



STAFF REPORT ACTION REQUIRED

Control of European Gypsy Moth Outbreak in some areas of the City of Toronto

Date:	December 20, 2006
To:	Parks and Environment Committee/City Council
From:	Brenda Librecz, General Manager, Parks, Forestry and Recreation
Wards:	Wards 2, 3, 4, 5, 11, 13, 22, 25, 26, and 27
Reference Number:	

SUMMARY

The purpose of this report is to describe the presence of confirmed outbreak levels of the European gypsy moth in some areas of the City of Toronto. Background information describes past approaches for control.

This report recommends control options including aerial and ground based spray of a biological control agent. Aerial spray is proposed in Wards 3 and 4 and ground-based spray is proposed in Wards 2, 5, 22, 25, 26 and 27; and physical egg mass removal by vacuum is proposed in Wards 13 and 25. Public consultation will be done in consultation with Councillors and Toronto Public Health. It is expected that this control strategy will reduce the gypsy moth population and expected levels of defoliation to avoid decline or demise of City trees. Urban Forestry intends to re-allocate some of its 2007 operating budget to address this issue and there will be some service implications. Urban Forestry also recommends that residents be asked to contribute to the cost of spraying private trees through voluntary payments.

RECOMMENDATIONS

- 1) the General Manager of Parks, Forestry and Recreation implement in 9 Wards (2, 3, 4, 5, 13, 22, 25, 26 and 27) an Integrated Pest Management (IPM) program involving aerial spray of a biological control agent, ground-based spray and mechanical egg mass removals; such program to include both City and privately owned trees, to control the larval stage of the European gypsy moth which causes defoliation of trees;

- 2) the General Manager of Parks, Forestry and Recreation implement a communications program, in consultation with Councillors in Wards 2, 3, 4, 5, 13, 22, 25, 26, 27; Parks Forestry & Recreation Communications, and Toronto Public Health, to inform and educate residents within all known areas of European gypsy moth infestation on:
 - a. IPM methods which can be initiated by homeowners to control this invasive pest; and
 - b. the aerial and ground-based spray program of *Bacillus thuringiensis* subspecies *kurstaki* (Btk) initiated by the City of Toronto;
- 3) the General Manager of Parks, Forestry and Recreation consult with Public Health, Transportation Division and Police Services to coordinate the implementation of the proposed aerial and ground-based application of the biological control agent Btk;
- 4) the General Manager of Parks, Forestry and Recreation continue to monitor the population of the European gypsy moth City-wide and the effectiveness of the control measures applied in Wards 2, 3, 4, 5, 13, 22, 25, 26 and 27 and report back to the Parks and Environment Committee in December of 2007 on the further recommendations for control in 2008 if required;
- 5) the City Solicitor be authorized to introduce a bill to implement a control strategy for gypsy moth infestation through ground based and aerial spraying;
- 6) the General Manager of Parks, Forestry and Recreation coordinate a process with City Finance whereby a portion of the cost for applying spray can be collected from residents to help offset the cost of the control measures;
- 7) the appropriate City Officials be authorized and directed to take the necessary action to give effect thereto.

IMPLEMENTATION POINTS

- City Council decides whether to authorize the IPM program involving aerial spray, ground spray and egg mass removal control methods;
- City Council recommends approval to spend about \$150,000 of the Forestry Operating budget, for the implementation of an IPM program for public and private trees to control gypsy moth in Toronto;
- City Council passes a by-law to implement the control strategy for gypsy moth infestation through ground based and aerial spraying.
- City Finance reports to Council on the possible implementation of charge-backs that may be used to offset the cost of the control program;
- The General Manager Parks, Forestry and Recreation develop a communication program in consultation with 10 Councillors and Toronto Public Health, to inform the public about all aspects of the proposed gypsy moth control;

- The General Manager Parks, Forestry and Recreation hire Bioforest Technologies to help coordinate the aerial spray program;
- The General Manager hire Zimmer Air to conduct the aerial spray operation;
- The General Manager hire a contractor to implement ground-based spray operations;
- The General Manager monitor the results of the gypsy moth control program, and report back to the Parks and Environment Committee in December, 2007 on this and further control recommendations if required.

FINANCIAL IMPACT

Urban Forestry intends to re-allocate about \$150,000 of its 2007 operating budget to implement a gypsy moth control program and, as a result, there will be service implications equivalent to about 575 fewer service orders being completed.

It may be possible to recover some costs from private residents that receive the benefit of the aerial spray program. In 2006, Mississauga recovered about 50% of the cost of spraying through voluntary payments from private land owners.

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

BACKGROUND

The European Gypsy Moth

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 has been advancing steadily westward throughout the range of oak in New Brunswick, Nova Scotia, Quebec and Ontario, in addition to the northeast and mid-west US. The first population of European 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, the early-2000s.

The gypsy moth's preferred hosts are all species of oak trees (*Quercus* spp.) however it will also attack maples, spruces, birches, aspens and many other 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 the outbreaks makes control difficult as the pattern is not predictable.

European gypsy moth has four life stages: egg, larva (caterpillar), pupa and adult. The caterpillar is the destructive form with potentially thousands of caterpillars feeding on the leaves of an individual tree for about 7 weeks. 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 resulting in twig, small and large branch death and/or whole tree mortality.

Normally, gypsy moth is present at low numbers which are controlled by predators such as birds and mice and naturally occurring pathogens such as *Entomophaga maimaiga*, a fungal pathogen that kills gypsy moth larva; nucleopolyhedrosis virus or NPV, a virus which kills gypsy moth larva; and parasitizing wasps which kill gypsy moth eggs. At low population levels, these naturally occurring biological controls aid in keeping the population levels low. When population levels climb rapidly, these controls are not effective in preventing an outbreak of larva which can cause tree mortality but will, over time, bring the population levels down. Outbreak conditions may last from 2 to 4 years and normally result in tree mortality. 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. This was seen in the spring and summer of 2006 in some individual trees as early defoliation was offset by a second flush of leaves. However, in combination with other stresses, repeated defoliation causes tree mortality.

Current Outbreak in Toronto

The European gypsy moth has likely 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. 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.

Many concerned residents used IPM techniques to control caterpillars. Methods used include:

- 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;
- scrape away and destroy egg masses;
- spray whole trees with a biological control agent.

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 tree bark is very rough, many egg masses may be missed during mechanical scraping operations.

Toronto Urban Forestry staff have also undertaken measures to control gypsy moth. In winter 2005 and spring 2006 Forestry staff and contractors removed gypsy moth egg masses using bucket trucks and portable vacuum cleaners from city trees in front of over 150 residential properties. Forestry staff and contractors also brushed caterpillars and pupae off of trees in selected areas to reduce population numbers. Property owners were also encouraged to remove the egg masses from private trees at that time.

The results of the physical egg mass removal (known as a mechanical control) were closely monitored, and it was determined that while these were successful in some areas, such controls were not successful everywhere, such as at Humber Valley Golf Course. The impacts of natural parasites/disease on the gypsy moth are also being closely monitored and high levels of viral and fungal infection has been noted in some areas.

St. Georges Golf Course and neighbouring residential property owners determined that they had an outbreak of gypsy moth in 2005. As a result they applied a biological control agent by aerial spray in spring 2006, resulting in a significant reduction of gypsy moth numbers and tolerable levels of defoliation which trees could survive in 2006.

Similarly, the City of Mississauga had a population of gypsy moth that reached outbreak levels in 2005, and they instituted a spray program in 2006 which was effective in drastically lowering the population of gypsy moth and level of defoliation in the areas where it was applied.

COMMENTS

Recent Surveys in Toronto

Urban Forestry staff have been conducting spot inspections of oak-dominated areas of the City for the past three years. In 2006, pheromone traps were installed in selected areas to collect high numbers of moths during their flight season and before mating, and to monitor spreading populations. Approx. 200 traps were distributed and installed in areas with high level of population and also in several locations throughout the city for monitoring purposes.

In the late spring and early summer of 2006, moderate to severe levels of defoliation were found on individual trees in oak-dominated areas of Wards 3, 4 and 11 and on non-preferred host trees in Ward 25.

As a result of concern about the gypsy moth population rising to outbreak levels, Urban Forestry staff established a survey protocol to investigate the scope and extent of the gypsy moth infestation. Because, the egg stage of the gypsy moth is the easiest to detect and provides a reliable prediction of the larval population, an egg mass survey protocol was developed in consultation with BioForest Technologies, a firm retained by the City of Mississauga in 2006 to guide their aerial spray program. In Toronto the egg mass survey was carried out in November 2006 by City of Toronto Forestry staff to forecast the population of European gypsy moth larva and predict the levels of defoliation expected in the spring and summer of 2007 in the established survey blocks.

Four survey blocks were identified based on known urban forest composition containing preferred host species, i.e. oaks and IPM service requests identifying areas with known European gypsy moth populations. The four survey blocks are located in Wards 3, 4, 5, 10, 11, 13, 22, 23, 24, 25, 26, 27 and 33; the high risk areas for outbreak are found in

Wards 3, 4, 13 and 25; and isolated trees with higher numbers of egg masses are also found in Wards 2,5,22,27 and 29. See Attachment 1 for a map showing the 4 survey blocks and proposed treatment sites; and attachment 2 for a close-up of these sites, as discussed later in this report.

The results of the gypsy moth egg mass survey conducted in 2006 are shown in Table 1 below:

Table 1. Results of Gypsy Moth Egg Mass Survey in High Risk Areas

Block #	Size of Survey Block (ha)	Size of High Risk Area Within the Survey Block (ha)	Estimated # trees in High Risk Area	Egg Masses (EM) in High Risk Areas			
				Avg. # of EM below 5m per tree	Avg. # of EM above 5m per tree	Avg. Total # of EM per tree	Total estimated egg masses per hectare
1	324	25	1875	9	79	88	6554
2	528	36	3348	12	23	35	3245
3	450	21	NA	2	8	10	933
4	2194	36	NA	10	4	13	2742

Control Measures Proposed

The criteria used to decide whether control measures should be implemented is whether significant defoliation or tree mortality is expected. Because levels of the gypsy moth population were found to be at outbreak levels in three discrete areas of the City, and at outbreak levels, tree mortality from European gypsy moth defoliation is highly probable. Therefore control measures must be implemented to reduce the population of gypsy moth larva to levels where potential defoliation is limited and the ability of individual trees to recover from any defoliation is retained.

The Ontario Ministry of Natural Resources have determined that gypsy moth egg mass densities at levels above 1235 egg masses per ha will result in moderate to severe defoliation. Below this threshold, the presence of gypsy moth larva may be a nuisance but should not cause tree mortality or decline.

For this reason, the threshold for control measures to be initiated was determined to be 1236 egg masses per ha. From Table 1 we can see that the high risk areas of Blocks 1 and 2 all have egg mass densities at levels far exceeding the threshold for moderate

defoliation. Even with the known presence of naturally occurring control agents in these areas we cannot be sure that the population of ravenous caterpillars would be reduced to “acceptable” levels. As a result, Forestry is proposing to implement a suite of control measures which should bring the population of gypsy moth larva down to levels that reduce the probability of tree mortality occurring in the treated blocks.

The urban forest tree composition in the high risk areas of Blocks 1 and 2 is dominated by large, mature white oaks tree which are particularly susceptible to gypsy moth defoliation. Levels of defoliation ranged from light to severe in 2006. Using egg mass densities we can predict moderate to severe defoliation in 2007. Most gypsy moth egg masses are found over 5 metres above ground level. Due to the size and number of trees in these blocks, IPM measures such as egg mass removal and a ground-based application of Btk are not feasible. As a result, Urban Forestry is proposing to implement an aerial spray program over approximately 70 hectares in the high risk areas of Blocks #1 and 2. A properly executed aerial spray application of *Bacillus thuringiensis* subspecies *kurstaki* (Btk) would produce the highest probability of reducing the population of gypsy moth larva to levels where significant defoliation and/or tree mortality would be avoided. Aerial spraying would occur over City and privately owned property and protect both City and privately owned trees. Without an aerial spray, it is likely that white oaks will succumb to added stress caused by the gypsy moth infestation and other factors.

The high risk area in Block 4 also indicates egg mass densities at levels which should produce moderate defoliation (Table 1). In the summer of 2006 there was significant defoliation of Norway maple trees and Colorado blue spruce trees, which indicates an abnormal host preference by the gypsy moth. The results of the egg mass survey also reflected this unusual host preference. The vast majority of the egg masses are found below 5 metres on the individual trees. This combined with the fact that the composition and structure of the tree cover in this area is vastly different from that in Blocks #1 and #2 rationalize a control strategy of mechanical egg mass removal and spot spraying of dormant oil onto egg masses. These IPM measures are proposed to be implemented on City trees and some accessible privately owned trees in this area.

The high risk area in Block 3 was found to have an egg mass density below the threshold for moderate defoliation; however, approximately 100 individual trees have greater than 10 egg masses per tree and should be treated. These trees include large red oak trees with relatively smooth bark, that allow for effective mechanical egg mass removal.

Five other areas of the City were found to have groups of individual trees located on public lands with high numbers of egg masses per tree and will require treatment. Due to the size and species of the trees and accessibility, a ground-based spray application of Btk is proposed, as described in Table 2 below. Ground-based spray is only feasible in locations where trees are relatively accessible. Given the short window of opportunity for Btk to be effectively applied, few trees can be treated with this method of treatment. There are few registered contractors available and Toronto may compete with others for work to be done at a fair price and at the ideal time for treatment.

Should other areas or individual trees be found during the first few months of 2007 requiring treatment, appropriate measures will be implemented.

Table 2. Low Risk Areas Requiring Ground Spray Treatment

Location	Number of Trees	Size of Trees	City Wards
Sunnybrook/Wilket Creek Park	40	Medium to tall, mature	25
Edwards Gardens	10	medium	25
Moore Avenue	30	Tall, mature	22, 26 and 27
Humber Valley Golf Course	3	Tall, mature	2
Bloor and Royal York	10	Tall, mature	5

Authority for Spraying Privately-owned Trees

The Municipal Act, section 128, authorizes a local municipality to prohibit and regulate with respect to public nuisances, including matters that, in the opinion of Council, are or could become or cause public nuisances. In the City of Mississauga, Council declared the infestation of gypsy moth at outbreak level to be deemed a public nuisance, particularly given that the continuation of the outbreak conditions would lead to devastation of the natural environment in the City with the defoliation of many trees.

Under the new 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. It is not necessary for City Council to take the step of declaring the gypsy moth to be a public nuisance and a hazard. City Council does not need to make a declaration on this, but can do so, if desired.

In addition, 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 Mississauga could also be implemented. Should residents be willing to share in the cost of applying the spray as was done in 2006 in the City of Mississauga, staff could establish a process whereby a portion of the cost could be collected from residents to help offset the cost of the aerial spray. An effective means to do this would be by invoicing the residents for a

proportional cost of the spraying of private property. Mississauga received payment of approximately \$130 per property from 80% of the 1700 properties sprayed. In Toronto, it is estimated that about 440 private properties would be aerial sprayed alongside city lands, at a total cost of about \$56,000 plus fixed costs of policing, communications and coordination.

Urban Forestry recommends implementing a voluntary payment system, in coordination with City Finance, instead of charging a fee to all residents in the spray zone. Not all properties have trees that will benefit from the spray and to charge only those that do have trees would be inappropriate. To do so would penalize those property owners who are contributing to the city tree canopy through their privately maintained landscapes.

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.

There are two major reasons for the City to become involved in the protection of privately-owned trees. First, at least half of the trees in residential areas of the city are privately-owned. The protection of privately-owned trees is therefore important to the goal of increasing canopy cover. Second, if only the 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 treatments within all blocks include both City- and privately-owned trees. Due to the extent and scope of the gypsy moth infestation in Blocks 1 and 2, a program of aerial spraying of Btk is being proposed. Because aerial spray operations specifically target defined geographical areas and not individual trees, the treatment of privately-owned trees is unavoidable.

Biological Control Agent: *Bacillus thuringiensis ssp kurstaki* (Btk)

Btk 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 larva feeding on the leaves. The active ingredients in Btk work only in the gut of moth and butterfly larvae and these conditions are not found in 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 larva when Btk is most effective. Once the Btk-treated leaf is ingested, the normal operation of the gut of the caterpillar is disrupted resulting in death by starvation or lethal blood poisoning from the bacterium entering the host.

The commercial formulation that would be used has the registered tradename of *Foray 48B* produced by Valent BioSciences Limited. *Foray 48B* is registered and approved for use by the Pest Management Regulatory Agency (PMRA) against gypsy moth in Canada applied aerially or from the ground for forestry, woodland and residential use. Btk is considered to be lower-risk pesticide and is exempted from the restrictions of the Toronto Pesticide By-law (Municipal Code 612, Section 1, subsection (2) d).

Toronto Public Health has reviewed the potential adverse health impacts of aerial spraying of Btk. The evidence suggests exposure to Btk through aerial spraying is not harmful. Some reports indicate Btk may temporarily cause mild irritation to eyes, skin, and nose in some people.

The emergence of gypsy moth larva coincides with the flushing of oak leaves in this part of North America. The spraying of *Foray 48B* to control gypsy moth larva, in late April–early May, is timed to coincide with the flushing of leaves of oak trees and the emergence of gypsy moth larva. Few other butterfly or moth larvae would be affected by the spray at this time of year.

Btk usually takes a few days to kill larva. In areas sprayed with Btk, not all the caterpillars will die due to differential rates of deposition and feeding. Unlike other programs to control unwanted insect pests, such as the Asian Long Horned Beetle program, this is not an eradication program and success will not be measured by the disappearance of the pest but instead by its reduction in numbers to levels where defoliation is drastically reduced thereby limiting the stress on individual trees.

Below, Table 3 shows the timetable for proposed treatment options in each Block.

Table 3: Timetable for Proposed Control Options in each Block

Proposed Control Treatment	Block #1 (High Risk Area)	Block #2 (High Risk Area)	Block #3 (High and Low Risk Areas)	Block #4 (High and Low Risk Areas)

Aerial Spray Application of Btk	Twice in May 2007	Twice in May 2007	Not Applicable	Not Applicable
Ground Spray Application of Btk	Not Applicable	Not Applicable	Trees in various locations, sprayed in May 2007	Trees in various locations, sprayed in May 2007
IPM Methods including egg mass removal, dormant oil spray, etc	Not Applicable	Not Applicable	Starting December 2006 continuing into 2007	Starting December 2006 continuing into 2007

Cost of Proposed Gypsy Moth Control Program

In Mississauga Estimates of the cost of aerial spraying 500 hectares in 2006 show that the costs of the aerial spray alone to be approximately \$212,500 or \$422/ha. Additional consulting, Ontario Ministry of Transportation, Toronto's Transportation Division, communications and administrative and contingency fixed costs of approximately \$122,000 were estimated in addition to \$60,000 for Policing costs. The control program for 500 hectares in Mississauga in 2006 cost about \$394,266.

It is estimated that the cost of spraying 70 ha in the City of Toronto would be approximately \$56,000 or \$800.00 per ha, if done in conjunction with an aerial spray program in Mississauga and perhaps Burlington. Given the high cost of equipment needed to apply an aerial spray over residential areas, there is only one firm, Zimmer Air, that would be able to conduct an aerial spray operation in Toronto, and they will have the necessary economy of scale to do this if there are additional areas to treat outside of Toronto. The unit cost in Toronto is higher due to the smaller area to be sprayed (70 ha compared with 500 ha in Mississauga). Other fixed costs and policing costs have not been determined but based on the experience of Mississauga, significant costs could be expected.

Estimates to implement a ground-based spray program for the approximately 100 trees in five separate locations based on a quote provided by a contractor would be approximately \$25,000 for 75 tall, mature trees and 25 medium-sized trees all having good access. Given the limited number of contractors available to implement ground-based sprays in the Toronto region, contracts will have to be set up early in 2007.

Mechanical egg mass removal/treatment instituted by City of Toronto staff or contractors would have costs dependent on the number of trees and the accessibility of those trees. The cost of treating 100 tall, mature trees would be approximately \$20,000. It is expected that additional trees may be found requiring this level of treatment as surveys continue through areas with lower levels of infestation.

Based on past experience in Mississauga and the caution that the unit costs for the aerial spray program would be based on a program that included Mississauga, the total cost for a multi-faceted gypsy moth control program in Toronto is estimated to be at least \$150,000.

Some funds may be able to be recovered from residents where the aerial spray program is implemented over private property. Mississauga received payment of approximately \$130 from 80% of the 1700 properties sprayed, resulting in a cost recovery of \$176,800 and a net cost to the city of \$197,466.

Urban Forestry has been advised that Zimmer Air intends to make their helicopter available for gypsy moth programs in 2007. BioForest Technologies have proposed to coordinate and conduct the spray program for 2007. The services they would offer Toronto include:

- Review of field surveys to assess population densities and distribution
- Review of data analysis and forecasts of future defoliation
- GIS capabilities for spray block design and digitizing
- Negotiation of contracts for applicators and pesticide
- Regulatory compliance
- Presentations to council and the public
- Issues research and response
- BioSIM modelling to predict pest development and spray timing
- Field surveys to validate spray timing
- spray deposit assessment to document on-block and off- block Btk deposition using the ADAM Field Kit
- Review of defoliation assessment surveys and efficacy assessment

The provision of the above services, where required in Toronto, would ensure that all statutory and safety requirements are complied with by the City. In particular it is necessary to work with Transport Canada to determine all the safety measures required and to comply with them to obtain a ministerial exemption to the requirements of the Canadian Aviation Regulations for flying at low altitude. A comprehensive plan must be developed to minimize exposure of the public to the pesticide. In Mississauga it was determined that the City's risk was controlled with the hiring of a professional consultant with experience in dealing with the control of pests and subsequently with all the legislative requirements to achieve the spray.

Impacts on Other Forestry Programs

The potential impact on other Forestry programs could be great. Whether the "Do Nothing" approach or the proposed suite of control measures be applied, funds would need to be diverted to the effects of European gypsy moth. The backlog of work orders for City-owned trees is already at unacceptable levels and should this pest not be controlled, hundreds of dead and/or hazardous trees could require attention consuming even more of the budget which has been allotted to dealing with the existing backlog.

CONTACT

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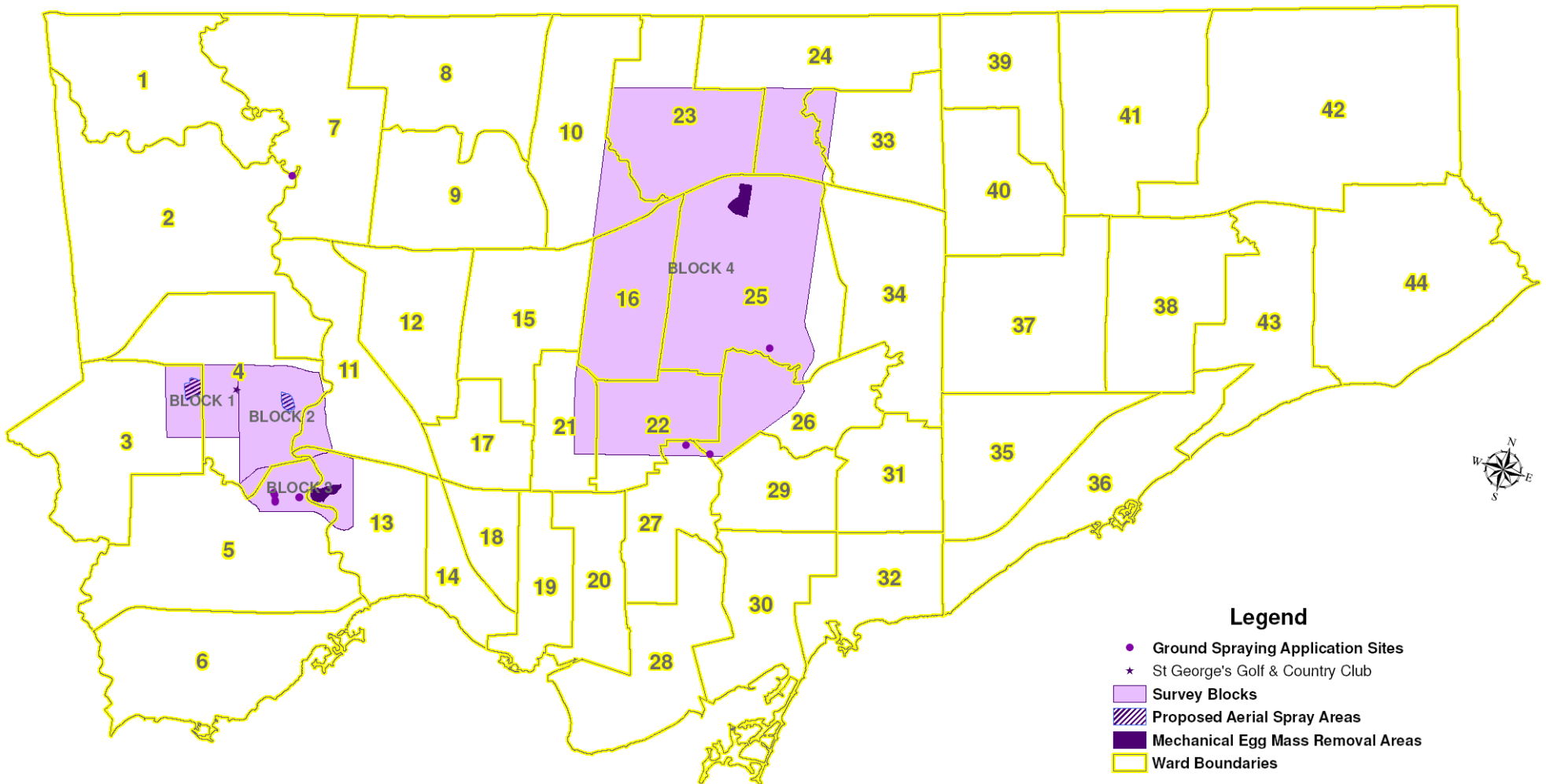
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SIGNATURE

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ATTACHMENTS

- 1 – Gypsy Moth survey Areas & Proposed Treatment Sites
- 2 – Close-up of Gypsy Moth survey Areas & Proposed Treatment Sites



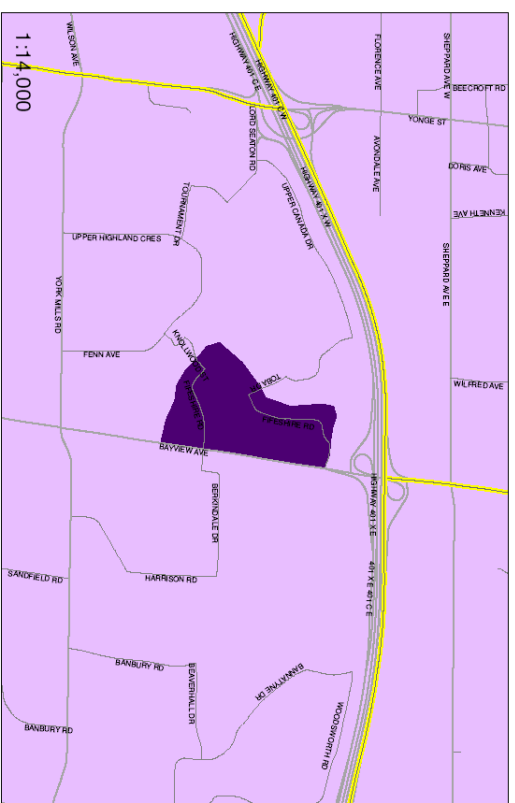
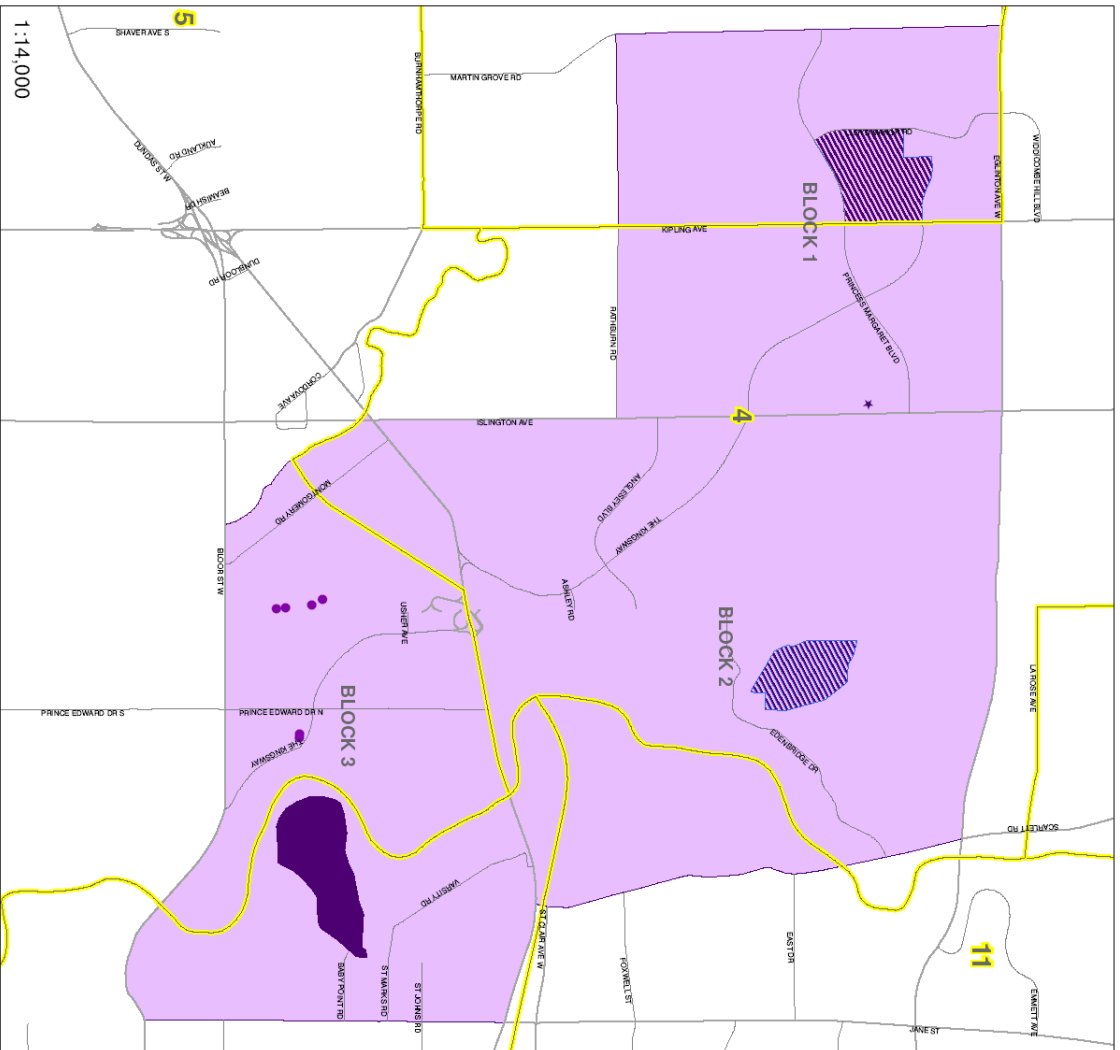
Legend

- Ground Spraying Application Sites
- ★ St George's Golf & Country Club
- Survey Blocks
- ▨ Proposed Aerial Spray Areas
- Mechanical Egg Mass Removal Areas
- ▭ Ward Boundaries

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**GYPSY MOTH SURVEY AREAS
& PROPOSED TREATMENT SITES**

TORONTO PARKS, FORESTRY AND RECREATION



CLOSE-UP OF GYPSY MOTH SURVEY AREAS & PROPOSED TREATMENT SITES

Legend

- Ground Spraying Application Sites
- ★ St George's Golf & Country Club
- Survey Blocks
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- Mechanical Egg Mass Removal Areas
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