include improved air and water quality, mitigation of heat island effects, provision of shade and protection against sun and associated skin cancer risks and reduced carbon dioxide levels in the atmosphere.

Approximately 60 per cent of Toronto's trees are located on private property; therefore, the protection of private trees is important to the goal of increasing canopy cover. If only City owned trees are subjected to Gypsy Moth control measures, the likelihood that outbreak levels of the population would spread to other areas of the city is much greater.

Gypsy moth is also a serious nuisance to the residents living in outbreak areas. The crawling caterpillars and their droppings on private property become intolerable for many residents. Urban Forestry is inundated with complaints from the public, related to tree defoliation and the nuisance the caterpillar stage of the gypsy moth presents.

Proposed areas for aerial spray treatments contain both City and privately owned trees. Due to the extent and scope of the Gypsy Moth infestation in these areas and the availability of a landscape level control option for this pest, a program of aerial spraying of Btk is being recommended. Because aerial spray operations specifically target defined geographical areas and not individual trees, the treatment of privately-owned trees is unavoidable.

Authority for Spraying Privately Owned Trees

Under the City of Toronto Act, the City has authority to provide any service or thing that the City considers necessary or desirable for the public and to pass by-laws respecting the economic, social and environmental well-being of the city as well as the health, safety and well-being of persons.

In an effort to protect the City's tree canopy against invasive pests, it is necessary for the City to implement a Gypsy Moth control program in 2017, including an aerial spray in certain areas of the City.

CONTACT

Jason Doyle, Director, Urban Forestry, Tel: 416-392-1894

E-mail: Jason.Doyle@toronto.ca

SIGNATURE

Janie Romoff
General Manager, Parks, Forestry and Recreation

ATTACHMENTS

None