



STAFF REPORT ACTION REQUIRED

Control of European Gypsy Moth Outbreak in the City of Toronto

Date:	October 22, 2012
To:	Parks and Environment Committee
From:	General Manager, Parks, Forestry and Recreation
Wards:	All Wards
Reference Number:	P:\2012\Cluster A\PFR\PE17-110912-AFS#16357

SUMMARY

European Gypsy Moth (*Lymantria dispar*) is an invasive alien pest that was first found in Ontario in 1969. Its population fluctuates in relation to environmental and biological controls. This pest cannot be eradicated. In 2006, 2007 and 2008, Toronto implemented control measures when European Gypsy Moth populations attained outbreak levels. Those measures were successful in reducing the population to acceptable levels. Current surveys 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 interim 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 in Wards 2, 3, 4, 5 and 27. Ground based spraying, tree injection and egg mass removal is proposed for other locations throughout the city. 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 2, 3, 4, 5 and 27 and other wards as determined by surveys, 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 bill to implement a control strategy for European Gypsy Moth infestation through ground based and aerial spraying.
 4. City Council direct Corporate Finance to assist Urban Forestry staff with the billing and collection of voluntary payments from residents to offset a portion of the cost of the proposed European Gypsy Moth control measures.
 5. City Council authorize staff to enter into sole source contracts with Zimmer Air to conduct aerial spray operations and with BioForest Technologies to coordinate the aerial spray program, as part of the overall European Gypsy Moth control program, and

Financial Impact

Urban Forestry intends to allocate approximately \$300,000 from tree maintenance in its 2013 operating budget, which is still under consideration, to implement a European Gypsy Moth control program, with the impact being 2,150 fewer trees pruned in 2013.

It may be possible to recover some costs from private residents and businesses that will benefit from the aerial spray program. In 2007 and 2008, in addition to full cost recovery from large institutional land owners, the City of Toronto recovered approximately 20% of the cost of spraying privately-owned trees through voluntary payments from private and business land owners.

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

DECISION HISTORY

In 2007 and 2008, 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".

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

ISSUE BACKGROUND

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 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 *Entomophaga maimaiga*, a fungal pathogen and the nucleopolyhedrosis virus. 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 buildup. Treatment programs must balance the health of trees against the health of natural biological control populations.

Natural Gypsy Moth outbreaks may last from 2 to 4 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.

COMMENTS

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 and 2006, 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 and 2008 that were ultimately successful in reducing the Gypsy Moth population to tolerable levels until 2012.

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 and 2008, 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 virtually undetectable until spring of 2012.

Recent Surveys and Control Measures Proposed for 2013

Throughout the spring and summer of 2012, Urban Forestry staff identified a number of Gypsy Moth "hotspots". In September, Urban Forestry initiated egg mass surveys of areas of potential Gypsy Moth outbreak. Egg mass surveys are not yet complete, but results obtained so far clearly demonstrate that a number of locations will require aerial treatment in the spring of 2013. Presently, eight (8) separate sites totalling approximately 229.1 hectares (ha) are proposed for aerial spray treatment as identified in Figure 1 below. The threshold for predicting severe defoliation is 1,200 egg masses per ha.

Location	Ward	Approximate number of egg masses per hectare	Expected threat	Approximate Spray Area (ha)	Proposed Treatment Option(s)
Humber Valley Golf Course	2	NA	Severe defoliation of selected trees	11.4	Aerial spray of Btk.
Princess Gardens	3	34,606	Severe defoliation	22	Aerial spray of Btk
Herne Hill	4	2,540	Severe defoliation	4.5	Aerial spray of Btk
Thorncrest Road	4	16,920	Severe defoliation	7.2	Aerial spray of Btk
North Drive – Valecrest Drive	4	2,479	Severe defoliation	26	Aerial spray of Btk.
Edenbridge Drive – Cranleigh Court - The Kingsway	4	7,247	Severe defoliation	63	Aerial spray of Btk
Bloor Street - Royal York Road	5	1,603	Severe defoliation	47	Aerial spray of Btk.
Moore Park	27	1,586	Severe defoliation	48	Aerial spray of Btk
Total				229.1	

Figure 1: Area Population Levels and Proposed Treatment Option(s)

Surveys remain on-going in other communities across the City, where additional suspected "hotspots" exist. Egg mass threshold levels will determine whether aerial spraying is necessary in additional areas.

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 2012. Presently, these municipalities are implementing surveys to determine whether treatments are required for 2013.

Prior to implementation of spraying control strategies, Urban Forestry will be consulting with ward councillors, Toronto Public Health and members of the public.

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 consultant, BioForest Technologies, uses a unique computer program BioSim to forecast population development for effective timing of spray applications and provide an objective assessment of spray recommendations for implementation by the spray contractor. Their services are unique and specialized and cannot be provided by any other known service providers in Ontario. Similarly, 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 sole-source contracts to BioForest Technologies and Zimmer Air as was done in 2007 and 2008. Costs will be reduced through development of a partnership with other municipalities and private businesses.

Based on the preliminary estimates of areas and numbers of trees requiring treatment, funding of approximately \$300,000 may be required to implement the control program. It is anticipated that approximately \$25,000 of this will be used to hire consulting services with the remainder being used to implement the spray program. Urban Forestry intends to re-allocate those funds from its 2013 operating budget.

In 2008, in addition to residential and park trees being treated, the City of Toronto entered into agreements with two private business groups: St. Georges Golf Club and Mt. Pleasant Cemeteries Group, to aerially treat their properties. Full cost recovery was made from each of these business organizations. Due to the egg mass densities detected on St. Georges Golf Club in 2012, the club has requested that it be included in any City-led aerial spray program under similar terms.

Additionally, based on the experience of the City of Mississauga in 2006, Toronto requested a voluntary contribution toward the aerial treatment from residents whose privately owned trees were treated in conjunction with the City owned trees. In 2007, the City of Toronto received approximately \$16,000 of \$76,000 in voluntary payments requested and in 2008, approximately \$20,000 was received of \$103,000 requested.

***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 (*Lepidopteran*) 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 which is also a Class 11 pesticide under the Pesticide Act and considered to have low risk.

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% 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.

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.

The City of Toronto Act provides that a fee or charge may be imposed, whether or not it is mandatory, for the City or local board imposing the fee or charge to provide or do the service or activity, pay the costs or allow the use of its property. Accordingly, a fee for this service can be imposed, if desired. Alternatively, a voluntary payment system similar to that implemented in 2007 and 2008 could also be implemented.

Urban Forestry recommends implementing a voluntary payment system, in coordination with Corporate Finance, instead of charging a fee to all residents within spray zones.

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 2013.

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SIGNATURE

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