

Report to Planning & Environment Committee

To: Chair and Members
Planning & Environment Committee

From: Kelly Scherr, P. Eng., MBA, FEC
Deputy City Manager, Environment & Infrastructure

Subject: 2022 *Lymantria dispar dispar* (LDD) Moth Proposed Management Plan

Date: March 7, 2022

Recommendation

That, on the recommendation of the Deputy City Manager, Environment & Infrastructure, the 2022 *Lymantria dispar dispar* (LDD) Moth* proposed management plan **BE RECEIVED** for information and the following actions **BE TAKEN** with respect to the provision of LDD aerial spraying services:

- a) The single source estimated price of 100,000 plus HST, pending further negotiation submitted by Zimmer Air Services Inc. to provide an aerial spraying service to control the spread of the LDD moth in select locations as outlined in the report below, **BE ACCEPTED**.
- b) The financing for the project **BE APPROVED** within existing budgets.
- c) Civic Administration **BE AUTHORIZED** to undertake all the administrative acts that are necessary in connection with this purchase; and
- d) Approval hereby given **BE CONDITIONAL** upon the Corporation entering a formal contract or having a purchase order, or contract record relating to the subject matter of this approval.

Executive Summary

Lymantria dispar dispar (LDD), formerly known as European gypsy moth (EGM), is a non-native, invasive forest pest that was introduced to North America from Europe in 1869. Note that staff will be using “LDD moth” on a go-forward basis.

LDD was first detected in Ontario in 1969 and has quickly spread across southern Ontario during the 1980’s. The Canadian Food Inspection Agency (CFIA) is responsible for preventing the introduction and spread of invasive pest species. LDD is, unfortunately, considered a well-established regional pest in southern Ontario.

The City of London Urban Forest Strategy (2014) includes taking action to ensure the effective management of invasive pest species that are harmful to trees under the main goal to “Maintain Better”. This report includes a summary of the work undertaken in 2021 and a proposed 2022 LDD Management Plan to mitigate the impact this species will have on forest health. Key components of the plan include ongoing monitoring of the pest’s density and health, management techniques and public communications. Due to the degree of the outbreak, Civic Administration is proposing, again, to apply *Bacillus Thuringiensis Subspecies Kurstaki* (BTK) at select locations on public land via aerial application. Civic administration carried out a targeted aerial application of BTK last year and in 2009 to manage LDD.

The provincial government regulates the sale, use, transportation, storage, and disposal of pesticides in Ontario. Ontario’s Pesticides Act and Ontario

Regulation 63/09 provide the province's framework to regulate pesticides to protect human health and the natural environment. To use BTK, Civic Administration must acquire the appropriate permits and approvals from both federal and provincial regulatory authorities such as Transport Canada and the Ministry of the Environment, Conservation and Parks. Information that is submitted as part of the approvals process includes a review of the proposed locations (site and size), road and park closure plans, and a BTK aerial application public notification plan. These approvals, the communications plan associated with the strategy, and interactions with the Middlesex London Health Unit, will be used to inform the public about the aerial sprayings.

*

Linkage to the Corporate Strategic Plan

Municipal Council's 2019-2023 Strategic Plan identifies "Building a Sustainable City" and "Leading in Public Service" as strategic areas of focus. The management of invasive species contributes to a Sustainable City by protecting our urban forest and helps respond to on-going public concern regarding the current outbreak.

Analysis

1.0 Background Information

1.1 Previous Reports Related to this Matter

Planning & Environment Committee (February 8, 2021) 2021 European Gypsy Moth (EGM) Proposed Management Plan

Planning & Environment Committee (July 14, 2008) Gypsy Moth Infestation

2.0 Discussion and Considerations

2.1 LDD Impacts on Forest Health

LDD is a problematic pest as the caterpillar (larva) stage feeds aggressively on a wide range of trees. LDD affects many types of trees, but it prefers oaks, maples, basswood, white birch, and willow. Many of these types of trees are in parks, along streets and in woodlands. However, oak trees are particularly favored by the pest and can have a significant affect on them.

Each LDD caterpillar can eat up to one square meter of leaf area. During major outbreaks there can be hundreds to thousands of caterpillars feeding on a single tree causing major defoliation (loss of tree leaves and canopy). Healthy, mature trees can tolerate a few seasons of minor defoliation, but ongoing infestations can result in the loss of major branches and/or kill the entire tree. How a tree will respond to LDD defoliation depends on the amount of foliage removed, timing in the growing season, and the current health and condition of the tree.

Trees rarely die due to one factor and normally die from a combination of events. LDD defoliation can make trees more susceptible to other impacts such as pests, disease, and drought. Conifer trees (evergreens like pine, spruce) can die after one major defoliation event. Keeping the urban forest healthy and resilient will make it better prepared to respond to changing environmental conditions and opportunistic pests and diseases.

The LDD caterpillar can have negative impacts on the enjoyment and use of forested areas such as parks, woodlands and even tree lined streets and sidewalks. Concerns from residents have been received regarding impacts to their health in the form of rashes attributed to LDD. The hairs of the LDD caterpillar can result in mild to moderate cases of contact dermatitis.

The LDD peak outbreak cycle occurs approximately every eight to ten years. Although very disruptive, the caterpillar stage lasts four to six weeks with major outbreaks collapsing two to four years after peaking due to natural factors.

2.2 Regional Trends LDD Population Density and Movement Trends

Forecasting pest populations is very challenging. LDD is particularly challenging to manage as it responds to a combination of natural factors such as the presence of fungus, virus, and predators in the environment. Over the past three years, there has been a noticeable increase in the LDD pest population and associated negative impacts such as tree defoliation. This trend is not unique to London as it has been documented across the entire southern region of Ontario. In London, it has been observed that the pest is also moving from known established areas to new ones.

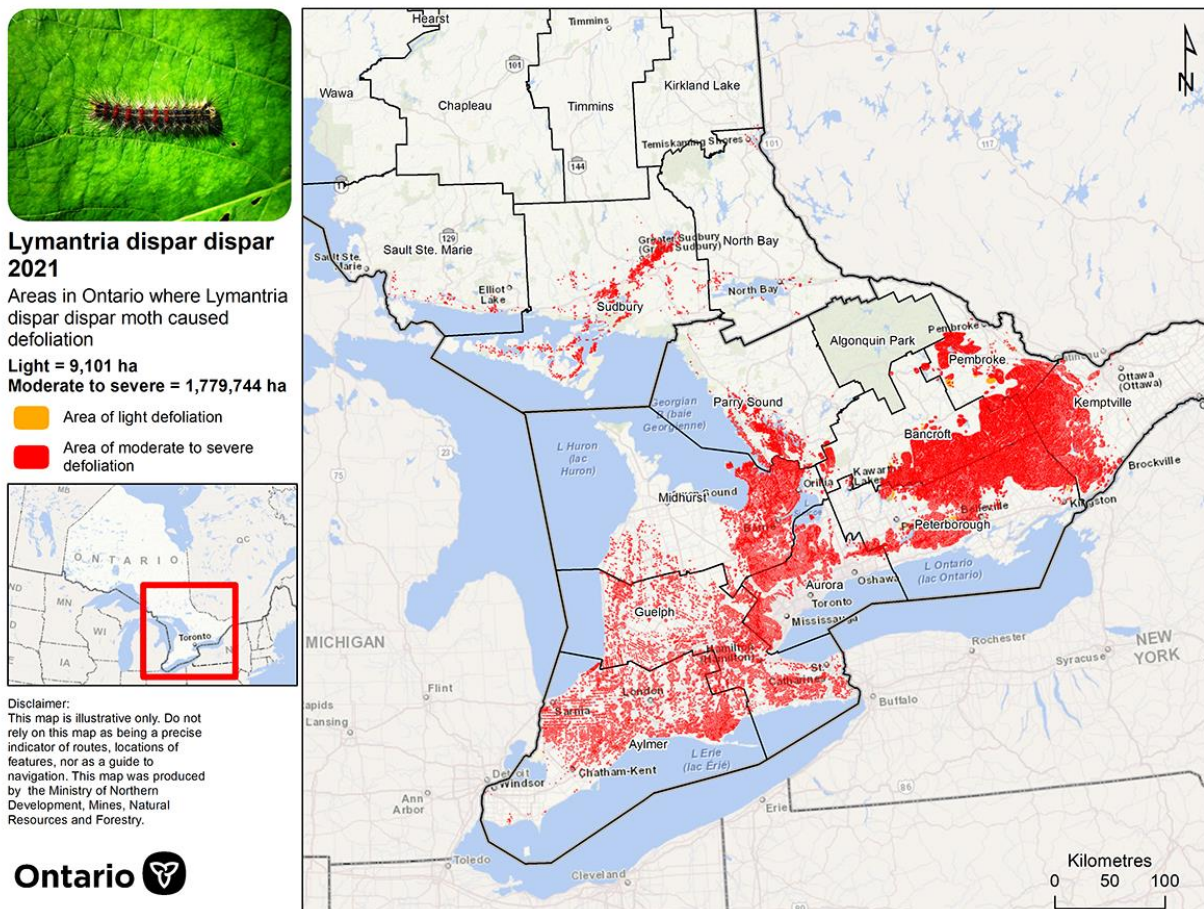


Figure 1. Defoliation caused by LDD moth in Ontario increased from 586,385 hectares in 2020 to almost 1.8 million hectares in 2021.

Moderate to Severe Defoliation Southern Region

- 2019 Defoliation - 43,158 ha
- 2020 Defoliation - 569,384 ha
- 2021 Defoliation - 1,779,744 ha

2.3 Summary of Consultant Data Collection & Surveys

Civic Administration has contracted BioForest Technologies Incorporated. to assist with implementing a LDD monitoring program. The consultant adapted two standard forest methodologies to measure LDD populations in an urban environment to establish fixed-area plots.

Fixed Area Plots

In 2019 1,158 fixed-area plots were established and data was collected from thousands of trees. A key consideration in the location of the plots was the presence of oak trees. In 2020, 22 new streets and 12 new parks were added to the monitoring program. Associated data plots were also added due to increasing and more widespread populations. These added data plots were chosen based on LDD complaints and were areas known to have concentrated oak stands. The plots were also strategic locations that would help determine if LDD was moving into new locations.

In 2021, plots were removed from parks with two (2) consecutive years of no actual defoliation, and from parks where no egg masses were recorded in 2020. The four (4) parks meeting these requirements were Byron View Park, Hyde Park Woods, Jorgenson Park, and Killaly Meadows. Seven (7) street plots with two (2) consecutive years of no actual defoliation within Byron were removed. These locations were found to have few oak trees and the resources for these locations were allocated elsewhere.

Forest Hill Park, which is a new and growing outbreak, and the surrounding area streets were added to the monitoring program.

A general summary of the 2021 egg mass surveys included the following:

- 60 existing street plots
- 10 new street plots
- 19 existing parks
- 1 new park

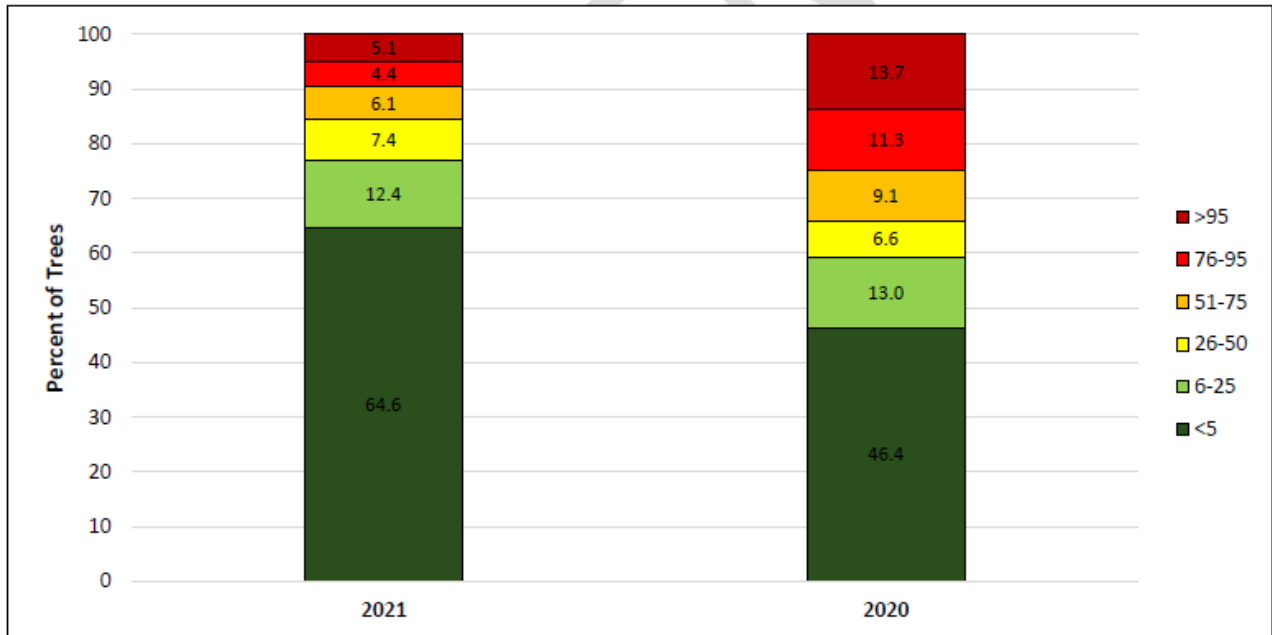
Major Findings Defoliation & Egg Mass Studies

In 2021, BioForest Technologies Incorporated completed one defoliation study in July, one egg mass survey in late November and another egg mass survey in early December. Overall actual defoliation in 2021 was lower than forecasted in most areas surveyed, but there is a new location in the northeast where the outbreak is new and growing. Previously surveyed areas indicated that we are in year three (3) or four (4) of the peak outbreaks.

Park Trees

All parks that were aerially sprayed in the spring of 2021—Crestwood Woods, Fairmont Park, Grand View Park, Griffith Street Park and Somerset Woods—recorded much lower levels of defoliation than forecasted. This confirms that the aerial spray program was successful in mitigating defoliation within these parks as most saw less than 25% defoliation.

Chart 1. Comparison of Actual Defoliation in Park Trees 2020 versus 2021



Somerset Woods and Fairmont Park, while sprayed, did not fair as well as the other parks. In Somerset Park this may be due to the adjacent forested areas and the park's narrow shape which can be a challenge for aerial spraying. In Fairmont Park the density of the pest, the highest in the City, was likely so significant that one aerial spray application was not as effective.

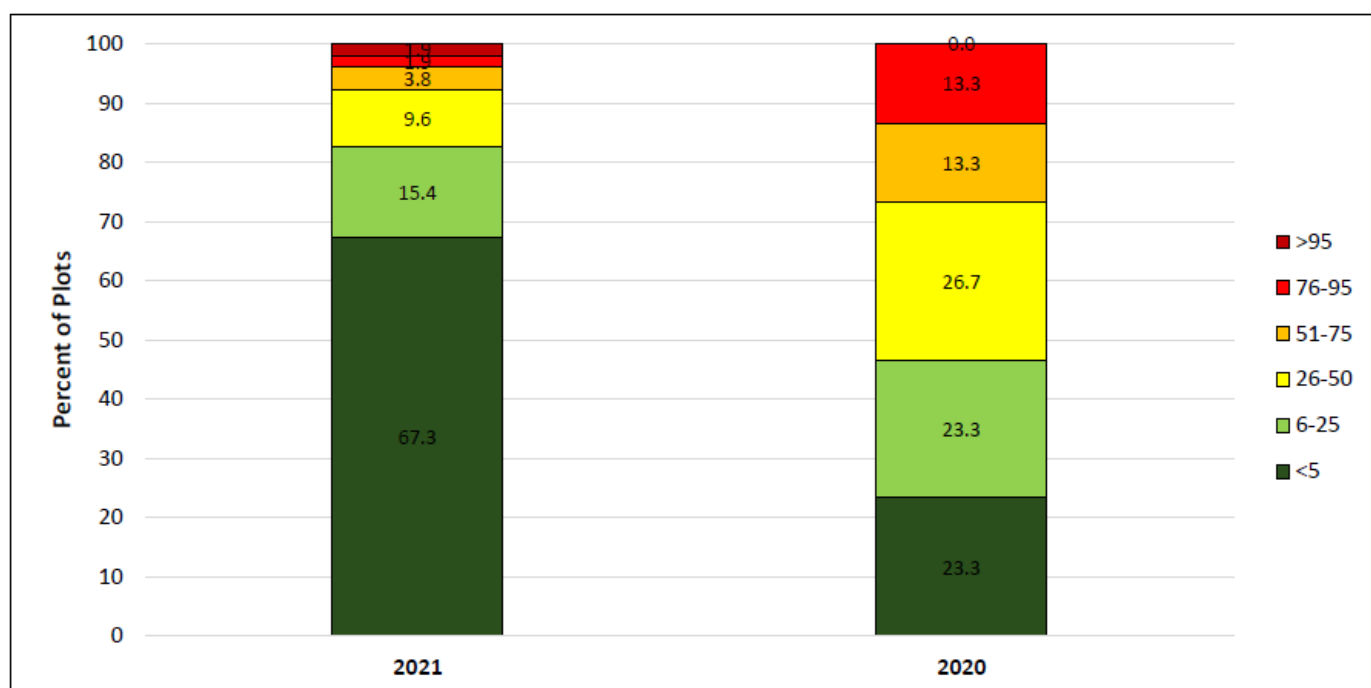
Chart 2. Defoliation Trend of Aerial Sprayed Parks

#	Location	2020 Actual Defoliation	2020 Egg Masses/Ha	2021 Defoliation Forecast	2021 Defoliation Actual
1	Fairmont Park	Severe	272,033	Severe	Severe
2	Grand View Park	Severe	18,425	Severe	Light
3	Griffith Street Park	Severe	47,633	Severe	Light
4	Crestwood Woods	Severe	29,600	Severe	Light
5	Somerset Woods	Severe	15,100	Severe	Moderate - Severe

Street Trees

Street trees that were part of the LDD Program fared very well. Forestry Operations performed egg mass scrapings for approximately 1,250 street trees with varying level of infestation. These scrapings took place over the month of January using both skilled forestry employees and contractor services with specialized equipment for larger trees. As noted in the chart below the overall defoliation of street trees in 2020 moved from 53% that were experiencing moderate to severe defoliation to 17.2% in 2021. This is a significant improvement in health and condition.

Chart 3. Comparison of Actual Defoliation in Street Trees 2020 versus 2021



Egg Mass Size & Numbers

Egg mass size is a key indicator of the health of the LDD Moth population. Surveys were conducted in late November early December during leaf-off seasons so that the egg masses could be viewed unobstructed. In 2020, 74% of the masses were classified as “large” and the average size of the egg masses was 31.3 mm. The average egg mass size classified as “large” is 500 egg masses per tree at 25 mm or greater. This was the case in both 2019 and 2020. This indicated a healthy, growing, stable population of the pest. In 2021, 57% of all new egg masses were classified as “large” at 26.7mm. This is an overall reduction in both statistics for last year.

However, this included the new Forest Hill Park area where a new outbreak has been established. Ninety percent (90%) of the egg masses were large and had an egg mass size of 34.4 mm which indicates a healthy, stable, and growing population.

In prior plots that were being tracked—Byron, Fairmont, and Oakridge communities—only 52% of the egg masses are large with an average size of 25.4 mm.

This year, for the first time, new egg masses versus old were tracked. It is important to track new egg masses and compare them to old egg masses to evaluate risk of defoliation. Less than 25% of old egg masses indicate a healthy LDD moth population and indicate an outbreak is developing. In 2021, 66% of all egg masses were new. Byron had the lowest percentage of new masses at 50%, while Fairmont had the highest at 87%. Byron’s low percentage and smaller than average new egg mass size suggest that the population here may have reached its peak and is now beginning to

decline and collapse. The other locations are less conclusive. This measure will continue to be tracked.

2.4 Proposed LDD 2022 Management Plan

Based on the past two years of experience managing the LDD moth, Civic Administration has decided to continue to implement an Integrated Pest Management (IPM) approach to manage LDD on public lands. This means using different management techniques, sometimes at the same time, starting with solutions which result in the lowest risk to the environment to address the pest population. IPM techniques focus on methods that interrupt the pest's life cycle earlier and often because such efforts tend to be more successful in managing the pest. The goal of the LDD management program is not to try to eliminate the pest but to get its population back to tolerable levels where forest health can recover, and natural controls can collapse the population.

The following strategies will be implemented in the LDD Management Plan:

A Comprehensive Communications Plan

Communication and education are powerful tools in any pest management program. In 2021, a Get Involved web page was created to keep residents up to date on LDD management techniques and the aerial spray timing. It was one of the tools residents used when identifying the new outbreak in Forest Hill Park. In addition, Civic Administration hosted two virtual meetings on the topic and helped create brochures for distribution in communities affected. Information will continue to be shared on the City website and promoted through social media.

Civic Administration will continue to promote the following management techniques that will coincide with the specific LDD life-cycle stages:

- Manually removing egg masses and cocoons from trees;
- Wrapping burlap around tree trunks to trap caterpillars;
- Consulting with a licensed professional to apply biopesticides or tree injections and providing contact information of companies that perform this type of work; and,
- Encouraging other best practices such as keeping trees healthy and not moving firewood.

Civic Administration will not be recommending applying “sticky tape” as a method to manage LDD due to risk to birds, mammals, and reptiles. As caterpillars move up and down the tree, they become trapped in the tape. In particular, the trapped insects become an attraction for birds, and they too can become trapped or subject to harm.

Manual Removal and Scraping of Egg Masses from City Trees

This year Civic Administration will target 45 streets in the following areas that are forecasted to be severely defoliated in 2021:

- Sunningdale Rd E/ Forest Hill Woods (new)
- Somerset Park (revisit)
- Oakridge/Sanatorium Road (revisit and new streets added)
- Hamilton Rd/Fairmont Park (revisit and new streets added)
- Byron area streets will be removed

Aerial Application of *Bacillus Thuringiensis Kurstaki* (BTK) in Select City Parks

Civic Administration is proposing again to use *Bacillus Thuringiensis Kurstaki* (BTK) in combination with the other management techniques. BTK is the primary pest control product recommended for LDD control. Health Canada identifies that BTK is a

bacterium found naturally in soils. It is a selective biopesticide that works only against a group of insects called lepidopterans, which includes LDD. BTK only becomes toxic in the alkaline gut of specific lepidopteran insects in the larval (caterpillar) stage of their life cycles. Because of this characteristic, it does not affect adult moths and butterflies, other insects, honeybees, fish, birds, or mammals.

Last year, Civic Administration recommended a single aerial spray application to reduce the risk of overlapping with the life cycles of other Lepidoptera (moths and butterflies) and the monarch butterfly that occur later in the season. However, based on the results in Somerset Woods and Fairmont Park, the standard two spray application is being recommended to help trees survive the current outbreak and associated defoliation. It was noted during the 2021 aerial application that it was early in the season and the primary habitat, milkweed, for the butterfly had not yet emerged. The 2022 spraying schedule will again be established [SK1] to minimize impacts on other species that can also be vulnerable to BTK in their larval stage.

Zimmer Air Single Source

Administration is asking for a single source approval of Zimmer Air Services Inc. to provide the aerial spraying service as per 14.4 (e) and (k) of the City of London Procurement Policy. Zimmer Air Services inc. provides the special knowledge, skills, expertise, equipment and experience to provide the service. Due to the increased spread of the LDD moth across southern Ontario, aerial spraying service providers are in short supply.

The initial list of locations identified in the chart below were considered and identified for aerial application approvals based on outbreak levels, mature oak tree stands and forecasted defoliation.

Chart 4. List of Proposed Btk Aerial Spray Locations

#	Location	Rational	2022 Defoliation Forecast
1	Fairmont Park	3 or 4 years of > 90% defoliation	Severe
2	Somerset Wood	3 or 4 years of > 80% defoliation	Moderate - Severe
3	Forest Hills Woods	New outbreak with growing and healthy insect populations	Severe
4	Springbank Park	3 or 4 year of > 80% defoliation; major oak stand; TBD	Severe
5	Thames Valley Golf Course	3 or 4 year of > 80% defoliation; major oak stands	Severe

BTK is a naturally occurring, widely distributed organism in the natural environment. However, because of the policy context associated with Environmentally Significant Areas (ESAs), ESA forests will be avoided in this current program.

LDD Populations Will Eventually Collapse Due to Natural Factors

In 2021, BioForest crews observed natural controls such as a small number of caterpillars affected by *E. maimaiga* fungus and NPV virus during the defoliation surveys. Caterpillars were noted characteristically hanging from the trunk of trees in an inverted “V” fashion (NPV). Egg mass predators were also observed during the egg mass surveys. Natural factors will ultimately cause LDD to collapse. This collapse normally follows two to four years after the peak pest populations. Some of the natural factors leading to the collapse include the following:

- Virus NPR (Nucleopolyhedrosis) which establishes when the LDD population is at high density. This virus has been observed throughout London over the past two years and has the largest impact on collapsing the LDD population.
- Fungus (Entomophage maimaiga) requires a cool wet spring but kills LDD caterpillars at any density.

- Winters with extended cold temperatures less than -20° C and with a lack of snow will kill egg masses.

Financial Impact/Considerations

There are no direct financial or resource implications associated with the 2022 LDD Management Plan. The plan described herein can be supported within existing budget.

Key Issues and Considerations

BTK Information

Health Canada's Pest Management Regulatory Agency (PMRA) is responsible for ensuring the human health and environmental safety of all pest control products prior to their approval for use in Canada. Pesticide manufacturers must provide a full analysis of the product formulation, as well as extensive health and environmental data, so that a risk assessment can be carried out by Pest Management Regulatory Agency scientists. Only products that are scientifically reviewed and found to be effective and safe for use with minimal risk to human health and the environment are registered by the PMRA. In Canada, the PMRA has classified all BTK products registered for use in forests, woodlands, and residential areas as "restricted". Restricted class products require special permits or licensing from the provincial regulatory authority.

The federal government Health Canada [website factsheet](#) states that BTK poses little threat to human health, either through handling products directly or through indirect exposure such as during a spray program. Health Canada identifies that BTK strains have been used by both organic and non-organic farmers throughout the world for many years. It is one of the few pesticides acceptable to organic growers as it is a naturally occurring biological organism rather than a synthetic chemical. BTK is a bacterium found naturally in soils. BTK only becomes toxic in the alkaline gut of specific lepidopteran insects in the larval (caterpillar) stage of their life cycles. [SK2]

Civic Administration reached out again in 2022 to the Middlesex London Health Unit to seek their opinion on the aerial application of BTK. They in turn contacted Public Health Ontario whose role is "to provide scientific evidence and expert guidance that shapes policies and practices for a healthier Ontario". Their role includes pesticide use. The letter has been included as an attachment.

BTK Aerial Application Notification Plan

The aerial application of BTK must have a robust notification plan in place. This plan will be submitted to the Ministry of the Environment, Conservation and Parks for their approval. Notification is expected to be through social media and web based. All adjacent properties will be directly mailed notification letters and signage will be posted. A comprehensive communications plan will be created to inform Londoners and comply with all notification and logistical processes as required for the safe application of BTK.

Conclusion

Although it appears that in some locations in the City, LDD moth populations are collapsing, in other locations they are just getting established. Civic administration will continue to monitor the LDD moth pest population and manage it to mitigate the current ongoing risk to the health of the urban forest.

Civic Administration has reviewed consultant data and verified findings in the affected areas. The recommended 2022 LDD Management Plan, based on IPM principles, will include a communication plan, egg mass scraping, and aerial applications of BTK at selected sites to reduce the spread of LDD in the London. Liaison with the Middlesex London Health Unit and provincial and federal approval agencies are included in this program.

Prepared by: Jill-Anne Spence, Manager, Urban Forestry

Submitted by: Scott Stafford, Director, Parks and Forestry

Recommended by: Kelly Scherr, P.Eng., MBA, FEC
Deputy City Manager, Environment and
Infrastructure

[SK3]