



## Staff Report for Council Meeting

Date of Meeting: July 7, 2021

Report Number: SRCS.21.13

Department: Community Services  
Division: Public Works Operation

**Subject: SRCR.21.13 - LDD (European gypsy moth) management options and recommendations**

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### Purpose:

To provide Council with information, options and recommendations for addressing European gypsy moth (*Lymantria dispar dispar*) in Richmond Hill.

### Recommendation(s):

- a) That Staff Report SRCS.21.13 be received.
- b) That staff be directed to continue current LDD moth management methods already underway including egg mass removals, TreeAzin® injections of select trees, manual spread of NPV virus, watering during dry periods, street sweeping, monitoring and public education.
- c) That staff be directed to include a budget request of \$109,000 for consideration as part of the 2022 operating budget to support new and/or expanded LDD moth management methods including expanded manual removal of egg masses, distribution of resident burlap trap kits, expanded street and sidewalk sweeping and expanded public education resources.

### Contact Person:

Ann Marie Farrugia, Manager of Park Operations, Extension 5509

### Report Approval:

**Submitted by:** Darlene Joslin, Commissioner of Community Services

**Approved by:** MaryAnn Dempster, City Manager

All reports are electronically reviewed and/or approved by the Division Director, Treasurer (as required), City Solicitor (as required), Commissioner, and City Manager. Details of the reports approval are attached.

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### Background:

In response to a Council motion brought forward on June 23, this report has been prepared to provide information, management options and recommendations for how the City should continue to respond to the LDD moth outbreak, (previously known as gypsy moth) that is currently being experienced in Richmond Hill.

LDD is an invasive moth species whose caterpillars are responsible for defoliation of common tree species in North America such as oak, aspen and birch. LDD moth outbreaks generally last 3 to 4 years and are cyclical in nature, occurring every 7 to 10 years. First detected in Ontario in 1969, severe outbreaks have occurred in 1991, 2002, and 2008, with the most recent outbreak in 2020 and 2021. Although healthy trees can withstand repeated years of defoliation (generally up to 4 years), each LDD caterpillar can eat up to one square meter of leaf area resulting in mass defoliation during outbreak periods.

During this recent outbreak, the Ministry of Natural Resources and Forestry observed 586,385 ha of defoliation by LDD across Ontario in 2020 – almost 12 times the area defoliated in the previous year. In 2020, York Region undertook an LDD egg mass survey to assess and forecast potential defoliation by the LDD caterpillar in 2021. Map 1 shows the forecasted severity across Richmond Hill. The majority of egg masses discovered within Richmond Hill forest plots were concentrated to Twickenham Park and to TRCA-managed woodlands north of Stouffville Road and in the Oak Ridges Corridor Conservation Reserve (ORCCR). The majority of egg masses within roadway plots were found along Bayview Avenue, Stouffville Road and Forest Ridge Road. Additional refined in-house monitoring and tracking conducted by City staff have identified more than 7,900 street and park trees (79 streets and 39 parks) and approximately 240 ha of municipally owned woodlands and natural areas impacted by LDD throughout the City. Map 2 provides a representation of these areas and generally demonstrates the widespread impact of LDD within the City ranging from street trees, park trees, large and small wooded areas. The map also shows the disparity between how much land the City owns with LDD and the lands owned by others where LDD is also present. As such, approaches employed to control LDD will be complex and would require a coordinated effort among all land owners to be successful, which may not be feasible.

As experienced in 2020 and 2021, LDD outbreaks are triggered by warm winters and hot dry spring and summer months. A series of natural factors, however, can cause an LDD population collapse including: cold winter temperatures (<-20°C), heightened tree defenses (i.e. development of tougher leaves and less nutrients), competition for food, predation and parasitism, and two naturally occurring diseases - NPV (nucleopolyhedrosis virus) and an introduced fungus (entomophaga maimaiga). NPV is a virus and one of the most important factors in the collapse of LDD outbreaks in North America. NPV spreads naturally when caterpillars are abundant regardless of climatic conditions; its presence has recently been detected in York Region including Richmond Hill. The fungus is dependent on cool wet weather to facilitate the spread of fungal

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spores. Both of these naturally occurring diseases result in mass mortality of LDD larva and support the known cyclical nature of LDD outbreaks.

The LDD moth has four distinct developmental stages in its life cycle similar to other butterflies and moths. Several management options for LDD described in this report are only effective and timed during specific life cycle stages.

### **Egg (Late August to early May)**

- Dormant stage (easiest to manage)
- Egg masses range in size from 2-8 cm long and can contain between 100-1000 eggs
- Egg masses are usually oval shaped and beige/light brown in colour
- Often found on tree trunks and the underside of larger branches

### **Caterpillar (Early May to mid-July)**

- Tree damaging stage
- Newly hatched caterpillars are about half a centimetre long and dark in colour. As they grow, they change colour becoming dark coloured and hairy with a double row of five pairs of blue spots followed by a double row of six pairs of red spots, down the back
- Caterpillars can be found feeding on the leaves of trees since this is their main food source

### **Cocoon (Mid July to early August)**

- Stage lasts for 10 to 14 days
- Once the adult moth emerges, it leaves the empty cocoon behind which can be seen on infested trees

### **Moth (Late July to late August)**

- Stage lasts 10 days
- An adult LDD moth's only function is to reproduce and not eat anything, unlike other moth and butterfly species
- Female is larger, white and cannot fly
- Male is smaller, brown and is attracted to pheromones produced by female moths

## **What are we doing?**

Richmond Hill manages its urban tree canopy using a holistic Plant Health Care (PHC) approach to care for all trees, shrubs and herbaceous plants, with a goal of improving and maintaining their health. A true PHC program draws from different strategies including cultural, biological and pest/disease control treatments. As such,

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City staff have employed a multi-pronged approach for responding to the anticipated presence and impact of LDD within the City using existing resources and staffing. These include:

***Participation in Regional Urban Forestry Forum, collaboration and communication*** - Several Richmond Hill staff members participate in a York Region-lead inter-municipal working group. Through this forum staff across all nine Regional municipalities, Toronto Region and Conservation Authority and the City of Toronto have been meeting and sharing urban forestry-related information, knowledge, best practices and measures including what has been employed to manage LDD outbreaks that have been experienced across the entire region.

***Inter-departmental Urban Forest Working Group*** - Lead by Planning and Infrastructure Department staff, City staff meet on a regular basis to discuss and collaborate on cross-corporate urban forestry related issues such as implementation of the Urban Forest Management Plan, the EAB Management Strategy and development of planting standards and guidelines etc. Over the last year, this team of staff have been working together developing and implementing tactics to respond to the LDD outbreak.

***Egg mass removals*** - In response to the York Region egg mass study results that were received by the City early in 2021 (February), urban forestry staff quickly mobilized to begin egg mass removals on City trees during the winter months. In consultation with counterparts at the City of Toronto who have experience conducting egg mass removals, two battery powered backpack vacuum cleaners were purchased to remove LDD egg masses on trees in the most severely impacted neighbourhoods. In addition, when snow clearing activities were not taking place, windrow staff were tasked with scraping egg masses in parks and along trails in natural areas. In total, City staff removed and destroyed 65,281 egg masses from trees on streets and in parks. With each egg mass containing approximately 500 eggs, City staff prevented 32,640,500 caterpillars from impacting City trees and spreading in the community.

***TreeAzin® Injections*** - In the spring of 2021, 94 large oak trees in Phillips Park were treated with TreeAzin® as a pilot. TreeAzin® is a botanical injectable pesticide formulated with an extract of neem tree seeds. The pesticide has been used by the City to manage the impact of Emerald Asher Borer on City-owned ash trees for the last 10 years. The chemical provides a treated tree with effective protection against a variety of insects including LDD. When a caterpillar eats the leaves of a treated tree, the pesticide kills the insect by preventing it from growing any larger. This limits the amount of damage to the tree. Significant/high value trees are generally selected for this treatment. The timing of treatments is critical for the successful control of LDD, with injections occurring in late April prior to when caterpillars emerge. Recent observations of the treated trees in Phillips Park have demonstrated that the treatments have been effective in preventing severe defoliation from the LDD caterpillars.

***Communications*** - The City's LDD moth communications strategy aims to educate the community about LDD, what the City is doing to manage trees on public property and

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what residents can do for the trees on their property. Numerous communication tactics have been used to share this information including a webpage with online resources at [RichmondHill.ca/LDDMoth](http://RichmondHill.ca/LDDMoth), Council email updates (winter and spring), the Access Richmond Hill contact centre, a notification letter to residents in hot spots, a story in *The Liberal* (May), a fact sheet, social media posts, a video highlighting management of City trees, as well as stories in the City's myRichmondHill e-Newsletter (May) and the City-wide hard copy spring newsletter.

**Manual spread of NPV virus** - In recent weeks the NPV virus has been observed in LDD populations throughout the Region with a significant presence observed in Newmarket. In an effort to facilitate the spread of this virus across the Region, City staff were invited to collect infected caterpillar samples from Newmarket so that they can be introduced in other areas throughout the Region in an effort to accelerate the collapse. City staff were successful in collecting and spreading infected NPV caterpillars on City trees with a focus on street tree populations. Although there is not a lot evidence to support this practice, there is support from the scientific community to pilot these types of measures.

**Watering** - Although several years of defoliation can cause stress to impacted trees, most trees do not sustain long-term damage from LDD and will regrow their canopy within the season. In order to ensure trees stay healthy and can recover quickly, City staff are watering urban street trees on a regular basis, particularly during hotter summer months as urban conditions tend to be harsher environments for tree growth. Residents have been encouraged to do the same on their own properties through our communication efforts.

**Street and sidewalk sweeping** - During the height of the caterpillar stage, City staff completed street and sidewalks sweeping to address concerns in some of the hardest impacted streets where a build-up of caterpillar frass (droppings/feces) accumulated and created unsightly conditions.

## Other Management Tactics for Consideration

### Option 1 - Spraying

In Canada, Btk (*Bacillus thuringiensis*) bacterium spray treatment has been used to control LDD on trees after egg hatch, as it is only poisonous to the larvae (caterpillars). [Health Canada](#) identifies Btk as a natural biological-based insecticide derived from bacteria naturally found in soil. It is used in agriculture and is rated for organic farming since it is biological in nature.

Btk crystals and water are combined to create a solution that can be sprayed on infected trees. These crystals accumulate on leaves which are then consumed by the caterpillar. Btk mainly affects organisms that have an alkaline stomach. Many insect species have alkaline stomachs where the toxic protein molecules from Btk can become activated and break down the walls of the insect's stomach causing sepsis and death. Humans and mammals are unaffected by the Btk due to the acidic conditions within

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their stomachs which prevents the activation of Btk toxins. Btk, however, can affect other insect species that have a similar cyclical life cycle and contain a larval feeding and intense growth stage i.e. other moth and butterfly species.

For Btk to be most effective, it is usually applied to infested areas more than once. Btk breaks down in the environment very quickly, in three to seven days and faster with sunlight. The caterpillars must be in an early larval stage for the Btk to work, and not all caterpillars hatch at the same time. For maximum efficacy, two rounds of spraying are recommended, approximately 10 days apart. Btk is estimated to kill 60-80% of the treated population, which means 20-40% of caterpillars are not effected by the treatment. Also, repopulation of treated areas is possible as caterpillars from untreated areas can travel up to 200m especially when food sources are depleted.

Since Btk is only effective during the larval caterpillar phase, it will not be an effective management tool for this year (2021) as they begin to enter the cocoon phase. The next opportunity for the application of Btk would be in spring of 2022.

As with any type of pesticide usage, the City will need to be prepared to deal with real and perceived risks associated with spraying. This can be very controversial, especially when spraying large areas including publicly accessible areas like woodlands with trails and public parks. Also, any homes or private lands adjacent to where spraying is taking place may be exposed to spray drift, which may or may not be acceptable to the general public. It should be noted that there has been controversy related to any aerial spraying of insecticides. Although studies have noted that BTK causes few adverse effects, people can be exposed to BTK by breathing in the bacteria while it is being sprayed, by ingesting it after touching sprayed objects or by eating food that may have been exposed to overspray. For this reason, spraying of BTK could give rise to resident complaints ranging from allegations of damage to plants and gardens and possible health related issues.

There are two forms of spray treatments which can be utilized in different situations:

### ***Aerial Spray***

For larger wooded areas, aerial spray is the most effective way to manage LDD outbreaks due to inhibited access to very tall and concentrated tree stands by ground. In Southern Ontario, there is only one contractor that provides aerial spray services which is conducted using a helicopter. Securing the services of this contractor must be completed prior to March of the treatment year and pesticide applications are dependent on weather conditions as high wind and rain must be avoided.

In order to conduct an aerial spray in an urban area such as Richmond Hill, an extensive Transport Canada risk assessment and approval process must be prepared and approved. These plans must include application and timing restrictions, aircraft type restrictions, pesticide product restrictions, personnel requirements, public consultation, and notification to residents among other requirements.

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Municipalities in the GTA who have conducted aerial sprays of public land in 2021 include Burlington, London and Oakville. Toronto and Mississauga did not conduct spraying this year but have in the past. All sprays within the municipalities have taken place on public lands and were confined to a few discrete areas such as woodlands and parks. Toronto and Region Conservation Authority also conducted sprays in conservation Parks in 2021 where camping and recreational activities such as Treetop Trekking take place.

**Cost:** An aerial spray program would be considered a new level of service for the City which would require dedicated funding and staffing. The estimated cost to conduct an aerial spray in Richmond Hill would be approximately \$303,000 (based on 2021 pricing, subject to change and availability). This would include spraying 240 ha of woodland in multiple locations throughout the City where outbreaks of LDD have been observed including Twickenham Park, Phillips Park, TransRichmond Trail, Moraine Park, Mill Pond Park and others. This cost also includes funds for signage and other communication requirements, contracted staff and truck rental to coordinate and oversee the program.

### ***Ground Spray***

To complement an aerial spraying for wooded areas, ground spraying would be the appropriate option for City street and park trees as the trees are spread apart and can be targeted to avoid unintended spray drift onto other properties and surfaces. This type of spraying would be delivered using a contracted service where Btk would be applied using a hand held or boom truck applicator by a licensed exterminator to spray each tree.

Several municipalities have conducted ground spraying of trees in 2021, however most have been on a small scale to target specific trees and areas. These include Mississauga, Brampton, Hamilton, London, Oakville and Toronto.

**Costs:** A ground spraying program would be considered a new level of service for the City which would require dedicated funding and staffing. The estimated cost would be approximately \$1,615,000. The cost includes treatment of approximately 7900 trees (\$200/tree) plus communications materials, a staffing resource and rental truck to coordinate and oversee the program. Note, due to the scale and number of impacted trees that would be required to treat using this method, securement of contractor to complete the work in the narrow treatment timeframe may not be feasible.

### **Option 2 - Tree injection**

An alternative to ground spraying treatment can be applied through tree injection using TreeAzin<sup>®</sup>, which is similar to the approach that has been taken to manage emerald ash borer within the City (Note this would not be feasible for forested areas). This is a method already accepted by our community for managing invasive pests and the risk of exposure is far less, as the pesticide is injected into the base of the tree by a licensed operator and degrades naturally within tree tissues. Treatment is required once per

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growing season and occurs just after trees leaf out. When caterpillars eat leaves that contain the insecticide, it kills the caterpillars. As such, caterpillars will not grow to their largest and most damaging size.

York Region, Mississauga and Toronto treated trees with TreeAzin® in 2021. Treatments were conducted on streets and in City parks including more susceptible trees such as conifers which cannot regrow their needles at the same rate as deciduous trees can with their leaves. A limited number of significant, high value and/or more vulnerable trees are generally selected for this treatment.

Cost: Although City staff have treated high value trees as a pilot in 2021, the extent of treating all impacted street and park trees (approximately 7900 trees) would be a considered a new level of service for the City requiring dedicated funding and staffing. The estimated cost would be approximately \$1,615,000. The cost includes injection of approximately 6000 trees (\$200/tree) plus communications materials and a staffing resource and rental truck required to coordinate and oversee the program. Again note, due to the scale and number of impacted trees that would require treatment using this method, securing of contractor to complete the work in the narrow treatment timeframe may not be feasible.

### **Option 3 – Expand egg mass removals**

The manual removal of egg masses from impacted trees is a known method for addressing LDD, particularly because each egg mass can contain anywhere between 100 to 1000 caterpillar eggs. This activity can begin as early as September once the moths have finished laying eggs. Currently, City staff have two battery powered backpack vacuum cleaners to do this work. During the fall and winter months of 2021/2022, Parks staff that are not engaged in winter activities such as the windrow program, can complete vacuuming and scraping on streets and in parks until caterpillars emerge in April 2022. In comparison, removals began this year in mid-March and continued until the end of April.

Cost: The estimated cost for this activity would be approximately \$9,000. The cost includes the cost for two additional backpack vacuums and batteries to maximize efforts plus a rental truck to deliver the program.

### **Option 4 – Resident burlap kit**

A common method used to minimize the impacts of LDD is the installation of burlap traps around the trunk of the trees at chest height. These traps are secured with a string or rope in the centre with the top half folded over the bottom half which provides a cool place for caterpillars to hide from the midday heat and makes them easier to collect and dispose of. Caterpillars can be picked off by hand on a daily basis in late spring and into the summer. Burlap traps also have been found to promote spread of the NPV virus when the caterpillars accumulate in large numbers within the trap.



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Newmarket and Aurora distributed burlap banding kits to homeowners this spring as a way to engage residents and help manage LDD on residential properties and/or on City street trees. An LDD burlap kit initiative would be an effective way of engaging and educating residents about LDD and will aid in minimizing damage and controlling spread.

Based on the number of residential properties impacted to date and the number of calls received during April and May when caterpillars were most active, staff are proposing the creation and distribution of 8000 burlap kits in 2022. Each kit would include three pieces of burlap, twine and a fact sheet. Kits would be distributed at the Operations Centre (assuming the facility is open) or through an organized distribution event with COVID-19 health and safety measures in place if required.

Cost: The estimated cost for this activity would be approximately \$31,000, which includes a staffing resource to create the kits and organize distribution to the public.

### **Option 5 – Expanded Street and Sidewalk Sweeping**

In the spring of 2021, City staff conducted limited street sweeping in areas where concerns were received by residents. In order to help mitigate the impacts of LDD on neighbourhoods, street and sidewalk sweeping on a regular basis would help alleviate the accumulation of caterpillar droppings that create unsightly conditions.

Cost: The estimated cost for this activity would be approximately \$61,000 using external contracted services for a 6 week period. Sweeping activities would take place on approximately 80 hot spot streets when the caterpillars are most active (Late May to early July).

### **Discussion**

LDD is a naturalized species that is known to have cyclical outbreaks that occur approximately every 10 years and last up to 3 to 4 years. Populations have been known to collapse due to the moth's naturally occurring diseases and predators which reduces populations to manageable levels. Most impacted trees have the ability to regrow their leaves as the season progresses. As such, long-term impacts to the City's urban forest canopy are not a concern at this time. Strategic use of funding and resources to control invasive species could be better reserved for species that detrimentally impact City trees and do not have any known natural controls to regulate their spread (for example like what was experienced with emerald ash borer). Spraying could be considered to manage the pest as a nuisance, however due to the widespread presence of LDD in the community the cost associated with spraying does not make it feasible. Also, due to the public perception associated with spraying pesticides within the environment and community in addition to the potential for non-target insects to be impacted, some residents may be strongly opposed to this type of treatment option.

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### Recommendation

Based on the information presented in this report staff are recommending an approach that **builds on the control methods already underway** and **expands the program by incorporating Options 3, 4 and 5 described above as well as expanded public education to support the program**. The overall program would include the following management approaches:

Already underway:

- Knowledge sharing and collaboration through Regional and interdepartmental working groups
- Egg mass removals using 2 vacuums
- TreeAzin® injections of select trees
- Manual spread of NPV virus
- Watering during dry periods
- Public education

New and/or expanded:

- Expanded egg mass removals using 4 vacuums (Option 3) - \$9,000
- Residential LDD burlap trap kit distribution program (Option 4) - \$31,000
- Expanded street and sidewalk sweeping program - \$61,000
- Public education resources and communications (online resources, ads, workshops, translated materials, signage etc.) - \$8,000

### Financial/Staffing/Other Implications:

Based on the recommended approach outlined above for addressing LDD, staff will be seeking \$109,000 through the 2022 operating budget to complete the “New and/or expanded” management options.

These efforts will complement the management efforts “Already underway” which can be accomplished using existing staffing resources and budgets.

### Relationship to Council’s Strategic Priorities 2020-2022:

As experienced in the past and predicted by expert entomologists, the LDD outbreak is expected to collapse as a result of natural processes and its cyclical nature. The management approach outlined in this report provides fiscally responsible tactics for managing this short-term nuisance that is impacting our community.

### Climate Change Considerations:

LDD management approaches outlined in this report contribute to climate change mitigation by helping to ensure the City’s urban tree canopy is protected and stays healthy, which helps to combat urban heat island effect and absorb/filter carbon emissions in the air.

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### **Conclusion:**

In response to a Council motion brought forward on June 23, this report has been prepared to provide information, management options and recommendations for how the City should continue to respond to the LDD moth outbreak that is currently being experienced in Richmond Hill. LDD populations have been known to collapse due to the moth's naturally occurring diseases and most impacted trees have the ability to regrow their leaves as the season progresses. As such, long-term impacts to the City's urban forest canopy are not a concern at this time. Until the population natural corrects itself, staff are recommending a multi-pronged management approach to mitigate the impacts of LDD on the community. The recommended tactics build on methods currently underway and incorporates new and expanded methods including expanded egg mass removals, TreeAzin® injections of select trees, manual spread of NPV virus, watering during dry periods, expanded street and sidewalk sweeping, distribution of resident burlap trap kits, monitoring and expanded public education and resources.

### **Attachments:**

The following attached documents may include scanned images of appendixes, maps and photographs. All attachments have been reviewed and made accessible. If you require an alternative format please call the contact person listed in this document.

- Map 1 - LDD Egg Mass Survey
- Map 2 - LDD Distribution

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### Report Approval Details

Document Title:	SRCS.21.13 - LDD (European Gypsy Moth) management options and recommendations.docx
Attachments:	- SRCS.21.13 - Map 1 - LDD Egg Mass Survey.docx - SRCS.21.13 - Map 2 - LDD Distribution.docx
Final Approval Date:	Jun 30, 2021

This report and all of its attachments were approved and signed as outlined below:

**Diogo Oliveira on behalf of Jeff Stewart - Jun 30, 2021 - 12:05 PM**

**Tracey Steele on behalf of Darlene Joslin - Jun 30, 2021 - 3:36 PM**

**Sherry Adams on behalf of MaryAnne Dempster - Jun 30, 2021 - 3:59 PM**