Credit Valley Conservation
inspired by nature

Town of Halton Hills Lymantria dispar dispar Population Assessment

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Prepared for: Town of Halton Hills

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Executive Summary

LDD moths have had notable effects on trees in Ontario for over 40 years. Their populations go through density dependent boom-and-bust fluctuations in response to host availability and the presence of natural controls. In the past, the Town of Halton Hills (Town) has allowed nature to take its course and LDD moth infestations have collapsed without notable impact to the trees. However, severe outbreaks across southern Ontario combined with a rise in media reports about LDD has increased awareness of the moth and its impacts. Residents are becoming increasingly concerned about the long-term effects of the moth on their trees and the associated human health impacts. In response, the Town is developing an LDD management workplan to assess the current state of the outbreak and determine potential management options.

As part of the development of their LDD workplan, the Town contracted Credit Valley Conservation Authority (CVC) to implement an LDD monitoring program. The goals of the monitoring program were to determine the number and extent of LDD egg masses present in 2021, estimate the severity of defoliation that could be expected in 2022, and provide recommendations for management techniques that could be considered by the Town in 2022 to limit defoliation severity. CVC and Town staff collaborated to identify key locations based on tree species, topography, Town property locations, access, and reports of LDD activity.

A total of 73 sites composed of Town owned woodlots, parks, and street trees were selected for monitoring. Following the results of the Town's Resident LDD survey, three additional street tree monitoring points were added in neighbourhoods that contained a high volume of responses. Four additional park and woodlot monitoring points were requested by the Town after the preliminary report was received to gather more data about large Town owned woodlots in close proximity to areas where higher levels of defoliation were expected.

Of the 80 sites monitored by CVC staff, defoliation potential was assessed as severe for 20 sites, moderate for 15 sites, and light or trace level for 45 sites. Distribution of high-risk sites was extremely sporadic; however, the north Georgetown area has the highest concentration of potential moderate to severe defoliation sites in 2022.

In addition to completing monitoring for the Town, CVC implemented an LDD monitoring program on our owned and managed lands as part of a larger integrated pest management framework. We also reached out to neighbouring conservation authorities, Conservation Halton (CH) and Grand River Conservation Authority (GRCA), to obtain a comprehensive idea of LDD spread and severity forecasted across the region for 2022. Similar to the results of this monitoring program, conservation authorities are reporting sporadic distribution of egg mass numbers, with some areas expected to experience high defoliation and others expected to experience very little. None of the conservation authorities will be completing an aerial spray program in 2022 but are investigating the potential for localized treatments such as banding, egg mass scraping, ground spraying, and injections to trees in high-risk areas.

Although egg mass numbers remained high in some areas, there have been signs that an LDD population collapse may be on the horizon, especially in areas that have been experiencing outbreaks for the last three to four years. Throughout the growing season all three conservation authorities have reported anecdotal evidence of heavy viral and fungal loads as well as parasite and natural predator activity.

Since the distribution of sites with high egg mass numbers is extremely variable both in the Town and across the landscape, an aerial spray is not recommended. Instead, CVC suggests a combination of ground tactics and public outreach as resources and budget allow. Leveraging

support and interest of residents to help protect backyard and neighbourhood trees in areas at risk for severe defoliation would nicely compliment a targeted chemical treatment program on Town owned properties. It would also provide a positive staff presence in neighbourhoods with potential for severe defoliation and encourage residents to use safe and effective techniques on their own property.

Table of Contents

Background 5
Introduction 5
Methodology 5
Survey Results 8
Recommendations 15
References 19
Appendix A 20
Appendix B 23
Appendix C 34
Appendix D 38

Table of Figures

Figure 1: Location of sample sites in Acton 7
Figure 2: Location of sample sites in Georgetown 7
Figure 3: Number of egg masses per hectare across all sites surveyed 9
Figure 4: Potential defoliation severity in 2022 across all survey sites 11
Figure 5: Average size of egg masses 13

Background

In 1869, Lymantria dispar dispar (LDD) moths were accidentally released in North America. They were first seen in Ontario in 1969 but significant defoliation in this province was not observed until 1981. As with many other forest pests, LDD moth populations cycle through significant peaks and valleys. In Ontario, LDD levels peaked in 1985, 1991, 2002 and 2008 (Ministry Northern Development, Mines, Natural Resources and Forestry (MNDMNRF, 2021). Over the past several years populations have again been on the rise. LDD defoliation levels rose dramatically from 47,203 hectares (ha) in 2019 to 586,385 ha in 2020, then tripled to 1.8 million ha in 2021 with increases reported across the province (MNDMNRF, 2021).

Severe LDD outbreaks have a wide range of impacts affecting not only tree growth and health, but also human health and property aesthetics. Although LDD outbreaks do not typically negatively affect forest composition on a large scale, repeated years of complete defoliation can lead to declines in growth and vigor, eventually causing the death of the tree (CVC, 2021). Death can occur after one to two years of severe defoliation in conifer species; however, this is not the preferred food source for LDD so tends to be a less common occurrence (Forest Gene Conservation Association, 2021).

The impact of LDD on trees in urban environments can be greater than impacts in forests due to compounding stressors such as salt, soil compaction, drought, flooding, landscaping injury, and existing pests and disease. As a result, municipalities across Ontario have begun implementing programs aimed at mitigating the negative impacts of LDD.

Introduction

2021 has been a significant year for LDD populations throughout Southern Ontario. Residents are anxious for solutions to the nuisance and destruction caused by record levels of LDD caterpillars last spring. Calls for action have likely been amplified by the COVID 19 pandemic as stay-at-home orders have increased the use of backyards and public outdoor spaces and associated anecdotal observations of the effects ofLDD.

Credit Valley Conservation (CVC) was approached by the Town of Halton Hills (Town) to implement a monitoring program evaluating LDD populations throughout its jurisdiction. The data contained in this report may be used by urban forestry, Town planners, and stakeholders interested in preserving the local tree canopy to inform future LDD-based initiatives in the Town.

Methodology

Survey sites were identified through the combined effort of the Town and CVC staff. CVC was given existing street tree, parks, cemetery, and woodlot data, as well as the locations of anecdotal reports of high LDD numbers from Town staff and residents. Street tree data

was collected as part of an ongoing tree inventory initiative at the Town and does not contain complete records for street trees in Georgetown, Glen Williams, Limehouse, and Norval. The Town also conducted a survey in mid-October giving residents the opportunity to comment on LDD numbers in their neighbourhood and describe the tactics they used to combat them. This information was compiled to determine the survey locations outlined below.

Woodlots:

All natural areas containing woodlots within the Town were identified through desktop GIS analysis to determine suitability for LDD monitoring and accessibility for staff. Thirteen sites containing vegetation communities dominated by Oak, Maple, or Poplar were selected.There were four sites in Acton, five sites in Georgetown, two sites in Glen Williams, and two sites in rural Halton Hills (Appendix B). Two additional sites, one on Glen Williams and one in Georgetown were added after the initial surveys were completed to provide more information about the status of larger woodlots. CVC staff used a Modified Kaladar Plot (MKP) surveying methodology (Appendix C) for all woodlot locations.

Parks and Cemeteries:

All parks and cemeteries owned by the Town were assessed through GIS desktop analysis for suitability. Due to the large number of parks across the study area and their proximity to other survey sites, small parkettes were removed from consideration. A total of 30 parks and cemeteries were identified for monitoring including six in Acton, 21 in Georgetown, two in Limehouse, and one in Glen Williams. Two sites were added at Georgetown Town Hall to provide more information about the Town Hall-Fairgrounds complex. CVC staff used a modified 5-tree count surveying methodology (Appendix D) to conduct these surveys.

Street Trees*:*

Existing street tree data was examined via GIS desktop analysis to determine which neighbourhoods had a high concentration of LDD host trees (oak, poplar, and maple). This information was combined with anecdotal reports (2021) from staff and residents. Thirty sites were selected for monitoring: nine in Acton, 17 in Georgetown, and four in Glen Williams. Three additional sites, one in Acton and two in Georgetown, were added following the results ofthe resident survey conducted by the Town in October. CVC staff used a modified 5-tree count surveying methodology to conduct these surveys.

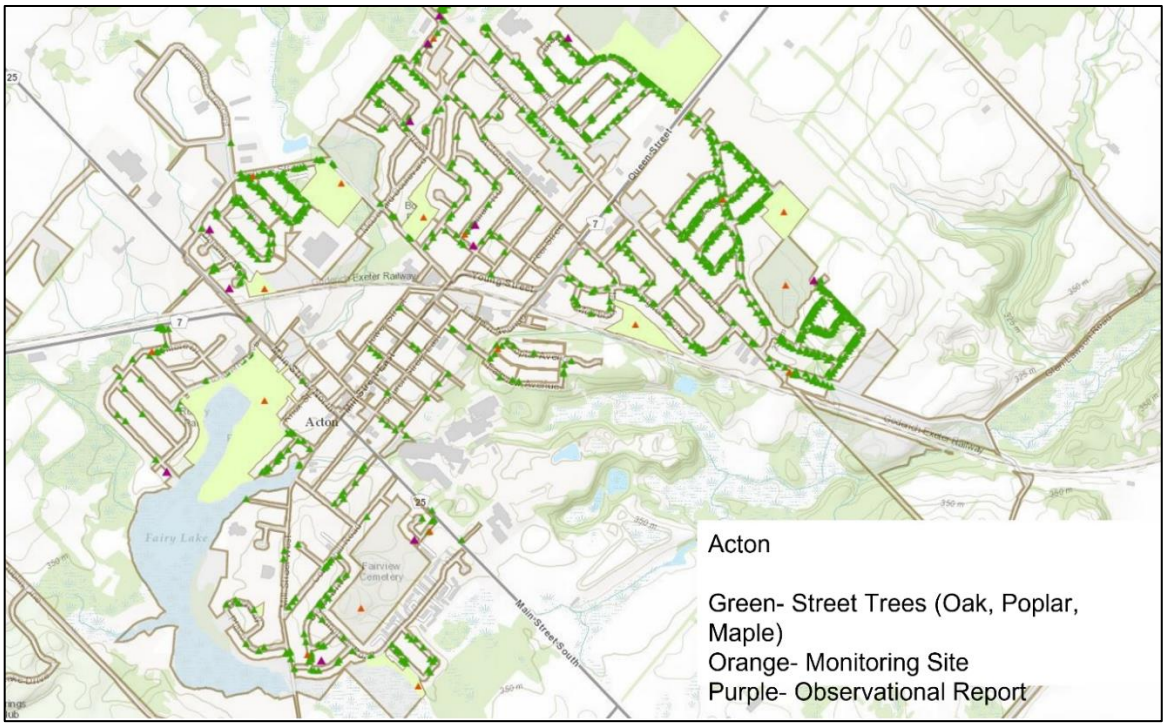

Figure 1: Location of sample sites in Acton, with target tree species and LDD reports. Street tree data was collected by the Town as part of an ongoing initiative and is not complete for the entire town.

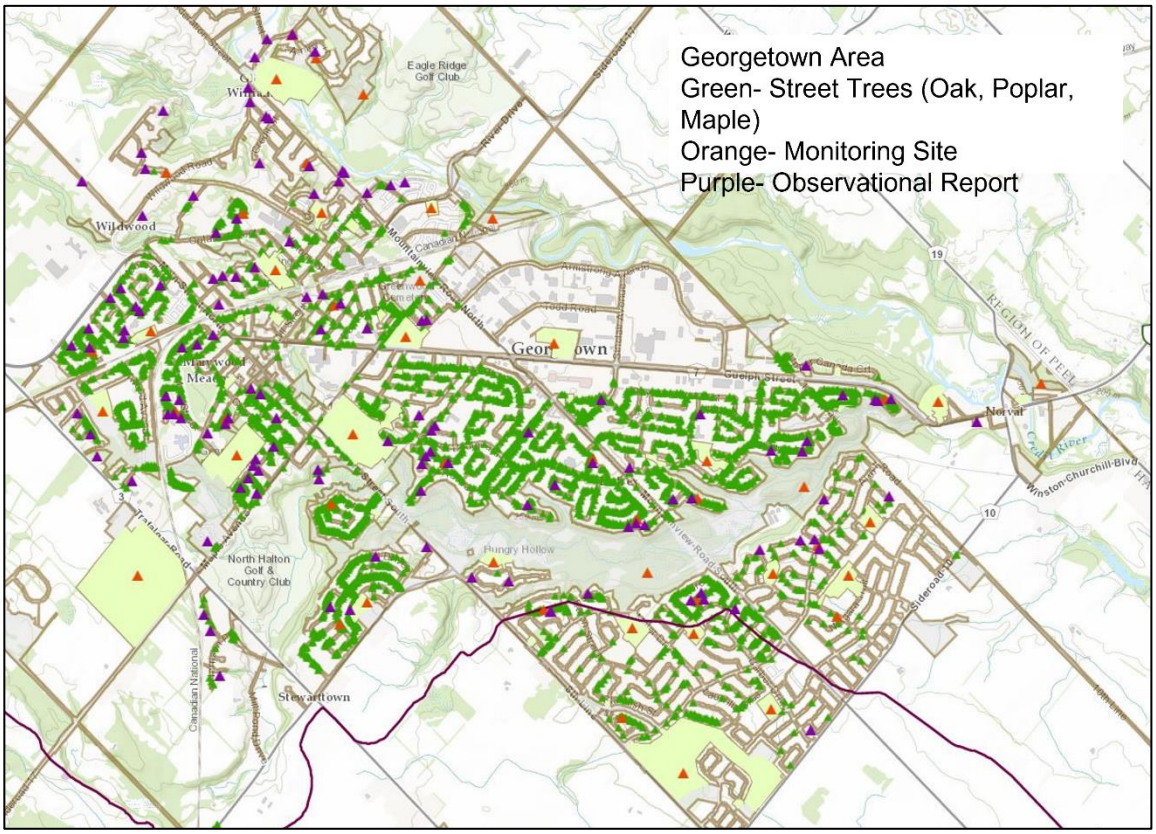

Figure 2: Location of sample sites in Georgetown, with target species and LDD reports. Street tree data was collected by the Town as part of an ongoing initiative and is not complete for the entire town.

Survey Results

From October 12th, 2021, to January 20th, 2022, CVC surveyed a total of 80 sites: 15 woodlots, 30 parks, and 35 streets. A total of 473 individual trees, spanning 43 different species were checked for egg masses. Of this total, 148 trees were found within woodlot MKP plots and 325 were street or park trees. The top five species assessed were:

1. Sugar Maple (Acer saccharum) - 65 trees
2. Norway Maple (Acer platanoides) - 52 trees
3. Red Oak (Quercus rubra) - 44 trees
4. Little-leaved Linden *(*Tilia cordata) - 27 trees
5. Red Maple *(*Acer rubrum) - 22 trees

An average of 9.5 egg masses per tree were found and the average length of each egg mass was 3.1 cm; however, concentrations of egg masses and their respective sizes varied considerably between areas surveyed (Table 1). The highest recorded number of egg masses per tree was 254 and the lowest was zero.

Table 1: Total egg masses found and average number of egg masses per tree for each location monitored.

Town	Number of Sites	Total Egg Masses Found	Total Trees Surveyed	Average Number of Egg Masses per Tree	Standard Error
Acton Area	21	664	122	5.6	2.0
Georgetown Area	59	3697	351	12.2	3.5

Figure 3 illustrates the number of egg masses per hectare extrapolated from the data collected at each survey point. Densities tend to be higher closer to forested areas and also appear to roughly conform to areas of relatively higher elevation as is common for LDD distribution.

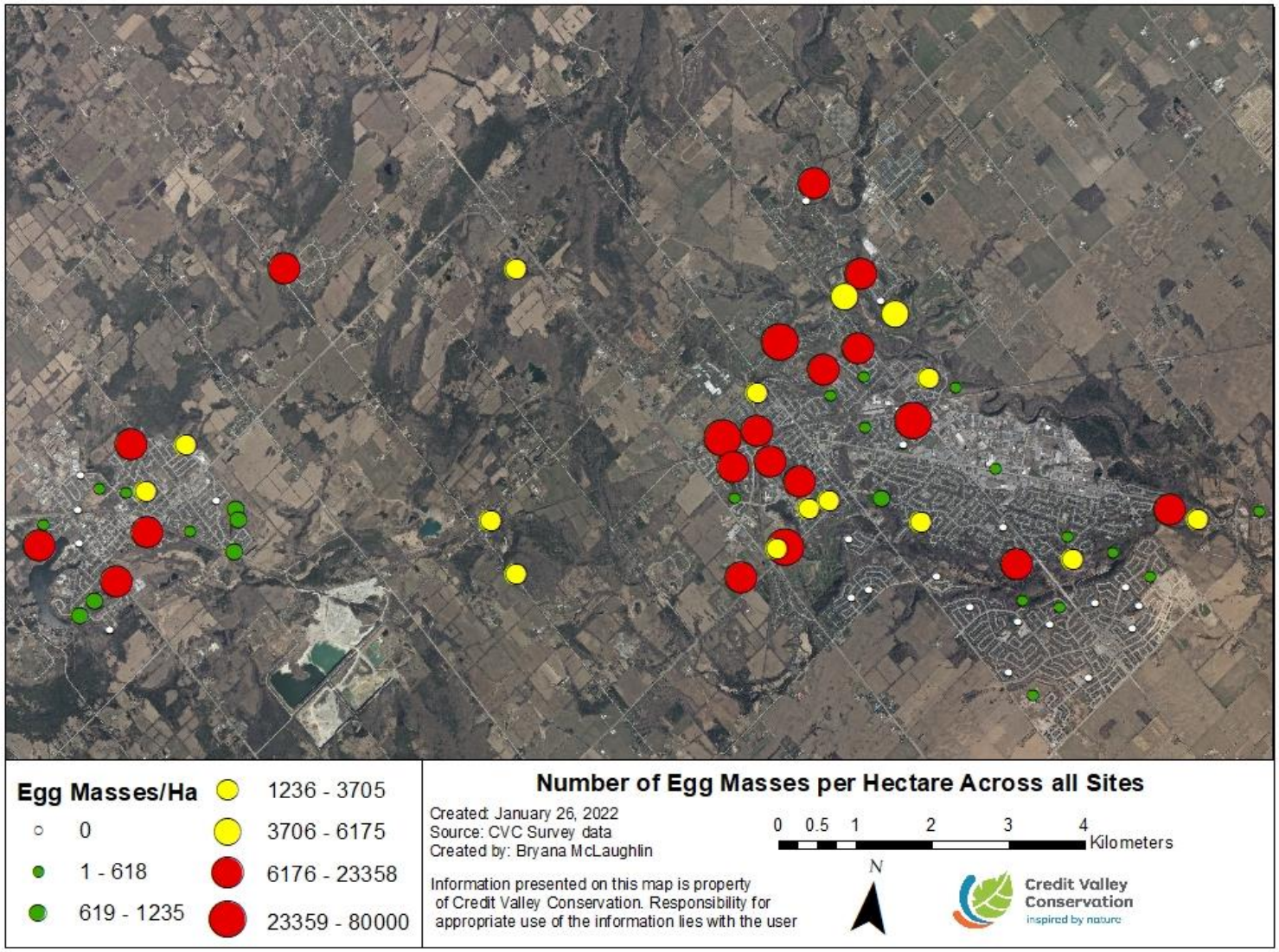

Figure 3: Number of egg masses per hectare across all sites surveyed. Data is extrapolated from MKP and 5-tree count survey numbers but does not account for natural predators or diseases that may be present at the survey site.

According to the criteria for egg mass counts set forth by the Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDMNRF) discussed below, 20 of the 80 sites surveyed are within the threshold for severe defoliation in 2022, 15 sites are within the threshold for moderate levels of defoliation, and 45 sites are expected to have light or trace levels of defoliation (Figure 4). However, these are predictions and do not account for the effects of natural predators or diseases that may be present at the survey site.

In Georgetown, the northwest side has the greatest potential for severe defoliation, whereas the southeast and the urban area north of Hungry Hollow is expected to experience only light defoliation.

In Acton, the areas with the potential to be severely defoliated are located through the center of town but also close to the borders of natural areas. The eastern and northwestern areas of town as well as the southernmost tip are expected to be least affected.

In all areas surveyed, there appears to be a pattern of higher egg mass counts on streets closer to natural areas. This may be due in part to edge effects where trees along the borders of forested areas have an average of 2.8 times more egg masses than similar trees in the nearby forest interior (Bellinger *et al*. 1989). Regardless, surveyed areas with high egg mass counts are more likely to experience significant defoliation in 2022.

Moderate defoliation of a Red Oak, taken on Russell Street in Georgetown, an area that will potentially experience severe defoliation in 2022.

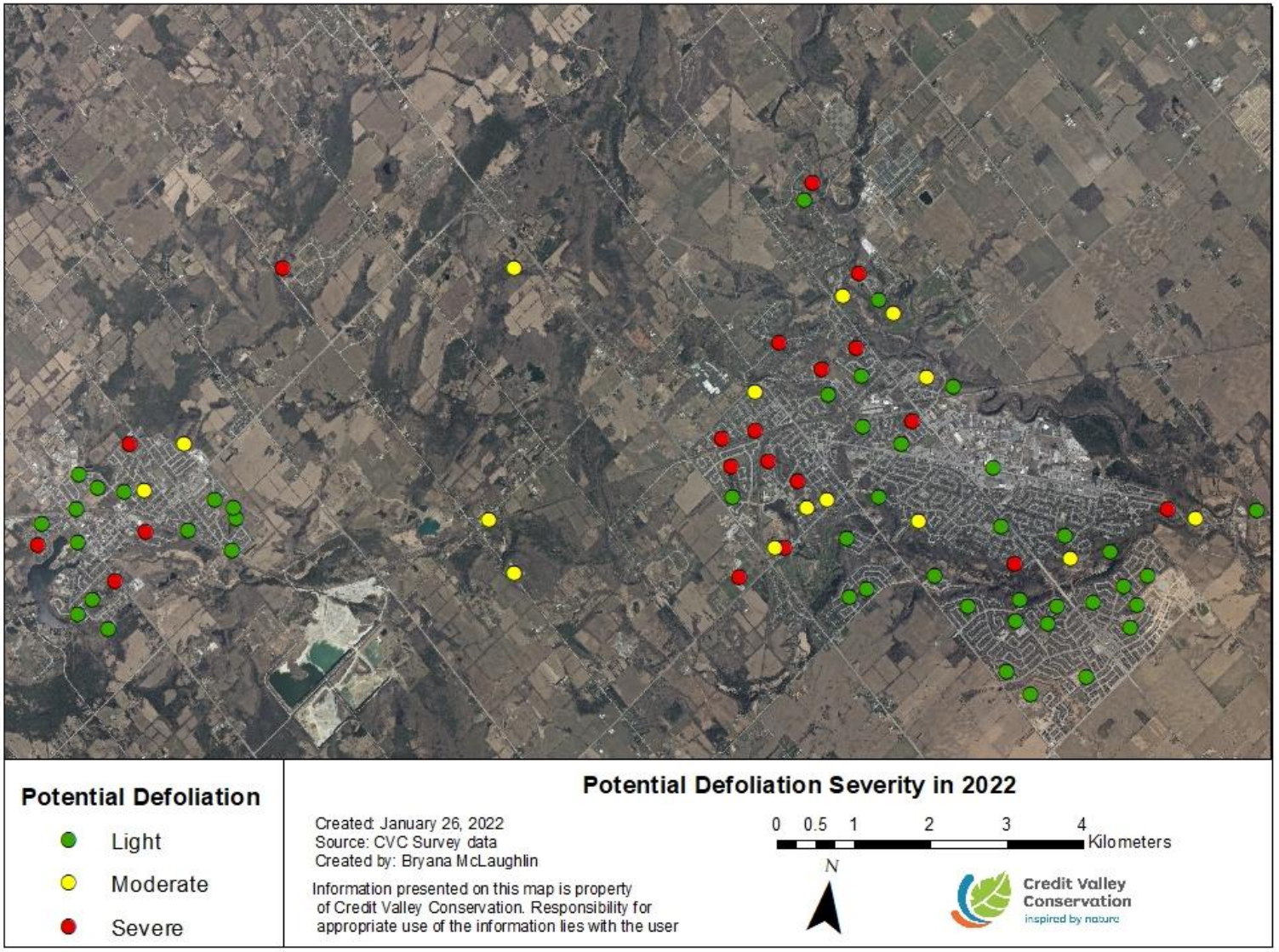

Figure 4: Potential defoliation severity in 2022 across all survey sites. Light (1-40% defoliation), Moderate (41-75% defoliation), and Severe (76-100% defoliation). Potential defoliation is based on total egg mass counts and does not account for mortality of eggs or larvae due to weather, natural predators, or disease.

It is interesting to note that there was a higher density of egg masses on the north edge of Hungry Hollow in Georgetown than the southern edge. LDD moths are known to proliferate along south and western facing slopes as trees there are often warmer, drier, more stressed and prone to frost cracks than those on north facing slopes. These conditions are favourable for LDD population growth as they provide a more stable microclimate and protection from predators (Lallemand Inc./BioForest 2021). At other sites within Georgetown this pattern held true. Surveyors observed a high density of egg masses at one south-facing site where nearly all the street trees had severe frost cracks filled with egg masses and pupae.

Frost crack on a small street tree sheltering LDD pupae.

Egg masses assessed for this survey ranged in size between 1 and 5 cm although most egg masses were close to 3 cm in length. The average size across all masses sampled was determined to be 3.1 cm. Egg mass sizes are used as an indicator to help determine the vigor of an LDD population. Egg masses greater than 3 cm in length imply a healthy or increasing population, egg masses between 2 and 3 cm indicate a stable population, and egg masses smaller than 2 cm imply the population is decreasing (Lallemand Inc./Bioforest, 2021).

Figure 5 illustrates the relative sizes of egg masses found at each site. The distribution is similar to that of egg mass density with the exception of Hungry Hollow, where larger egg masses were found along the entire northern side.

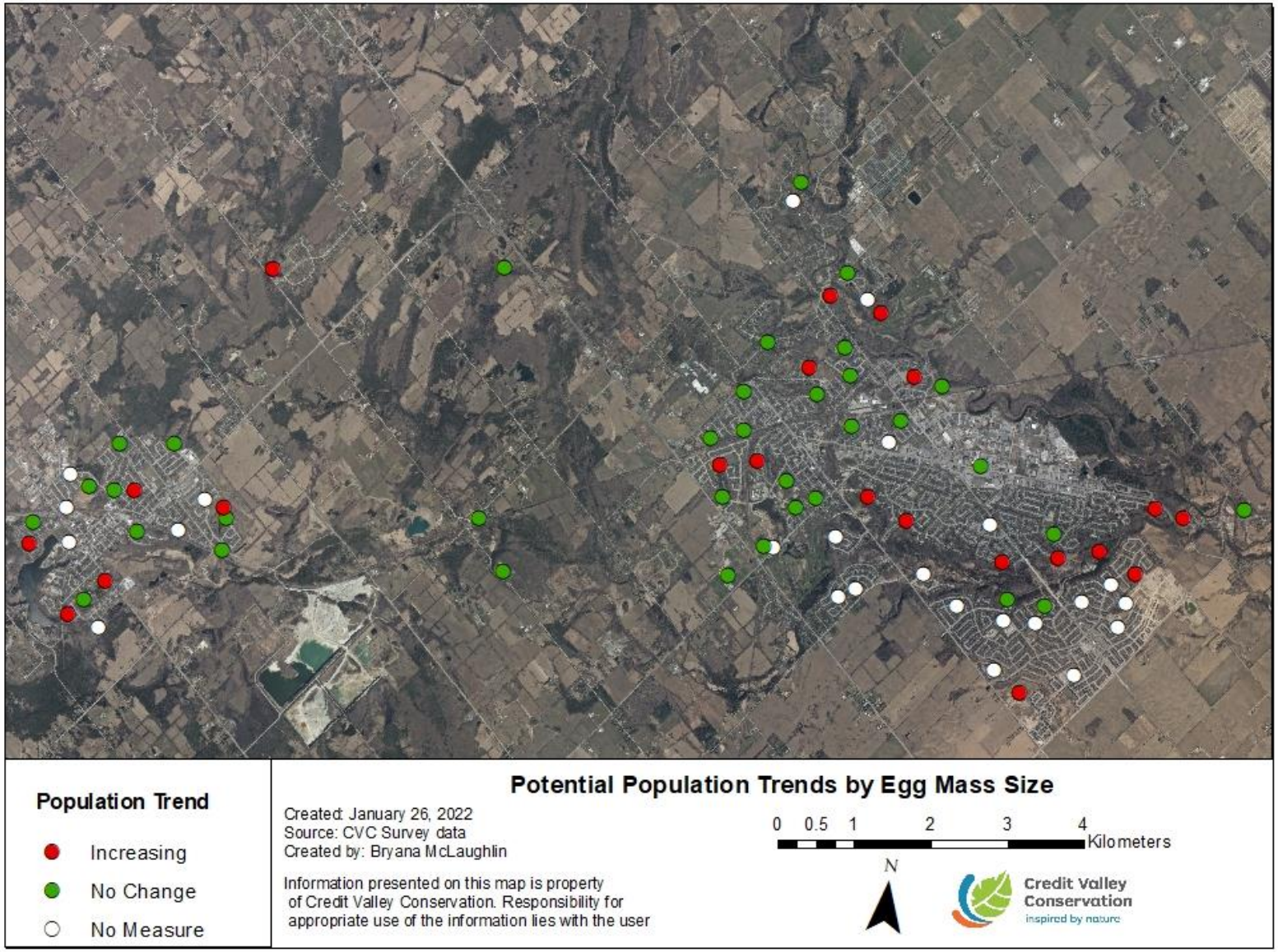

Figure 5: Average size of egg masses across Town of Halton Hills survey sites. Increasing population trends are egg masses 3 cm or greater, No Change is egg masses 2-3 cm, and No Measure represents sites that did not have egg masses present, or the egg masses were too high in the tree to be measured.

Natural enemy abundance

When interpreting these results, it is important to keep in mind that the severity of future outbreaks can be very difficult to predict, especially in urban settings, due to the vast number of variables involved including predation, parasite load, disease, and weather severity (MNDMNRF, 2021). Natural enemies play a large role in the collapse of LDD populations. Birds such as blue jays and orioles will eat the caterpillars, and chickadees will feed on the egg masses. Mice, chipmunks, skunks, voles, and other small mammals will eat the pupae or larvae. Besides wildlife, there are other natural control methods including both a virus and fungus. The nuclear polyhedrosis virus (NPV) infects the caterpillars, causing them to die and continues to spread through contact between caterpillars. It can also be spread through the feces of birds that eat dead or dying caterpillars. The effectiveness of the virus is dependent on high caterpillar density. The fungus Entomophaga maimaiga overwinters in soil and infects the caterpillars, resulting in their death. It needs cool, wet weather to persist and be effective. Observing large numbers of caterpillars infected with NPV or the fungus can be an indication of impending population collapse despite other indications of a stable or increasing population based on egg mass sizes or counts. It was too late in the year at the time of these surveys to evaluate caterpillar mortality on a large scale, however, CVC staff did observe caterpillars that had died in the characteristic V shape that indicates viral infection. To evaluate fungal and viral mortality across the survey area, additional LDD larval monitoring would need to be conducted between May and June.

Natural predation of egg masses was evident at nearly every tree surveyed. Many egg masses were disturbed and appeared to have been eaten by birds or small mammals. Small holes in the egg masses caused by the introduced parasitic wasp Ooencyrtus kuvanae were seen on most egg masses surveyed. The wasps themselves were also observed. Ooencyrtus kuvanae is estimated to kill 20-30 percent of LDD eggs in most years (McCullough, 1999). Pupae from another LDD parasitoid, Cotesia melanoscela, were also observed on a large portion of trees with egg masses, and even some without. This parasitoid kills LDD in its larval stage. Large numbers of them were observed on the underside of bark flakes, indicating there may be many more of these parasitoids present than are readily detectable.

Top: LDD parasitoid Ooencyrtus kuvanae on egg mass. Middle: Rice-like pupae of parasitoid Cotesia melanoscela. Bottom: Parasitoid pupae on underside of a bark flake.

Recommendations

Determination of thresholds and appropriate actions

In accordance with current industry standards, it is recommended that any actions taken employ an Integrated Pest Management (IPM) approach. IPM involves a variety of tactics based on sound research and best-management practices to create a treatment plan that minimizes negative impacts from forest pests while also minimizing harm to the surrounding ecosystem.

After baseline monitoring, the first step in deciding which tactics to pursue is establishing a threshold of action at which management efforts will be undertaken. In our analysis, survey data has been applied to the following categorization thresholds used by the MNDMNRF (Table 2):

Table 2: Defoliation severity thresholds for forest stands based on number of egg masses per hectare.

Egg Masses per Hectare	Defoliation Category	Percent of Forest Stand Affected
>6,175	Severe	75-100%
1,236-6,174	Moderate	40-75%
0-1,235	Light	1-40%

Generally, LDD management actions are undertaken after multiple years of severe defoliation if the population is still predicted to be high and/or if other stressors are also present. However, it should be noted that these thresholds were determined based on modeling of LDD defoliation in contiguous forest stands. Thresholds for action in an urban setting can vary depending upon the number of trees present in the area, the ecological services those trees provide, and other pressures such as compaction, drought, salt, other pests/diseases, and concern from residents.

There are several approaches used to manage populations of LDD. Table 3 outlines the common tactics generally considered for implementation on a municipal scale.

Table 3: Available tactics and recommendations for control of LDD in the Town.

Tactic	Description	Timing Applied	Pros	Cons	Recommendation
Tree Banding	Application of burlap or commercial banding products** to trap caterpillars as they move up and down the tree	May to July	Materials are inexpensive and readily available Very few off target impacts when applied correctly Does not require specialized tools or licenses	Very labour intensive (bands checked every day) Not efficient for woodlots or large areas Only captures caterpillars that descend to lower bole of the tree	Could be used by Town staff on street or park trees if time or budget allowed Great option for residents especially if combined with education and outreach or banding kit giveaways by the Town
Egg Mass Scraping	Removal of egg masses from accessible parts of the tree using a scraping tool and a container	October to early May	Materials are inexpensive and readily available Does not require specialized tools or licenses	Very labour intensive Not efficient for woodlots or large areas Some egg masses are too high in the tree to be reached safely	Could be used by Town staff on street or park trees if time or budget allowed Great option for residents especially if combined with education and outreach by the Town
Ground Spray*	Foliar spray of Bacillus thuringiensis kurstaki (Btk) from the ground or via bucket truck	Two applications May -June	Targeted application that can be applied to street or park trees in high-risk neighbourhoods Very effective Safe for use around mammals, birds, and most other insects	Expensive to apply May be difficult to source product or licensed contractors May not be able to reach top of large trees from ground or bucket truck Will impact other caterpillars present at the time of spray Not efficient for woodlots or large areas	Could be implemented by Town staff to protect amenity trees in neighbourhoods with potential for severe defoliation
Tree injections*	Injection of TreeAzin insecticide into the tree via drilled holes	One Application May- June	Effective Safe for use around mammals, birds, and most other insects Protects the entire tree canopy	Very expensive to apply Risk of damaging or girdling trees with repeated application Would require additional monitoring to select candidates Will impact other leaf eating insects Not efficient for woodlots or large areas	Could be implemented by Town staff to protect amenity trees that cannot be sprayed in parks with potential for severe defoliation
Aerial Spray*	Foliar spray of Bacillus thuringiensis kurstaki (Btk) by helicopter from above the canopy	Two applications May -June	Very effective for large areas Safe for use around mammals, birds, and most other insects Protects the entire tree canopy	Very expensive to apply Timing window is very narrow Will impact other caterpillars present at the time of spray Not suitable for small areas or scattered sites Requires long term intensive planning (6 months average lead time)	Not recommended due to scattered distribution of sites with potential for severe defoliation

*Technique must be applied by a licensed professional.
**Commercial products include ready to apply banding kits such as Bug Barrier (Sherrilltree, 2021).

Due to the scattered and localized nature of survey locations identified with potential for severe defoliation, an aerial spray is not recommended in 2022. Instead, we would recommend a combination of ground methods (See Appendix A) and public outreach as resources permit aimed at mitigating effects of LDD in neighbourhoods forecasted to experience moderate to severe defoliation. Continued monitoring efforts may also be performed on a regular basis to keep informed of changes in LDD populations on a local scale.

Throughout the survey process, CVC staff spoke to dozens of residents who were curious and/or concerned about the LDD outbreaks. Many eagerly described their efforts to control egg masses over the winter or caterpillars over the summer. A number of Town trees surveyed had burlap, tape, or sticky wax bands around the trunk and evidence of previous banding activities could be seen on many more. Considering that the majority of trees in the Town are privately owned (Town of Halton Hills, 2020), landowner participation is a valuable resource to leverage when developing a management framework for LDD. Strengthening education and outreach efforts specifically in areas where defoliation is potentially going to be severe is recommended. Individual tree scraping and banding efforts applied across a large scale have the potential to impact caterpillar numbers in 2022 and decrease overall defoliation intensity. Access to resources such as factsheets and instructional videos or the creation of a banding kit give-a-way for landowners are cost-effective ways of encouraging landowners to tackle individual trees while providing education on best management practices.

Norway maple boulevard trees showing evidence of previous banding activities.

Regional effects of LDD

In addition to completing surveys for the Town and LDD egg mass surveys across CVC owned and managed properties, CVC reached out to neighbouring conservation authorities: Conservation Halton (CH) and Grand River Conservation Authority (GRCA), to obtain a local landscape-level snapshot of LDD impacts experienced in 2021 and forecasted for 2022.

As part of a larger initiative to create a formalized integrated pest management framework, CVC initiated an LDD egg mass monitoring program in 2021. This included the completion of 29 surveys across 22 conservation areas focusing on vulnerable forest communities characterized by LDD preferred hosts (oak, maple, and poplar) throughout the watershed. Seven survey sites reported egg mass numbers high enough to predict severe defoliation in

2022 however, distribution of those sites was sporadic and spread across the upper two-thirds of the watershed. CVC staff have anecdotally reported a decrease in egg mass numbers in 2021 as well as increased presence of parasitic insects, NPV, and the fungus during the growing season.

GRCA has been experiencing significant outbreaks of LDD in the southern portion of the watershed since 2018. Due to ongoing defoliation pressure, five properties owned by GRCA were treated in 2020 and two of them were retreated in 2021. GRCA did not complete formal egg mass counts in 2021; however, they did complete defoliation surveys in the summer as well as observational egg mass surveys earlier in the fall. Defoliation in the treated areas was light but the surrounding untreated areas experienced moderate to severe defoliation. Additionally, some properties in the central portion of the watershed had notable but sporadic defoliation. Egg mass numbers and size appear to be decreasing in both treated and untreated forests where the outbreak has been ongoing since 2018 however there are still pockets with high egg mass numbers.

Conservation Halton experienced severe LDD outbreaks across the watershed in 2020. They treated 126.5 ha over four properties in spring 2021. When they re-surveyed existing monitoring plots in November 2021, they found a 90 percent decline in total egg mass number from 2020 to 2021 and egg masses were one-third smaller on average. CH also reported signs of heavy viral and fungal loads, likely assisted by high caterpillar populations and cool, wet spring weather.

Conclusion

Consistent with what has been reported from surrounding conservations authorities, LDD egg mass numbers within the Town are extremely sporadic. Some areas have the potential for severe defoliation while others had very few egg masses present. A combination of ground tactics and outreach targeted to high-risk neighbourhoods would minimize damage on Town trees and can be tailored to match available resources and budget. As virus, fungus, and parasite presence continue to increase, LDD moth populations are expected to decline leading to decreased management pressures.

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Appendix A

Parks, cemeteries, and woodlot management options

Town staff requested a detailed breakdown of properties with potential to experience moderate to severe defoliation in 2022 to help determine priority locations for ground-based methods. Of the Town properties (parks, cemeteries, and woodlots) surveyed, seven were forecasted to experience severe defoliation and 10 were forecasted to experience moderate defoliation in 2022 (Figure 1). Sites are listed in order of severity by the average number of egg masses per tree (Table 1). This number is indicative of the defoliation pressure that may be experienced by each tree measured within the plot. In the event that budget constraints do not allow treatment of all properties below, the average egg masses per tree can be used as a comparative metric between sites to determine the cutoff for treatment.

Table 1. Town properties (parks, cemeteries, and woodlots) that have the potential to experience moderate to severe defoliation in 2022 based on 2021 egg mass counts.

Name	Property Type	Location	Potential Defoliation	Average Egg Masses per Tree Surveyed
City Hall Driveway	Park	Georgetown	Severe	110.6
Greenwood Cemetery	Cemetery	Georgetown	Severe	83.2
Bridlewood Blvd.	Woodlot	Glen Williams	Severe	26.9
Emmerson Park	Park	Georgetown	Severe	20.0
Berton Blvd. Park	Park	Georgetown	Severe	18.4
Trafalgar Sports Park	Park	Georgetown	Severe	16.6
Glen Williams North # 1	Woodlot	Glen Williams	Severe	11.6
Glen Williams Park	Park	Glen Williams	Moderate	11.0
Limehouse Park	Park	Georgetown	Moderate	7.0
Georgetown Fairgrounds	Park	Georgetown	Moderate	6.2
City Hall Parking Lot	Park	Georgetown	Moderate	6.2
Glen Williams South	Woodlot	Georgetown	Moderate	4.5
Norval Park/ Willow Park Ecology Centre	Park	Georgetown	Moderate	3.0
Tolton Park	Park	Georgetown	Moderate	3.0
Barber Mill Park	Park	Georgetown	Moderate	2.6
Acton Sports Park	Woodlot	Acton	Moderate	2.1
Highway 7	Woodlot	Glen Williams	Moderate	2.0

Additional information regarding composition and access feasibility for the woodlots in Table 1 was requested by the Town to help determine their suitability for ground spraying or tree injections. Brief descriptions have been included below in order of potential defoliation severity.

Bridlewood Blvd.

This site is composed of silver maple dominated swamp, poplar forest, and old field vegetation. There is no access for equipment at the site however it can be accessed by foot through the old field vegetation on the south side of the property.

Glen Williams North

This site is an extremely steep ravine along the north side of the river. It is composed of deciduous forest (Sugar Maple dominant with Basswood, Trembling Aspen, Bitternut Hickory, Black Cherry, and White Birch) along the top of the ravine and White Cedar and Hemlock along the bottom near the

river. This site was surveyed in the initial woodlot surveys completed by CVC in October and revisited in January 2022 for additional information. The north side of the woodlot (Glen Williams North #1) was forecasted to expect severe defoliation in 2022. However, the southern side of the woodlot (Glen Williams North #2) had little evidence of LDD presence, one egg mass was found outside of the plot on a Sugar Maple. The site has no access for equipment, and it is challenging to reach by foot due to the steep slope; only accessible at the far ends due to private properties along the top of the slope.

Georgetown Fairgrounds Complex

This site was initially surveyed near the track as a park site in October 2021 but was revisited in January 2022 to assess the woodlot connecting the fairgrounds to Town Hall. The site is a lowland mixed forest dominated by White Cedar, White Pine, and Eastern Hemlock with some Sugar Maple, American Beech, Black Cherry, and Bitternut Hickory present. The site was quite wet, particularly along the trail edge and there was little evidence of LDD. There is equipment access to the woodlot from the trail and from the fairgrounds, but the interior of the woodlot would only be accessible by foot.

Glen Williams South

This site is predominately mixed forest and coniferous forest with a small maple dominated hardwood pocket near the golf course. The hardwood forest is accessible by foot, but not by equipment unless access was granted by the golf course.

Acton Sports Park

This site is a maple dominated hardwood forest located between Acton District School and Tanners Drive Park. It is bisected by trails that would provide entry and access for small to medium sized equipment.

Highway 7

This site is a maple dominated hardwood forest located at the top of a steep ravine. There is no access for equipment, and it is challenging to reach by foot due to the steep slope and presence of groundwater seeps along the sides of the ravine.

If the Town plans to proceed with ground spraying or tree injections, the next step would be to have a licensed contractor visit each of the selected high-risk sites. There they could determine the total number of trees at each site that would be ideal candidates for treatment (susceptible trees with large numbers of egg masses) and be accessible to their staff and equipment. Site visits could be completed any time over the winter until mid-April when caterpillars begin to emerge.

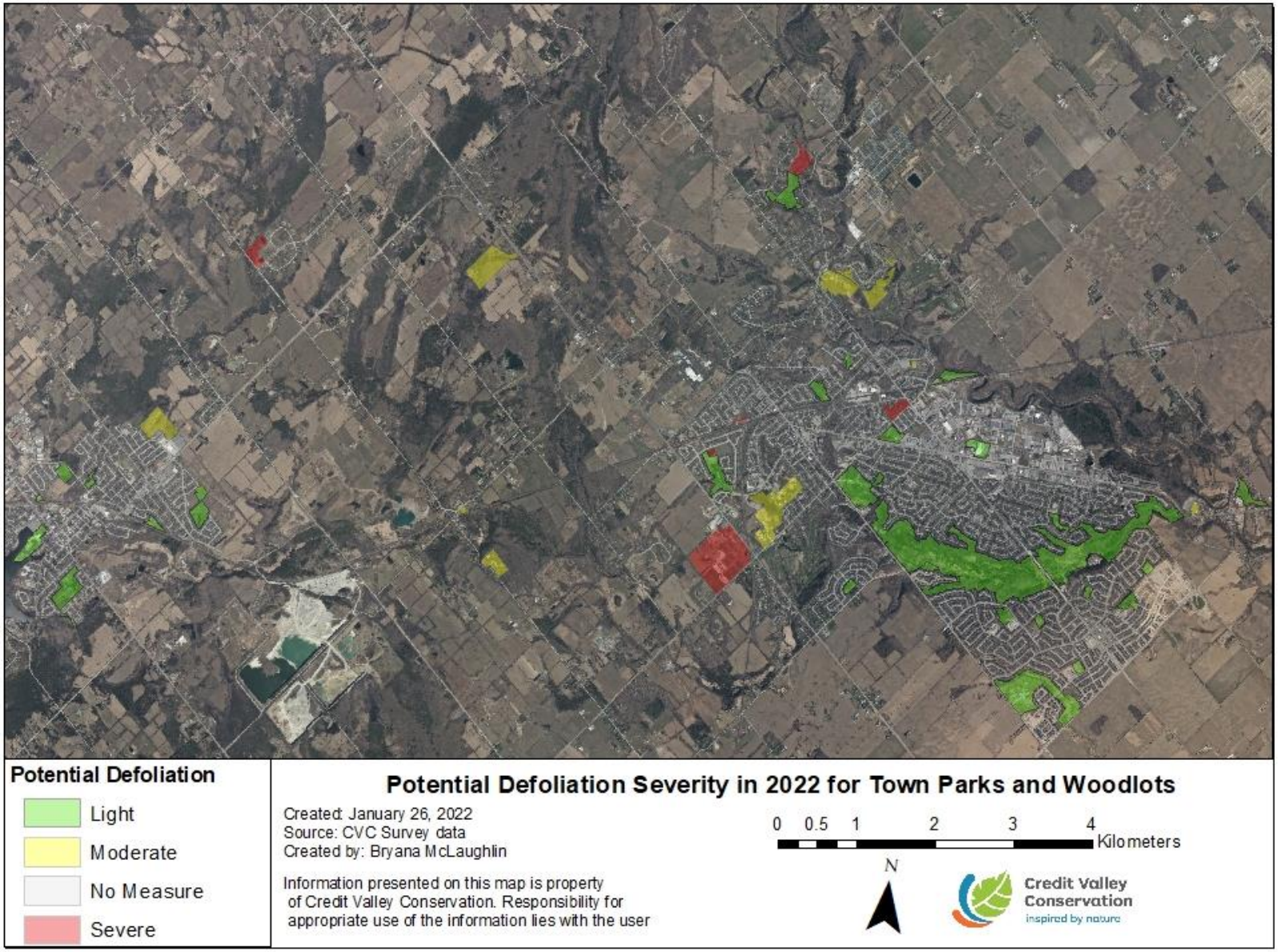


Figure 1: Potential defoliation severity in 2022 for Town park, cemetery, and woodlot properties. Light (1-40% defoliation), Moderate (41-75% defoliation), and Severe (76-100% defoliation). Predicted defoliation is based on a single survey point within the property. It reflects total egg mass counts and does not account for mortality of eggs or larvae due to natural predators or disease.

Appendix B

Town of Halton Hills Survey Data for Woodlots

Site ID #	Site Name	Town	Tree Species Common	Tree Species Latin	Tally	Egg Mass Above Ground Count	Average Egg Mass Size (cm)	Egg Mass Ground Count
1	Glen Williams South	Glen Williams	Manitoba Maple	*Acer negundo*	2	-	-	-
1	Glen Williams South	Glen Williams	White Pine	*Pinus strobus*	3	-	-	-
1	Glen Williams South	Glen Williams	Trembling Aspen	*Populus tremuloides*	4	-	-	-
1	Glen Williams South	Glen Williams	Black Cherry	*Prunus serotina*	2	-	-	-
1	Glen Williams South	Glen Williams	Little-leaved Linden	*Tilia cordata*	2	-	-	-
1	**Glen Williams South**	**Glen Williams**		**Total**	**13**	**59**	**3.6**	**0**
2	Glen Williams North #1	Glen Williams	Sugar Maple	*Acer saccharum*	7	-	-	-
2	Glen Williams North #1	Glen Williams	Ironwood	*Ostrya virginiana*	1	-	-	-
2	Glen Williams North #1	Glen Williams	Red Oak	*Quercus rubra*	2	-	-	-
2	**Glen Williams North #1**	**Glen Williams**		**Total**	**10**	**116**	**3**	**1**
83	Glen Williams North #2	Glen Williams	Sugar Maple	*Acer saccharum*	**8**	**-**	**-**	**-**
83	Glen Williams North #2	Glen Williams	American Basswood	*Tillia Americana*	**1**	**-**	**-**	**-**
83	**Glen Williams North # 2**	**Glen Williams**		**Total**	**9**	**0**	**N/A**	**0**
3	Bridlewood Blvd.	Glen Williams	Silver Maple	*Acer saccharinum*	1	-	-	-
3	Bridlewood Blvd.	Glen Williams	Sugar Maple	*Acer saccharum*	1	-	-	-
3	Bridlewood Blvd.	Glen Williams	Balsam Poplar	*Populus balsamifera*	2	-	-	-
3	Bridlewood Blvd.	Glen Williams	Trembling Aspen	*Populus tremuloides*	1	-	-	-
3	Bridlewood Blvd.	Glen Williams	American Elm	*Ulmus americana*	2	-	-	-
3	**Bridlewood Blvd.**	**Glen Williams**		**Total**	**7**	**188**	**3.85**	**0**
4	Hwy 7	Glen Williams	Sugar Maple	*Acer saccharum*	10	-	-	-
4	**Hwy 7**	**Glen Williams**		**Total**	**10**	**20**	**3**	**0**
5	Acton Sports Park	Acton	Sugar Maple	*Acer saccharum*	8	-	-	-
5	Acton Sports Park	Acton	Ironwood	*Ostrya virginiana*	2	-	-	-
5	**Acton Sports Park**	**Acton**		**Total**	**10**	**21**	**2.7**	**0**
6	Rennie Street Park	Acton	Sugar Maple	*Acer saccharum*	3	-	-	-
6	Rennie Street Park	Acton	Alternate-leaf Dogwood	*Cornus alternifolia*	5	-	-	-
6	Rennie Street Park	Acton	White Elm	*Ulmus americana*	1	-	-	-
6	**Rennie Street Park**	**Acton**			**9**	**10**	**3**	**0**
7	Fairview Cemetery	Acton	Sugar Maple	*Acer saccharum*	6			
7	Fairview Cemetery	Acton	Largetooth Aspen	*Populus grandidentata*	2			
7	**Fairview Cemetery**	**Acton**		**Total**	**8**	**7**	**2.5**	**0**
8	Wallace Street Park	Acton	Manitoba Maple	*Acer negundo*	1	-	-	-
8	Wallace Street Park	Acton	Trembling Aspen	*Populus tremuloides*	7	-	-	-
8	**Wallace Street Park**	**Acton**		**Total**	**8**	**1**	**2**	**0**
9	Georgetown North	Georgetown	Manitoba Maple	*Acer negundo*	2	-	-	-
9	Georgetown North	Georgetown	Sugar Maple	*Acer saccharum*	10	-	-	-
9	**Georgetown North**	**Georgetown**		**Total**	**12**	**3**	**3**	**0**
10	Norval/Georgetown East	Georgetown	American Beech	*Fagus grandifolia*	11			
10	**Norval/Georgetown East**	**Georgetown**		**Total**	**11**	**1**	**3**	**0**
12	Hungry Hollow Middle East	Georgetown	Sugar Maple	*Acer saccharum*	13	-	-	-
12	Hungry Hollow Middle East	Georgetown	Alternate Leaf Dogwood	*Cornus alternifolia*	2	-	-	-
12	Hungry Hollow Middle East	Georgetown	Black Cherry	*Prunus serotina*	2	-	-	-
12	**Hungry Hollow Middle East**	**Georgetown**		**Total**	**17**	**1**	**3.5**	**0**
13	Hungry Hollow Middle	Georgetown	Sugar Maple	*Acer saccharum*	8	-	-	-
13	Hungry Hollow Middle	Georgetown	Black Cherry	*Prunus serotina*	1	-	-	-
13	**Hungry Hollow Middle**	**Georgetown**		**Total**	**9**	**5**	**2.7**	**0**
84	Berton Park Woodlot	Georgetown	Sugar Maple	*Acer saccharum*	5	-	-	-
84	Berton Park Woodlot	Georgetown	Black Cherry	*Prunus serotina*	2	-	-	-
84	Berton Park Woodlot	Georgetown	White Ash	*Fraxinus americana*	1	-	-	-

84	**Berton Park Woodlot**	**Georgetown**		**Total**	**8**	**0**	**N/A**	**0**
36	Jubilee Woodlot	Georgetown	Red Maple	*Acer rubrum*	3	-	-	-
36	Jubilee Woodlot	Georgetown	American Beech	*Fagus grandifolia*	1	-	-	-
36	Jubilee Woodlot	Georgetown	Sugar Maple	*Acer saccharum*	3	-	-	-
36	**Jubilee Woodlot**	**Georgetown**		**Total**	**7**	**0**	**N/A**	**0**

Survey Data for Parks and Street Trees

Site ID	Town	Site Name	Site type	Town Tree ID	Tree Species, Common	Tree Species, Latin	Egg Mass Count	Average Egg Mass Size (cm)
17	Acton	Rennie Street Park	Park	-	Black Cherry	*Prunus serotina*	2	3
17	Acton	Rennie Street Park	Park	-	Black Cherry	*Prunus serotina*	2	3
17	Acton	Rennie Street Park	Park	-	Black Cherry	*Prunus serotina*	1	4
17	Acton	Rennie Street Park	Park	-	Ironwood	*Ostrya virginiana*	0	-
17	Acton	Rennie Street Park	Park	-	Sugar Maple	*Acer saccharum*	6	4
18	Acton	Sir Donald Mann Park	Park	-	Basswood	*Tilia americana*	0	-
18	Acton	Sir Donald Mann Park	Park	-	Basswood	*Tilia americana*	0	-
18	Acton	Sir Donald Mann Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
18	Acton	Sir Donald Mann Park	Park	-	Silver Maple	*Acer saccharinum*	1	3
18	Acton	Sir Donald Mann Park	Park	-	Silver Maple	*Acer saccharinum*	4	3
19	Acton	Acton Rotary/Prospect Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
19	Acton	Acton Rotary/Prospect Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
19	Acton	Acton Rotary/Prospect Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
19	Acton	Acton Rotary/Prospect Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
19	Acton	Acton Rotary/Prospect Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
20	Acton	Greenore Park	Park	-	White Ash	*Fraxinus americana*	0	-
20	Acton	Greenore Park	Park	-	Black Walnut	*Juglans nigra*	0	-
20	Acton	Greenore Park	Park	-	Black Walnut	*Juglans nigra*	0	-
20	Acton	Greenore Park	Park	-	Eastern White Cedar	*Thuja occidentalis*	0	-
20	Acton	Greenore Park	Park	-	Manitoba Maple	*Acer negundo*	0	-
21	Acton	Danville Park	Park	-	Black Locust	*Robinia psedoacacia*	0	-
21	Acton	Danville Park	Park	-	Black Walnut	*Juglans nigra*	0	-
21	Acton	Danville Park	Park	-	Cottonwood	*Populus deltoides*	0	-
21	Acton	Danville Park	Park	-	Siberian Elm	*Ulmus pumila*	0	-
21	Acton	Danville Park	Park	-	Trembling Aspen	*Populus tremuloides*	0	-
22	Acton	Bovis Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
22	Acton	Bovis Park	Park	-	Sugar Maple	*Acer saccharum*	3	3
22	Acton	Bovis Park	Park	-	Sugar Maple	*Acer saccharum*	1	3
22	Acton	Bovis Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
22	Acton	Bovis Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
50	Acton	Elmore Dr.	Street	1451	Norway Maple	*Acer platanoides*	0	-
50	Acton	Elmore Dr.	Street	1452	Red Oak	*Quercus rubra*	0	-
50	Acton	Elmore Dr.	Street	1450	Red Oak	*Quercus rubra*	1	1
50	Acton	Elmore Dr.	Street	1453	Silver Maple	*Acer saccarinum*	3	3
50	Acton	Elmore Dr.	Street	1460	Trembling Aspen	*Populus tremuloides*	0	-

Site ID	Town	Site Name	Site Type	Town Tree ID	Tree Species, Common	Tree species, Latin	Egg Mass Count	Average Egg Mass Size (cm)
51	Acton	Wallace St.	Street	2726	English Oak	*Quercus robur*	0	-
51	Acton	Wallace St.	Street	2727	English Oak	*Quercus robur*	0	-
51	Acton	Wallace St.	Street	2728	English Oak	*Quercus robur*	0	-
51	Acton	Wallace St.	Street	2725	English Oak	*Quercus robur*	0	-
51	Acton	Wallace St.	Street	2724	Red Oak	*Quercus rubra*	0	-
52	Acton	Storey Dr.	Street	1062	Black Locust	*Robinia pseudoacacia*	0	-
52	Acton	Storey Dr.	Street	1061	Norway Maple	*Acer platanoides*	1	3
52	Acton	Storey Dr.	Street	1058	Norway Maple	*Acer platanoides*	2	3
52	Acton	Storey Dr.	Street	1059	Norway Maple	*Acer platanoides*	7	4
52	Acton	Storey Dr.	Street	1060	Sugar Maple	*Acer saccharum*	0	-
53	Acton	Poplar Ave.	Street	1613	Black Locust	*Robinia Pseudoacacia*	0	-
53	Acton	Poplar Ave.	Street	1615	Norway Maple	*Acer platanoides*	19	3
53	Acton	Poplar Ave.	Street	1614	Silver Maple	*Acer saccharinum*	5	3
53	Acton	Poplar Ave.	Street	1616	Silver Maple	*Acer saccharinum*	45	3
53	Acton	Poplar Ave.	Street	1612	Sugar Maple	*Acer saccharinum*	0	-
54	Acton	Lasby Lane	Street	3074	Norway Maple	*Acer platanoides*	22	2.5
54	Acton	Lasby Lane	Street	3073	Norway Maple	*Acer platanoides*	34	3.5
54	Acton	Lasby Lane	Street	3075	Red Maple	*Acer rubrum*	1	1
54	Acton	Lasby Lane	Street	3076	Red Oak	*Quercus rubra*	5	3
54	Acton	Lasby Lane	Street	3077	Red Oak	*Quercus Rubra*	12	2
55	Acton	Adams Crt.	Street	1167	Callery Pear	*Pyrus calleryana*	8	2
55	Acton	Adams Crt.	Street	1168	Norway Maple	*Acer platanoides*	27	3
55	Acton	Adams Crt.	Street	1165	Norway Maple	*Acer platanoides*	24	5
55	Acton	Adams Crt.	Street	1169	Norway Maple	*Acer platanoides*	22	3
55	Acton	Adams Crt.	Street	1166	Sugar Maple	*Acer saccharum*	65	3
56	Acton	Churchill Rd. S	Street	2549	Basswood	*Tilia americana*	0	-
56	Acton	Churchill Rd. S	Street	2405	Honey Locust	*Gleditsia triacanthos*	1	3
56	Acton	Churchill Rd. S	Street	2548	Little-leaved Linden	*Tilia cordata*	0	-
56	Acton	Churchill Rd. S	Street	2406	Norway Maple	*Acer platanoides*	5	3
56	Acton	Churchill Rd. S	Street	2404	Red Oak	*Quercus rubra*	1	3
57	Acton	Rosemary Rd.	Street	3241	Mulberry	*Morus sp.*	0	-
57	Acton	Rosemary Rd.	Street	3242	Mulberry	*Morus sp.*	0	-
57	Acton	Rosemary Rd.	Street	3239	Red Maple	*Acer rubrum*	0	-
57	Acton	Rosemary Rd.	Street	3240	White Birch	*Betula papyrifera*	7	4
57	Acton	Rosemary Rd.	Street	3238	White Birch	*Betula papyrifera*	18	4
77	Acton	Beardmore Cres.	Street	1784	Honey Locust	*Gleditsia triacanthos*	0	-
77	Acton	Beardmore Cres.	Street	1765	Norway Maple	*Acer platanoides*	0	-
77	Acton	Beardmore Cres.	Street	1762	Red Oak	*Quercus rubra*	0	-
77	Acton	Beardmore Cres.	Street	1760	Red Oak	*Quercus rubra*	0	-
77	Acton	Beardmore Cres.	Street	1766	Red Oak	*Quercus rubra*	0	-

Site ID	Town	Site Name	Site Type	Town Tree ID	Tree Species, Common	Tree Species, Latin	Number of Egg Masses	Average size of Egg Masses
81	Acton	Tidey Ave.	Street	1510	Horse Chestnut	*Aesculus hippocastanum*	9	3.5
81	Acton	Tidey Ave.	Street	1511	Norway Maple	*Acer platanoides*	13	4
81	Acton	Tidey Ave.	Street	1509	Norway Maple	*Acer platanoides*	28	4.5
81	Acton	Tidey Ave.	Street	1507	Norway Maple	*Acer platanoides*	6	3.5
81	Acton	Tidey Ave.	Street	1508	Norway Maple	*Acer platanoides*	26	4
25	Georgetown	Trafalgar Sports Park	Park	-	Basswood	*Tilia americana*	10	2
25	Georgetown	Trafalgar Sports Park	Park	-	Norway Maple	*Acer platanoides*	49	3
25	Georgetown	Trafalgar Sports Park	Park	-	Sugar Maple	*Acer saccharum*	17	3
25	Georgetown	Trafalgar Sports Park	Park	-	Sugar Maple	*Acer saccharum*	7	3
25	Georgetown	Trafalgar Sports Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
26	Georgetown	Berton Blvd. Park	Park	-	Little-leaved Linden	*Tilia cordata*	20	3
26	Georgetown	Berton Blvd. Park	Park	-	Little-leaved Linden	*Tilia cordata*	7	3
26	Georgetown	Berton Blvd. Park	Park	-	Red Oak	*Quercus rubrum*	18	2
26	Georgetown	Berton Blvd. Park	Park	-	Red Oak	*Quercus rubra*	38	3
26	Georgetown	Berton Blvd. Park	Park	-	Sugar Maple	*Acer saccharum*	9	3
27	Georgetown	Emmerson Park	Park	-	Colorado Blue Spruce	*Picea pungens*	67	4
27	Georgetown	Emmerson Park	Park	-	Red Oak	*Quercus rubra*	1	3
27	Georgetown	Emmerson Park	Park	-	Sugar Maple	*Acer saccharum*	23	3
27	Georgetown	Emmerson Park	Park	-	Sugar Maple	*Acer saccharum*	9	2.5
27	Georgetown	Emmerson Park	Park	-	Sugar Maple	*Acer saccharum*	1	3
28	Georgetown	Georgetown Fairgrounds	Park	-	Sugar Maple	*Acer saccharum*	9	3
28	Georgetown	Georgetown Fairgrounds	Park	-	Sugar Maple	*Acer saccharum*	13	3
28	Georgetown	Georgetown Fairgrounds	Park	-	Sugar Maple	*Acer saccharum*	0	-
28	Georgetown	Georgetown Fairgrounds	Park	-	Sugar Maple	*Acer saccharum*	6	3
28	Georgetown	Georgetown Fairgrounds	Park	-	Sugar Maple	*Acer saccharum*	3	2
29	Georgetown	Cedarvale Park	Park	-	Black Locust	*Robinia pseudoacacia*	0	-
29	Georgetown	Cedarvale Park	Park	-	Manitoba Maple	*Acer negundo*	1	4
29	Georgetown	Cedarvale Park	Park	-	Manitoba Maple	*Acer negundo*	2	3
29	Georgetown	Cedarvale Park	Park	-	Manitoba Maple	*Acer negundo*	7	3
29	Georgetown	Cedarvale Park	Park	-	Manitoba Maple	*Acer negundo*	1	3
30	Georgetown	McNally Street Park	Park	-	Freeman Maple	*Acer freemanii*	0	-
30	Georgetown	McNally Street Park	Park	-	Norway Spruce	*Picea abies*	0	-
30	Georgetown	McNally Street Park	Park	-	White Pine	*Pinus strobus*	0	-
30	Georgetown	McNally Street Park	Park	-	White Pine	*Pinus strobus*	0	-
30	Georgetown	McNally Street Park	Park	-	White Spruce	*Picea glauca*	0	-
31	Georgetown	Gellert Community Park	Park	-	Bur Oak	*Quercus marcocarpa*	0	-
31	Georgetown	Gellert Community Park	Park	-	Bur Oak	*Quercus marcocarpa*	0	-
31	Georgetown	Gellert Community Park	Park	-	Bur Oak	*Quercus marcocarpa*	1	4
31	Georgetown	Gellert Community Park	Park	-	Bur Oak	*Quercus marcocarpa*	0	-
31	Georgetown	Gellert Community Park	Park	-	Red Oak	*Quercus rubra*	0	-
32	Georgetown	Miller Drive Park	Park	-	Silver Maple	*Acer saccharinum*	0	-

Site ID	Town	Site Name	Site Type	ToHH Tree ID	Tree Species, Common	Tree Species, Latin	Number of Egg Masses	Average size of Egg Masses
32	Georgetown	Miller Drive Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
32	Georgetown	Miller Drive Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
32	Georgetown	Miller Drive Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
32	Georgetown	Miller Drive Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
33	Georgetown	Eaton Neighbourhood Park	Park	-	Bur Oak	*Quercus macrocarpa*	0	-
33	Georgetown	Eaton Neighbourhood Park	Park	-	Honey Locust	*Gleditsia triacanthos*	0	-
33	Georgetown	Eaton Neighbourhood Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
33	Georgetown	Eaton Neighbourhood Park	Park	-	Silver Maple	*Acer sacchrinum*	0	-
33	Georgetown	Eaton Neighbourhood Park	Park	-	Sugar Maple	*Acer sacchrum*	0	-
34	Georgetown	Danby Road Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
34	Georgetown	Danby Road Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
34	Georgetown	Danby Road Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
34	Georgetown	Danby Road Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
34	Georgetown	Danby Road Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
35	Georgetown	Barber Drive Park	Park	-	Honey Locust	*Gledistsia triacanthos*	0	-
35	Georgetown	Barber Drive Park	Park	-	Honey Locust	*Gledistsia triacanthos*	0	-
35	Georgetown	Barber Drive Park	Park	-	Honey Locust	*Gledistsia triacanthos*	0	-
35	Georgetown	Barber Drive Park	Park	-	Honey Locust	*Gledistsia triacanthos*	0	-
35	Georgetown	Barber Drive Park	Park	-	Red Maple	*Acer rubrum*	0	-
37	Georgetown	Maple Creek Park	Park	-	Little-leaved Linden	*Tilia cordata*	1	3.5
37	Georgetown	Maple Creek Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
37	Georgetown	Maple Creek Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
37	Georgetown	Maple Creek Park	Park	-	Sugar Maple	*Acer saccharum*	1	4
37	Georgetown	Maple Creek Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
38	Georgetown	Ewing Street Park	Park	-	Sugar Maple	*Acer saccharum*	4	2.5
38	Georgetown	Ewing Street Park	Park	-	Sugar Maple	*Acer saccharum*	4	3
38	Georgetown	Ewing Street Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
38	Georgetown	Ewing Street Park	Park	-	Swamp White Oak	*Quercus bicolor*	0	-
38	Georgetown	Ewing Street Park	Park	-	Swamp White Oak	*Quercus bicolor*	3	3
39	Georgetown	Dominion Gardens Park	Park	-	Bur Oak	*Quercus macrocarpa*	0	-
39	Georgetown	Dominion Gardens Park	Park	-	Bur Oak	*Quercus macrocarpa*	0	-
39	Georgetown	Dominion Gardens Park	Park	-	Bur Oak	*Quercus macrocarpa*	0	-
39	Georgetown	Dominion Gardens Park	Park	-	Red Oak	*Quercus rubra*	0	-
39	Georgetown	Dominion Gardens Park	Park	-	Sugar Maple	*Acer saccharum*	0	-
40	Georgetown	Mold Masters Sportsplex	Park	-	Balsam Fir	*Abies balsamea*	3	2.5
40	Georgetown	Mold Masters Sportsplex	Park	-	Colorado Blue Spruce	*Picea pungens*	3	3
40	Georgetown	Mold Masters Sportsplex	Park	-	Colorado Blue Spruce	*Picea pungens*	0	-
40	Georgetown	Mold Masters Sportsplex	Park	-	Pyramidal Oak	*Quercus robur*	0	-
40	Georgetown	Mold Masters Sportsplex	Park	-	Red Oak	*Quercus rubra*	0	-
41	Georgetown	Joseph Gibbons Park	Park	-	Norway Maple	*Acer platanoides*	0	-
41	Georgetown	Joseph Gibbons Park	Park	-	Red Maple	*Acer rubrum*	0	-

Site ID	Town	Site Name	Site Type	ToHH Tree ID	Tree Species, Common	Tree Species, Latin	Number of Egg Masses	Average size of Egg Masses
41	Georgetown	Joseph Gibbons Park	Park	-	Red Maple	*Acer rubrum*	1	3
41	Georgetown	Joseph Gibbons Park	Park	-	Red Maple	*Acer rubrum*	0	-
41	Georgetown	Joseph Gibbons Park	Park	-	Silver Maple	*Acer saccharinum*	0	-
44	Georgetown	Barber Mill Park	Park	-	Colorado Blue Spruce	*Picea pungens*	7	4
44	Georgetown	Barber Mill Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
44	Georgetown	Barber Mill Park	Park	-	Little-leaved Linden	*Tilia cordata*	0	-
44	Georgetown	Barber Mill Park	Park	-	Silver Maple	*Acer saccharinum*	1	4
44	Georgetown	Barber Mill Park	Park	-	Silver Maple	*Acer saccharinum*	5	3
45	Georgetown	Meadowglen Park	Park	-	London Plane	*Platanus acerifolia*	0	-
45	Georgetown	Meadowglen Park	Park	-	London Plane	*Platanus acerifolia*	0	-
45	Georgetown	Meadowglen Park	Park	-	Red Oak	*Quercus rubra*	1	2.5
45	Georgetown	Meadowglen Park	Park	-	Red Oak	*Quercus rubra*	0	-
45	Georgetown	Meadowglen Park	Park	-	White Oak	*Quercus alba*	0	-
58	Georgetown	Banting Rd.	Street	5743	Honey Locust	*Gleditsia triacanthos*	11	3.5
58	Georgetown	Banting Rd.	Street	5740	Honey Locust	*Gleditsia triacanthos*	10	3
58	Georgetown	Banting Rd.	Street	5741	Norway Maple	*Acer platanoides*	217	3
58	Georgetown	Banting Rd.	Street	5742	Norway Maple	*Acer platanoides*	133	3
58	Georgetown	Banting Rd.	Street	5739	Red Maple	*Acer rubrum*	0	-
59	Georgetown	Hillside Dr.	Street	5219	Norway Maple	*Acer platanoides*	73	3.5
59	Georgetown	Hillside Dr.	Street	5216	Norway Maple	*Acer platanoides*	6	4
59	Georgetown	Hillside Dr.	Street	5218	Red Maple	*Acer rubrum*	4	2.5
59	Georgetown	Hillside Dr.	Street	5220	Red Maple	*Acer rubrum*	2	2
59	Georgetown	Hillside Dr.	Street	5217	Sugar Maple	*Acer saccharum*	2	2
60	Georgetown	Arborglen Dr.	Street	5547	Freeman Maple	*Acer freemanii*	0	-
60	Georgetown	Arborglen Dr.	Street	5546	Freeman Maple	*Acer freemanii*	0	-
60	Georgetown	Arborglen Dr.	Street	5599	Freeman Maple	*Acer freemanii*	0	-
60	Georgetown	Arborglen Dr.	Street	5598	Freeman Maple	*Acer freemanii*	0	-
60	Georgetown	Arborglen Dr.	Street	5597	Freeman Maple	*Acer freemanii*	0	-
61	Georgetown	Belmont Blvd.	Street	4077	Little-leaved Linden	*Tilia cordata*	0	-
61	Georgetown	Belmont Blvd.	Street	4076	Little-leaved Linden	*Tilia cordata*	0	-
61	Georgetown	Belmont Blvd.	Street	4075	Little-leaved Linden	*Tilia cordata*	0	-
61	Georgetown	Belmont Blvd.	Street	747	Red Oak	*Quercus rubra*	0	-
61	Georgetown	Belmont Blvd.	Street	19	Red Oak	*Quercus rubra*	0	-
62	Georgetown	Allen Rd.	Street	7287	Crab apple	*Malus sp.*	1	3
62	Georgetown	Allen Rd.	Street	7288	Freeman Maple	*Acer freemanii*	0	-
62	Georgetown	Allen Rd.	Street	7807	Norway Maple	*Acer platanoides*	0	-
62	Georgetown	Allen Rd.	Street	7481	Red Oak	*Quercus rubra*	0	-
62	Georgetown	Allen Rd.	Street	7289	Red Oak	*Quercus rubra*	27	4
63	Georgetown	Queen St.	Street	6415	Honey Locust	*Gleditsia triacanthos*	0	-
63	Georgetown	Queen St.	Street	6418	Norway Maple	*Acer platanoides*	0	-
63	Georgetown	Queen St.	Street	6416	Red Maple	*Acer rubrum*	0	-

Site ID	Town	Site Name	Site Type	ToHH Tree ID	Tree Species, Common	Tree Species, Latin	Number of Egg Masses	Average size of Egg Masses
63	Georgetown	Queen St.	Street	6339	River Birch (clump)	*Betula nigra 'clump'*	0	-
63	Georgetown	Queen St.	Street	6417	Sugar Maple	*Acer saccarum*	2	3
64	Georgetown	Faludon Dr.	Street	7842	Freeman Maple	*Acer freemanii*	0	-
64	Georgetown	Faludon Dr.	Street	7843	Norway Maple	*Acer platanoides*	0	-
64	Georgetown	Faludon Dr.	Street	7844	Norway Maple	*Acer platanoides*	0	-
64	Georgetown	Faludon Dr.	Street	7845	Norway Maple	*Acer platanoides*	0	-
64	Georgetown	Faludon Dr.	Street	391	Red Oak	*Quercus rubra*	0	-
65	Georgetown	Meadowlark Dr.	Street	10061	Little-leaved Linden	*Tilia cordata*	0	-
65	Georgetown	Meadowlark Dr.	Street	10062	Little-leaved Linden	*Tilia cordata*	0	-
65	Georgetown	Meadowlark Dr.	Street	10060	Little-leaved Linden	*Tilia cordata*	0	-
65	Georgetown	Meadowlark Dr.	Street	10059	Little-leaved Linden	*Tilia cordata*	0	-
65	Georgetown	Meadowlark Dr.	Street	10058	Little-leaved Linden	*Tilia cordata*	0	-
66	Georgetown	Metcalfe Crt.	Street	8504	Norway Maple	*Acer platanoides*	2	4
66	Georgetown	Metcalfe Crt.	Street	8503	Norway Maple	*Acer platanoides*	1	3.5
66	Georgetown	Metcalfe Crt.	Street	8507	Norway Maple	*Acer platanoides*	24	3
66	Georgetown	Metcalfe Crt.	Street	8506	Sugar Maple	*Acer saccharum*	0	-
66	Georgetown	Metcalfe Crt.	Street	8505	Sugar Maple	*Acer saccharum*	5	3.5
67	Georgetown	Nixon Cres.	Street	9851	Little-leaved Linden	*Tilia cordata*	0	-
67	Georgetown	Nixon Cres.	Street	9849	Norway Maple	*Acer platanoides*	2	3
67	Georgetown	Nixon Cres.	Street	9848	Norway Maple	*Acer platanoides*	0	-
67	Georgetown	Nixon Cres.	Street	9850	Red Maple	*Acer rubrum*	1	3
67	Georgetown	Nixon Cres.	Street	9847	Red Oak	*Quercus rubra*	0	-
68	Georgetown	Argyll Rd.	Street	-	Honey Locust	*Gleditsia triacanthos*	0	-
68	Georgetown	Argyll Rd.	Street	-	Little-leaved Linden	*Tilia cordata*	0	-
68	Georgetown	Argyll Rd.	Street	-	Little-leaved Linden	*Tilia cordata*	0	-
68	Georgetown	Argyll Rd.	Street	-	Little-leaved Linden	*Tilia cordata*	0	-
68	Georgetown	Argyll Rd.	Street	-	Red Oak	*Quercus rubra*	0	-
69	Georgetown	Russell St.	Street	8846	Norway Maple	*Acer platanoides*	3	3.5
69	Georgetown	Russell St.	Street	8848	Norway Maple	*Acer platanoides*	25	3
69	Georgetown	Russell St.	Street	8847	Red Oak	*Quercus rubra*	4	4
69	Georgetown	Russell St.	Street	8845	Red Oak	*Quercus rubra*	22	4
69	Georgetown	Russell St.	Street	8844	Red Oak	*Quercus rubra*	67	3
70	Georgetown	Greenwood Cemetery	Park	-	European Beech	*Fagus sylvatica*	54	2.5
70	Georgetown	Greenwood Cemetery	Park	-	Norway Maple	*Acer platanoides*	5	2.5
70	Georgetown	Greenwood Cemetery	Park	-	Red Oak	*Quercus rubra*	43	3
70	Georgetown	Greenwood Cemetery	Park	-	Red Oak	*Quercus rubra*	133	2
70	Georgetown	Greenwood Cemetery	Park	-	Red Oak	*Quercus rubra*	181	2.5
71	Georgetown	Westbranch Drive Park	Park	-	Red Maple	*Acer rubrum*	0	-
71	Georgetown	Westbranch Drive Park	Park	-	Red Maple	*Acer rubrum*	0	-
71	Georgetown	Westbranch Drive Park	Park	-	Red Maple	*Acer rubrum*	0	-
71	Georgetown	Westbranch Drive Park	Park	-	Red Oak	*Quercus rubra*	0	-

Site ID	Town	Site Name	Site Type	ToHH Tree ID	Tree Species, Common	Tree Species, Latin	Number of Egg Masses	Average size of Egg Masses
71	Georgetown	Westbranch Drive Park	Park	-	Red Oak	*Quercus rubra*	0	-
73	Georgetown	Barber Dr.	Street	-	Basswood	*Tilia americana*	0	-
73	Georgetown	Barber Dr.	Street	-	Bur Oak	*Quercus macrocarpa*	0	-
73	Georgetown	Barber Dr.	Street	-	Red Oak	*Quercus rubra*	0	-
73	Georgetown	Barber Dr.	Street	-	Swamp White Oak	*Quercus bicolour*	0	-
73	Georgetown	Barber Dr.	Street	-	Swamp White Oak	*Quercus bicolour*	0	-
74	Georgetown	Oak St.	Street	345	Freeman Maple	*Acer freemanii*	0	-
74	Georgetown	Oak St.	Street	342	Red Maple	*Acer rubrum*	0	-
74	Georgetown	Oak St.	Street	341	Red Maple	*Acer rubrum*	0	-
74	Georgetown	Oak St.	Street	344	Red Maple	*Acer rubrum*	0	-
74	Georgetown	Oak St.	Street	343	Sugar Maple	*Acer sacchrum*	0	-
75	Georgetown	Irwin Cres.	Street	7706	Horse Chestnut	*Aeculus hippocastanum*	28	3
75	Georgetown	Irwin Cres.	Street	7705	Horse Chestnut	*Aeculus hippocastanum*	4	3
75	Georgetown	Irwin Cres.	Street	7707	Norway Maple	*Acer platanoides*	33	3.5
75	Georgetown	Irwin Cres.	Street	7709	Norway Maple	*Acer platanoides*	12	3.5
75	Georgetown	Irwin Cres.	Street	7708	Norway Maple	*Acer platanoides*	18	4
76	Georgetown	Harold St.	Street	4723	Crab apple (Crab)	*Malus sp.*	8	2.5
76	Georgetown	Harold St.	Street	4714	Norway Maple	*Acer platanoides*	13	3
76	Georgetown	Harold St.	Street	4715	Norway Maple	*Acer platanoides*	42	3
76	Georgetown	Harold St.	Street	4724	Norway Maple	*Acer platanoides*	23	3
76	Georgetown	Harold St.	Street	4713	Silver Maple	*Acer saccharinum*	2	3
78	Georgetown	Jason Cres.	Street	6827	Honey Locust	*Gleditsia triacanthos*	0	-
78	Georgetown	Jason Cres.	Street	6832	Little-leaved Linden	*Tilia cordata*	26	3.5
78	Georgetown	Jason Cres.	Street	6829	Norway Maple	*Acer platanoides*	168	3
78	Georgetown	Jason Cres.	Street	6830	Paper Birch	*Betula papyrifera*	18	3
78	Georgetown	Jason Cres.	Street	6831	Red Maple	*Acer rubrum*	0	-
79	Georgetown	Joseph St.	Street	4782	Callery Pear	*P. calleryana*	0	-
79	Georgetown	Joseph St.	Street	4996	Freeman Maple	*Acer freemanii*	0	-
79	Georgetown	Joseph St.	Street	4780	Red Maple	*Acer rubrum*	0	-
79	Georgetown	Joseph St.	Street	4781	Sugar Maple	*Acer saccharum*	11	3
79	Georgetown	Joseph St.	Street	4779	Sugar Maple	*Acer saccharum*	17	3
82	Georgetown	Moore Park Cres.	Street	5868	Chokecherry	*Prunus virginiana*	4	3
82	Georgetown	Moore Park Cres.	Street	5866	Japanese Lilac	*Syringa reticulata*	0	-
82	Georgetown	Moore Park Cres.	Street	143	Little-leaved Linden	*Tilia cordata*	0	-
82	Georgetown	Moore Park Cres.	Street	5869	Little-leaved Linden	*Tilia cordata*	11	3
82	Georgetown	Moore Park Cres.	Street	5867	Sugar Maple	*Acer saccharum*	20	3
23	Georgetown/Limehouse	Tolton Park	Park	-	Manitoba Maple	*Acer negundo*	0	-
23	Georgetown/Limehouse	Tolton Park	Park	-	Manitoba Maple	*Acer negundo*	1	3
23	Georgetown/Limehouse	Tolton Park	Park	-	Norway Maple	*Acer platanoides*	1	3
23	Georgetown/Limehouse	Tolton Park	Park	-	Paper Birch	*Betula papyrifera*	13	3
23	Georgetown/Limehouse	Tolton Park	Park	-	Trembling Aspen	*Populus tremuloides*	0	-

Site ID	Town	Site Name	Site Type	ToHH Tree ID	Tree Species, Common	Tree Species, Latin	Number of Egg Masses	Average size of Egg Masses
24	Georgetown/Limehouse	Limehouse Park	Park	-	Norway Maple	*Acer platanoides*	3	3
24	Georgetown/Limehouse	Limehouse Park	Park	-	Norway Maple	*Acer platanoides*	4	3
24	Georgetown/Limehouse	Limehouse Park	Park	-	Sugar Maple	*Acer saccharum*	2	2
24	Georgetown/Limehouse	Limehouse Park	Park	-	Sugar Maple	*Acer saccharum*	7	3
24	Georgetown/Limehouse	Limehouse Park	Park	-	Sugar Maple	*Acer saccharum*	19	3
42	Georgetown/Norval	Willow Park Ecology Centre	Park	-	Eastern Hemlock	*Tsuga canadensis*	7	3.5
42	Georgetown/Norval	Willow Park Ecology Centre	Park	-	Eastern Redbud	*Cercis canadensis*	0	-
42	Georgetown/Norval	Willow Park Ecology Centre	Park	-	Sugar Maple	*Acer saccharum*	1	3
42	Georgetown/Norval	Willow Park Ecology Centre	Park	-	Sugar Maple	*Acer saccharum*	7	3
42	Georgetown/Norval	Willow Park Ecology Centre	Park	-	Sugar Maple	*Acer saccharum*	0	-
16	Glen Williams	Glen Williams Park	Park	-	Sugar Maple	*Acer saccharum*	11	3
16	Glen Williams	Glen Williams Park	Park	-	Sugar Maple	*Acer saccharum*	26	3
16	Glen Williams	Glen Williams Park	Park	-	Sugar Maple	*Acer saccharum*	11	3
16	Glen Williams	Glen Williams Park	Park	-	Sugar Maple	*Acer saccharum*	4	4
16	Glen Williams	Glen Williams Park	Park	-	White Spruce	*Picea glauca*	3	4
47	Glen Williams	Prince St.	Street	-	Red Maple	*Acer rubrum*	1	2
47	Glen Williams	Prince St.	Street	-	Red Maple	*Acer rubrum*	6	3
47	Glen Williams	Prince St.	Street	-	Red Maple	*Acer rubrum*	0	-
47	Glen Williams	Prince St.	Street	-	Red Oak	*Quercus rubra*	40	3
47	Glen Williams	Prince St.	Street	-	Red Oak	*Quercus rubra*	77	2
48	Glen Williams	Oak Ridge Dr.	Street	-	Norway Maple	*Acer platanoides*	98	2.5
48	Glen Williams	Oak Ridge Dr.	Street	-	Norway Maple	*Acer platanoides*	54	2
48	Glen Williams	Oak Ridge Dr.	Street	-	Norway Maple	*Acer platanoides*	254	3
48	Glen Williams	Oak Ridge Dr.	Street	-	Norway Maple	*Acer platanoides*	130	2
48	Glen Williams	Oak Ridge Dr.	Street	-	Norway Maple	*Acer platanoides*	174	2
49	Glen Williams	Mullen Place	Street	-	Black Walnut	*Juglans nigra*	11	3
49	Glen Williams	Mullen Place	Street	-	Bur Oak	*Quercus macrocarpa*	1	3
49	Glen Williams	Mullen Place	Street	-	Bur Oak	*Quercus macrocarpa*	1	1
49	Glen Williams	Mullen Place	Street	-	Red Oak	*Quercus rubra*	54	3
49	Glen Williams	Mullen Place	Street	-	Sugar Maple	*Acer saccharum*	17	3
72	Glen Williams	Barraclough Blvd.	Street	-	Serviceberry	*Amelanchier arborea*	0	-
72	Glen Williams	Barraclough Blvd.	Street	-	Trembling Aspen	*Populus tremuloides*	0	-
72	Glen Williams	Barraclough Blvd.	Street	-	Trembling Aspen	*Populus tremuloides*	0	-
72	Glen Williams	Barraclough Blvd.	Street	-	Trembling Aspen	*Populus tremuloides*	0	-
72	Glen Williams	Barraclough Blvd.	Street	-	Trembling Aspen	*Populus tremuloides*	0	-
85	Georgetown	City Hall Parking Lot	Park	-	Red Oak	*Quercus rubra*	3	-
85	Georgetown	City Hall Parking Lot	Park	-	Red Oak	*Quercus rubra*	8	3
85	Georgetown	City Hall Parking Lot	Park	-	Red Oak	*Quercus rubra*	2	-
85	Georgetown	City Hall Parking Lot	Park	-	Red Oak	*Quercus rubra*	4	-
85	Georgetown	City Hall Parking Lot	Park	-	Red Oak	*Quercus rubra*	14	3
86	Georgetown	City Hall Driveway	Park	-	Red Oak	*Quercus rubra*	78	2.5

86	Georgetown	City Hall Driveway	Park	-	Red Oak	*Quercus rubra*	181	3
86	Georgetown	City Hall Driveway	Park	-	Red Oak	*Quercus rubra*	85	2.5
86	Georgetown	City Hall Driveway	Park	-	Norway Maple	*Acer platanoides*	55	2.5
86	Georgetown	City Hall Driveway	Park	-	Norway Maple	*Acer platanoides*	154	3

Appendix C

Modified Kaladar Plot Survey Methodology

Produced by:
Forest Health and Silviculture Section
Forest Management Branch
Sault Ste. Marie, Ontario

A gypsy moth egg mass survey is used to estimate the population of gypsy moth in a woodlot.

To find out if gypsy moth is present in a wooded area on your property, you should take a walk in your woodlot and look for gypsy moth egg masses. Egg masses are approximately the size of a quarter, and are covered with tan coloured, fuzzy hairs. They look like a piece of chamois. You can find them on the underside of tree branches, in bark crevices, and on branches, logs, and rocks on the ground.

If you see any egg masses, you can do an egg mass survey to estimate the gypsy moth population. The survey takes a sample of part of your woodlot using Modified Kaladar Plots (MKP). It's quick and simple. The information from the survey will be useful in determining the need for, and planning for, a pest management program.

The following are step by step instructions for doing the survey.

Equipment needed for an MKP survey

- Datasheet and pencil
- Flagging tape, ribbon, or tree paint
- 10 m (30 feet) measuring tape

Step 1: Where to conduct the survey

Identify the areas of your property that would be most susceptible to gypsy moth defoliation. Susceptibility can be evaluated by looking at two factors: trees species, and terrain.

Tree species that are very susceptible to gypsy moth include Oak, Poplar, Aspen, Birch, Maple, and Basswood. For help in identifying the type of trees on your property, you can obtain tree identification guides in most bookstores and libraries. You can also contact your local Ministry of Natural Resources district office.

Terrain also influences gypsy moth defoliation, with high and dry ridges being most susceptible. Wet sites such as swamps are least susceptible.

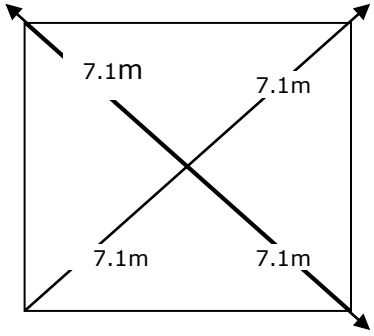
Areas of your property that would be the most susceptible to gypsy moth infestation

would be a high ridge covered with oak and poplar. Areas with low susceptibility would be cedar or balsam swamps. Another good place for the survey is where egg masses have been previously found, or where defoliation has been previously observed. Find the areas of greatest susceptibility and establish your MKPs there.

Step 2: Plot layout

Each MKP is 10 metres by 10 metres (0.01 hectares) and should be located away from open areas such as roads or trails to avoid inflated counts. Walk into your woodlot for about 20m and begin laying out the plot. Mark the first corner of the MKP with flagging tape (or ribbon or tree paint) and run a diagonal line 7.1m to the plot centre. Mark the plotcentre with two pieces of flagging tape and continue to run the diagonal line another 7.1m. Flag this spot as the corner opposite your starting point.

Complete the plot layout by running lines to the two other corners from the centre andflagging them. You now have a 10m x 10m box as shown below:



Step 3: Distinguishing between new and old egg masses

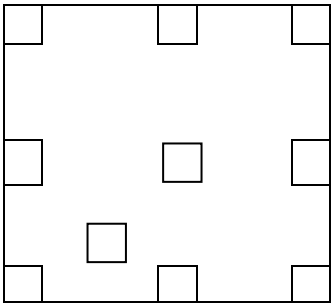
It is easier to distinguish old from new eggs masses in the fall, because the new ones are generally darker in colour. New egg masses are a tan to brown colour and firm to the touch. If pressed between two hard surfaces, or squeezed between two fingernails, new eggs always "pop." Old egg masses are usually bleached, chalky, and may be frail to the touch. In some cases, old egg masses, especially those on tree boles above the snow line,may be firm if the eggs did not survive the previous winter. However, old eggs do not usually "pop." Only count the new egg masses when doing your survey.

Step 4: Counting egg masses in the MKPs

The egg mass count consists of two separate counts, an **Above Ground Count**, and a **Ground Count**. The **Above Ground Count** includes all new egg masses found above the ground surface. This includes egg masses found on all parts of all the trees, shrubs, stumps, large rocks, branches, leaning sticks, etc. in the entire plot. A magnifying tool such as low power binoculars will help in seeing egg masses that are on high branches. Multiply this number by 100 to obtain the number of **egg masses/ha above the ground**.

The **Ground Count** is made using 10 mini-plots within the main plot. Each mini-plot is 1m x 1m. They are arranged in the main plot, one at each corner, one half way down

each side, one in the centre, and one at random, as shown below. Search carefully, counting the number of new egg masses found on the ground in each mini-plot. Then add up the number of egg masses from each mini-plot to find the **Ground Count**. Be sure to include all egg masses on the ground, under rocks, sticks, etc. Beware of hazards, such as poison ivy. Multiply the **Ground Count** by 1000 to obtain the number of **egg masses/ha on the ground**.



Add together the **egg masses/ha on the ground**, to the number of **egg masses/ha abovethe ground**. This final number gives you the **total number of egg masses/ha**.

Step 5: Interpreting the egg mass count

The MKP provides an estimate of the number of egg masses per hectare (EM/ha). This number can help you plan your management program. The more plots you do in the woodlot, the better idea you will have of the actual gypsy moth population. For example, the average number of EM/ha from 5 MKPs done in a 10ha woodlot should be a more accurate estimate than the result from 1 MKP in the woodlot. Generally, the more variable the gypsy moth population is in the woodlot, the more MKPs are needed to give a good forecast.

Predicting future gypsy moth defoliation is more accurate at the beginning of an infestation, than towards the end. Rates of parasitism and infection by pathogens (e.g. virus or fungi) typically increase the longer an infestation persists in a locale. When this happens, even high counts of egg masses may result in low defoliation the following season, because the parasites or pathogens have caused high gypsy moth mortality.

At the beginning of an infestation, an average of 1250 EM/ha generally indicates a population that will cause 40% or more defoliation the following growing season. Less than 40% defoliation is not readily visible to the untrained eye, and has minimal effect on tree health. Once defoliation exceeds 40% to 50%, defoliation is readily visible, and tree health can be adversely affected. Although trees usually re-foliate if they lose more than 50% of their foliage, this is an additional stress on the trees, and uses up their starch reserves for future growth.

If egg mass counts exceed 4000 EM/ha, the population is healthy (low parasitism and infection rates) and the egg masses are large (i.e. quarter size or larger, rather than dime size), defoliation greater than 50% should be expected. If the same healthy populations exist, and there are more than 10,000 EM/ha, 100% defoliation of susceptible trees can beexpected.

In most locations in Ontario, gypsy moth populations have not remained high for more than 2 or 3 years. High rates of parasitism, and the fungus *Entomophaga maimaiga*, have usually contributed to the population collapse. Nonetheless, tree impacts have occurred, including loss of aesthetic values, reduced tree growth, tree mortality, and increased vulnerability to other stresses such as drought and other insects (e.g. forest tent caterpillar). Tree mortality has been as high as 50%, and is considered to be associated with other stresses, particularly drought or poor site conditions.

Landowners considering forest pest management programs should contact their local Ministry of Natural Resources and Ministry of the Environment offices.

Appendix D

Five Tree Count Survey Methodology

This method, also known as the Modified MKP was developed by Bioforest (now Lallemand) to adapt the standards of the MKP to the constraints of sampling street trees in urban environments, such as the inaccessibility of private property. The adaptation is based on data indicating that there are on average five mature trees in a 0.1 ha MKP plot.

Materials Required:

-2 pairs of good quality binoculars
-Small Ruler
-Data Sheets
-Pencil
-Clipboard
-Mapping data with survey points (CVC crews used an ipad with points marked on the ArcGIS Collector app.)

Survey points are selected in advance using mapping software, adjusted as necessary on the ground to capture more mature trees or a better range of target species.

When scanning for egg masses only new egg masses are counted. Old egg masses are generally more bleached looking than newer tan-coloured masses. If the age of a mas is questionable, surveyors can try to pop the eggs between two hard surfaces or fingernails. If the eggs don't pop it is old if they do pop it is new. The appearance of a confirmed old mass on a particular tree can inform evaluation of egg masses out of reach.

Once the first tree is selected 2 surveyors systematically scan the tree for egg masses using binoculars while standing on opposite sides of the tree. To survey some larger trees coordination is required between surveyors to ensure egg masses are not counted twice.

For small to medium trees a surveyor can often remain in one place and scan the entire half of the tree from that vantage point but for larger trees it is usually necessary to change positions to completely scan the tree.

Egg masses within reach are measured using a small ruler. Site ID, tree species, number of egg masses found as well as the average egg mass size is recorded on a data sheet.

The process is repeated for the 4 closest street trees to the one initially surveyed (avoiding trees on private property) and the results are recorded.

This survey method is intended to be roughly equivalent to the MKP surveys in natural areas. The ground survey portion is omitted as the ground near street trees is usually tended lawn or asphalt, free of leaf litter, downed woody debris, and most other objects where LDD might deposit egg masses.

Since it is designed to mimic the MKP sample of a 0.01 ha area, the calculation for extrapolating the number of egg masses per hectare is identical, omitting the calculation for ground masses:

Total number of egg masses on 5 trees x 100 = Total number of egg masses/ha