Report to Community Protective Services Committee

To: **Chair and Members**
Community Protective Services Committee
From: **Kelly Scherr, Deputy City Manager, Environment and Infrastructure**
Subject: **Urban Forest Health: Status of Pests and Pathogens**
Date: **February 18th, 2025**

Recommendation

That on the recommendation of the Deputy City Manager, Environment and Infrastructure, the following actions be taken:

a) the report entitled "Urban Forest Health: Status of Pests and Pathogens" **BE RECEIVED** for information;

b) Civic Administration **BE DIRECTED** to engage local arborists and forestry service providers to establish a working group to coordinate pest and pathogens monitoring and associated responses;

c) Civic Administration **BE DIRECTED** to implement a community-based monitoring program to aid in the early identification of forest pests and pathogens; and,

d) Civic Administration **BE DIRECTED** to seek funding opportunities from the Federal and Provincial governments to off-set the costs associated with the management of infected trees and/or the planting of replacement trees.

Executive Summary

This report provides an overview of forest health at a high level – historic, current, and predicted future impacts – as well as the City's response to threats, its ongoing collaboration with other levels of government, and its efforts to engage the public.

Many of the forest pests discussed below have been present in London for several years. Some have management strategies associated with them, but most do not. City staff have gained valuable experience in addressing many pests that have caused or are still causing damage and remain vigilant for early detection of those pests not yet present in Canada, but on the horizon. Certain pests may have no known cure or treatment and those are the potentially most damaging ones. In addition, many trees, such as maples, are susceptible to more than one pest. In most instances the emergence and spread of a pest is linked to human activities, such as the transport of forestry products, but climate change may also be increasing the rate of spread of pests, the range of lands in which they are able to spread, and their negative impacts. Unfortunately, all species of ash, butternut, elms, and American chestnut are now endangered because of the impact from pests.

Staff strive for proactive, responsible Integrated Pest Management. This requires much collaboration year-round with other municipalities and government agencies for proper monitoring, data-gathering and planning of controls.

The near-term focus of the City's efforts to combat forest pest and pathogens are targeted to Beech Leaf Disease, Oak Wilt and the Emerald Ash Borer. All of these threats present ecological, financial and social risks to our community. Staff has established monitoring and management approaches for these pests and pathogens and updates will be provided in the annual Urban Forest Strategy Monitoring Report as well as budget monitoring reports.

Linkage to the Corporate Strategic Plan

Climate Action and Sustainable Growth:

1.2: Waterways, wetlands, watersheds, and natural areas are protected and enhanced.
2.2: London is more resilient and better prepared for the impacts of a changing climate.
3.2: Infrastructure is built, maintained, and secured to support future growth and protect the environment.

Analysis

1.0 Background Information

1.1 Previous Reports Related to this Matter

February 19, 2019: Urban Forest Health; Oak Wilt – Report to the Planning & Environment Committee
February 8, 2021: European Gypsy Moth (EGM); Proposed Management Plan – Report to the Planning and Environment Committee
March 7, 2022: Lymantria dispar dispar (LDD) Moth; Proposed Management Plan – Report to the Planning and Environment Committee

1.2 Forests Pests and Pathogens: Impacts and Management

Trees in urban areas, specifically streets, manicured parks, and yards, face challenging growing conditions. Problems include soil compaction, impacts of road operations and vehicle emissions, poor soil quality or limited soil volumes, standing water, and restrictions to height and natural form. Many urban trees fail to become fully established, do not reach their full potential, and/or succumb to disease. As long-lived organisms, trees are under constant threat from pests and diseases that find opportunities to invade stunted, wounded or generally unhealthy trees. Forest pests and pathogens use trees for a food source or as a host to reproduce. Although pests and pathogens are natural and omnipresent, they become a management problem when natural controls are not present and/or a surge in population size occurs. Impacts are especially acute when introduced and invasive pests and pathogens emerge that are not found in the local ecosystem.

Certain diseases and pests have been present in Ontario for over 80 years including Chestnut Blight (*Cryphonectria parasitica*), Dutch Elm Disease (*Ophiostoma ulmi* and *Ophiostoma novo-ulmi*), and Eutypella Canker (*Eutypella parasitica*). Due to their longstanding presence and impact on their target species, there has been a focus on research into treatments and preventions for these threats. In some cases, there is no cure, and efforts have turned to selective breeding of resistant cultivars sourced from survivors. Unfortunately, species including ash, butternut, elm, and American chestnut, are endangered from pest or disease impacts.

Other diseases including Anthracnose (*Aureobasidis* spp. and *Apiognomon* spp.), Verticillium Wilt (*Verticillium albo-artrum* and *Verticillium dalhiae*), and Spongy Moth (*Lymantria dispar dispar)* are less host-specific and can affect a wide range of species, including over ten tree species in the case of Spongy Moth. In some cases, management including pruning of diseased limbs, removal of fallen leaves from the site, and proper sanitization of equipment can vastly reduce their impact.

Generally, the effort to monitor for and control a pest or disease is related to the host species' economic value. Some, but not all, pests and diseases that affect trees are regulated by the Canadian Food Inspection Agency (CFIA) under the authority of the Plant Protection Act (S.C. 1990, c. 22), including Plant Protection Regulations (SOR/95-212). In cases where the pest or disease is regulated by the CFIA, they have the authority to take action to manage or prevent its spread, which supersede that of municipalities. This may include for example, ordering the destruction of trees, such as those infected or near an outbreak, setting disease control requirements, and regulating the movement of plants and plant products.

As outlined in Appendix 'A' the City has experienced significant challenges with managing and responding to pests and pathogens that have entered our urban forest. Some invasive insects like the Emerald Ash Borer (EAB) have produced terminal losses of trees, while others like the Spongy Moth have created nuisance conditions. Pest and pathogen outbreaks are all costly, whether it means reactive treatment or removal, re-planting, loss of canopy, and a loss to the community from the social and ecological benefits provided by impacted trees.

Climate change adds additional uncertainty regarding tree species suitability to future conditions. Trees of all species are anticipated to become more stressed from longer droughts, higher temperatures, isolation of individuals that require cross-pollination with another of their type, fragmentation of suitable habitat, increased extreme weather events and urban intensification. Human intervention will become more necessary to assist in tree species recovery, building appropriate conditions for resiliency to climate impacts and ensuring our urban forest has a diverse composition and structure.

2.0 Newly Detected and Impending Pests and Pathogens

Presently, London is faced with several existing and probable pests and pathogens that are, or will be, impactful to public- and privately-owned trees. It is important for the local forestry sector and the community as a whole to be aware of these threats and how they should be addressed.

London's urban forest is most vulnerable to the impacts of Beech Leaf Disease (BLD), Oak Wilt and the Asian Longhorn Beetle (ALB).

2.1 Beech Leaf Disease (BLD)

- **Description:** Beech Leaf Disease (BLD) impacts beech trees by compromising tree leaves and severely reducing plant energy, resulting in tree mortality. It has only recently emerged, being identified in the United States in 2012 and in Ontario in 2017. Older, larger trees with more energy reserves take a number of years to weaken before they die, while infected seedlings can die within a single growing season. BLD has been confirmed throughout London.

- **What causes the infection?** The pest is an invasive worm-like nematode that attacks leaf buds, restricting their proper emergence and limiting necessary photosynthesis for tree survival and growth. BLD causes distinct striping between leaf veins and destroys leaf buds for the next year.

- **What are the symptoms of infection?** Infected beech trees display visual cues, such as low leaf numbers and canopy volume, deformed leaves, and leaves with dark or yellow patches between veins. The nematode is too small to be seen, so proactive identification is difficult, and its presence is generally only observed once symptoms appear.

- **What are the potential impacts?** In late 2023, the City commenced a BLD survey in urban woodlots. Over one month, 33% of the city's woodlot area was surveyed – 74% of sample plots demonstrated trees infected with BLD and 53% of all beech trees had BLD. Further analysis in 2024 concluded that 100% of sites where beech trees are present have confirmed cases of BLD. Rates of infection are expected to

increase in the coming years. Beech trees only comprise 2.4% of the total trees within the city, but they are concentrated in a number of woodlands with a high population density. There are approximately 11,600 beech trees throughout London, with 94% located within woodlands. Where found, beech trees serve an important role in forest structure due to their large canopy volume, adaptability to a variety of growing conditions, and wildlife habitat benefits. Their loss can stimulate increased growth of invasive species and natural replacement with trees that reduce the diversification of tree species in woodlands.

- **How can the City respond to the impacts on our urban forest?** Trials with agricultural pesticides injected into moderately infested beech trees are underway in the United States; however, it is unlikely that a treatment option will be available within the next few years. It is also problematic that the vector and spread of infection is not fully understood due to limited research to date and, while thought to be unlikely, it is unknown if other tree species can be similarly infected. A proactive response for beech trees in woodlands is not viable, given the present rates of infection, low risk to life and property from mortality, high costs for removal and destruction of infected trees, and the social impacts to the community from wide-scale removals. Outside of woodland boundaries and locations proximate to formal trails, tree mortality will not be managed but will be monitored and assessed. Beech street trees present a greater risk from failure and will need to be removed shortly after infection is observed. These removals have commenced and will be ongoing in the coming years. Staff will be pacing the removals to manage risk, while also retaining healthy trees for as long as possible.

Figure 1: Infected Beech Leaf Tree (Helen Mott Shaw Park, London, ON.)

(Source: Urban Forestry Staff, City of London)

2.2 Oak Wilt

- **Description:** The Oak Wilt disease is caused by an invasive fungus that has an unknown origin. The fungus targets the outer sapwood of oak trees, which reduces the ability of the tree to transmit water and other nutrients throughout the trunk and branches. Once infected, trees experience rapid decline and death as the fungus spreads and the circulatory system fails. Although all oak trees are susceptible to Oak Wilt, the red oak group is particularly prone to infection. Oak Wilt has been present and managed in the southern United States since at least the 1940s and has recently been moving northward, with confirmed cases in eastern Michigan. The first confirmed case of this disease in Canada was located in Niagara Falls in May of 2023. Since then, there have been additional confirmed cases in the County of Simcoe and Niagara-on-the-Lake. Effectively, Oak Wilt is present north, south, east and west of London and it is only a matter of when the city will experience its first infected oak tree.

- **What causes the infection?** The fungus is transmitted by native beetles that are normally present on oak trees. The beetles serve as unintended carriers as fungus spores are picked up from an infected tree and passed along to an uninfected tree. The fungus enters the tree through wounds caused by damage (e.g., branch tears, bark removal, etc.), pruning, and other circumstances where the tree's inner layers are exposed.

- **What are the symptoms of infection?** Early detection of infected trees can be challenging. The most visible cue is when portions of, or all of, the tree's leaves appear brown, bronze, or yellow, outside of normal fall colour changes. Leaf tips will appear dull and discoloured. A sudden and unexpected drop of large volumes of leaves is also a distinguishing characteristic. The fungus itself can sometimes be seen on the outer layer of bark, but it can be seen underneath the bark (appearing white, grey, or black).

- **What are the potential impacts?** Approximately 1.4% of all London's trees are oaks, which make up disproportionally more tree canopy due to the large size they achieve over their lifetime. Oaks are a long-lived tree, and they provide significant habitat for urban wildlife. Due to their size and rapid decline once infected, compromised oak trees present a higher risk to life and property during storm events. Oak trees are popular park trees due to their size and longevity and the removal of infected trees would result in noticeable impacts to park character. A sizeable loss of oak trees would have a significant impact on the city's overall canopy cover.

- **How can the City respond to the impacts on our urban forest?** City staff have been providing an early detection and rapid response protocol to suspected Oak Wilt reports since 2017. In spring 2024, staff captured and sent specimens of the beetles that spread Oak Wilt for analysis by the Ministry of Natural Resources and Forests to detect Oak Wilt deoxyribonucleic acid (DNA). City staff that are regularly in parks and natural areas have been trained on Oak Wilt detection and any observations trigger investigation by City arborists. Forestry Operations has restricted the pruning of oak trees to periods outside of the growing season in order to mitigate potential infection. Industry partners are well-versed in the potential impacts of Oak Wilt and have generally adopted similar pruning restrictions. Confirmation of the presence of Oak Wilt would trigger the involvement of the CFIA and disease management protocols, which would include quarantine zones, tree removals and aggressive root pruning. For the foreseeable future, the City will be selectively planting oak trees as a means of disease mitigation.

Figure 2: Discoloured Leaves Due to Oak Wilt – Spring/Summer (CFIA Oak Wilt Webpage)

(Source: www.inspection.canada.ca/en/plant-health/invasive-species/plant-diseases/oak-wilt)

2.3 Asian Long-Horned Beetle

- **Description**: The Asian Long-horned beetle (ALB) is an invasive insect that has entered North America through wood-based packing materials and containers. Population spread occurs through the transmission of adult insects or eggs. Two outbreaks have been confirmed in the Greater Toronto Area (GTA), the most recent in 2013. Eradication was achieved in 2020 – seven years after first detection. The ALB is a relatively large insect with a shiny black exoskeleton with white spots and long black-and-white striped antennae. There are no known predators for the ALB.

- **What causes the infection?** The ALB is a burrowing insect that feeds on sapwood, heartwood, bark and leaves. Tunnels created by the ALB disrupt the flow of nutrients and water, leading to the decline and death of the tree. Maple trees are the preferred host for the ALB, although other hardwood trees can be selected.

- **What are the symptoms of infection?** The presence of ALB can be identified through the observation of individual insects on or close to trees. Host trees will also present numerous holes in the bark slightly smaller than a dime where insect larvae have burrowed out of the tree with emergence. Small, round depressions with removed bark can be a sign of the presence of laid eggs, usually accompanied by bark shavings located at the joint of trees and branches.

- **What are the potential impacts?** With a plentiful food source and a lack of natural controls, ALB populations can increase dramatically once established. Almost a quarter of London's trees are maple, distributed extensively throughout the city in parks, woodlands, as street trees, and as a popular choice for homeowners and businesses. Sugar maples and Norway maples alone provide more than 50% of the city's overall canopy cover. With over 1.6 million maple trees, the city's urban forest is particularly vulnerable to an outbreak of ALB – if an infestation were to occur and not be able to be controlled, the loss of trees would be many times that of the outcomes from the Emerald Ash Borer, radically changing London's landscape and overall canopy cover.

- **How can the City respond to the impacts on our urban forest?** Fortunately, the large size of the ALB limits its ability to fly at distances, so it can be contained if found. Eradication is possible through quarantine and the treatment of infected trees, but the time between initial detection and population collapse takes many years of focused management. City staff have established a monitoring protocol for the detection of the presence of ALB and staff regularly working in parks and natural areas have received training for identifying symptoms. In the fall of 2023, forestry staff from the City of London, the Upper Thames River Conservation Authority and ReForest London partnered with the CFIA in a mock infestation exercise to test observation skills and simulated responses. Ongoing proactive monitoring of sample plots and investigation of observations will continue to mitigate extreme impacts should the ALB arrive in London.

Figure 3: Example of an Asian Long-horned Beetle (CFIA Asian Long-horned Beetle Webpage)

(Source: www.inspection.canada.ca/en/plant-health/invasive-species/insects/asian-longhorned-beetle)

2.4 Additional Threats Being Monitored

Other forest threats are emerging and receiving a varied level of interest from both levels of government and local interest groups depending in part on the abundance and value of the host tree species. Potential pests and pathogens include the Thousand Cankers Disease (Geosmithia morbida) which attacks trees in the walnut genus (Juglans spp.), White Pine Blister Rust (Cronartium ribicola), Hemlock Woolly Adelgid (Adelges tsugae), and the Spotted Lanternfly (Lycorma delicatula) which has a broad range of host tree species, many of them fruit trees and also grape vines. Thousand Cankers Disease and Spotted Lanternfly have not yet been confirmed in Ontario but are present in nearby States. The emergence of any one of these pests and pathogens would produce increased strain on the overall health of the urban forest, and the resultant stress could increase the exposure and vulnerability to major threats from BLD, Oak Wilt and ALB.

3.0 Financial Impact/Considerations

The valuation of ecosystem services lost or diminished as a consequence of a declining urban forest is how financial impacts of species loss can be understood and provides justification for investing in the management of our urban forest. Pest management is usually reactive due to an absence of information where the pest will be next. The City of London, however, has been employing best management practices by undertaking annual monitoring for known or suspected pests and pathogens.

Funding for monitoring and limited proactive management of known or expected forest pests and pathogens is built into existing budgets. This funding represents and asset management strategy, intending to maintain the infrastructure benefits provided by trees and woodlands. It also aims to address concerns prior to the need for large expenditures to treat or remove large numbers of trees whenever possible.

Existing City budgets do not provide funding addressing pest and pathogen outbreaks, should large volumes of trees be impacted. The timing, frequency and total amount of expenditures is difficult to predict. In past years, costs associated with the EAB and Spongy Moth have been addressed through a combination of budget surpluses, senior government funding and the use of contingency reserves. Staff suggest that a similar approach be taken should a significant response be required for BLD, Oak Wilt or ALB.

It is estimated that the removal and disposal of infected beech street trees and warranted woodland trees could cost approximately $2.1 million over the next 5 years. Funding will be sourced from the capital budget (project UF2401) and may be addressed through budget monitoring, if needed. Capital budget sources are also available to fund replacement and restoration associated with removed trees.

Other than existing monitoring programs, no funding is presently identified or available to address Oak Wilt or ALB, given that these pests and pathogens have not been confirmed yet in London. Should either be confirmed, a financial strategy for the response would be identified and provided to Council. With the involvement of the CFIA, it is anticipated that senior government funding would be available to combat outbreaks and fund restoration efforts.

4.0 Next Steps

As described above, Staff has several pest and pathogen monitoring frameworks in place and are actively investigating suspected observations. Training and outreach has also been conducted with staff working in parks and natural areas, as well as local arborists. These efforts will continue, and external technical support will be engaged as needed. City staff will continue to liaise with surrounding municipalities, forestry associations, the Ministry of Natural Resources, and the CFIA.

Londoners can play a crucial role in supporting the early identification of pests and pathogens impacting trees at their homes, businesses or in public spaces. The City maintains a dedicated webpage to provide information on known or suspected tree pests and diseases (https://london.ca/living-london/water-environment/trees/pest-diseases) and a public education campaign will be launched in the coming months as trees begin to bloom. Educational materials will provide graphics to aid with identification and how to support investigations of suspected invasive insects, unusual leaf conditions or unusual bark wounds. Requests for inspections can be made via the Service London Portal (service.london.ca) or by emailing trees@london.ca.

Staff is requesting direction to formalize an arboriculture industry working group to coordinate the response to forest pests and pathogens, as well as an enhanced community-based monitoring program. Additionally, direction is sought to explore more formal opportunities for funding sources from senior levels of government.

The removal of unhealthy or infected trees is difficult for the community and residents directly impacted by the loss of street trees or the downing of trees in woodlands. Wherever possible, City staff will notify area residents about the need for the removals and will provide education on a) why the removals are necessary and b) what to expect for replanting and restoration. It is hoped that through continued management and monitoring activities that significant community impacts can be avoided.

Going forward, regular updates on the status and observations of forest pests and pathogens will be provided to Council with the Urban Forest Strategy Annual Report and through commentary provided in budget monitoring. If acute action is required in between these reporting periods, information will be provided to Council as details become known.

Conclusion

Our urban forest faces the threat from many pests, which can be lessened by proper monitoring, early detection, rapid response and a recovery plan. The key to successful prevention and mitigation is taking a proactive approach, learning from past infestations, applying knowledge and planning for and adapting to changing conditions and the inevitability of new pests appearing in London. Thankfully, the City has experienced some success in identifying and controlling pests in the past, and programs and protocols are in place for monitoring and identifying new pests as they emerge. Implementing proactive measures aids in reducing the incidence of infection in London's trees and mitigates worst-case scenarios. Tree loss is expected, however, as the changing climate creates conditions for the increased spread of pests and pathogens that do not have natural controls. This reality is an important consideration for the continuous improvement of pest and pathogen strategies and how the urban forest as a whole is managed.

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Appendix 'A': Recent Major Forest Pest Impacts

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Case Study #1: Emerald Ash Borer (EAB)

In 2008, there were nearly 800,000 ash trees within the Urban Growth Boundary comprising over 11% of all trees and a structural value by $80 million (UFORE, 2012). EAB has caused the near entire loss of ash species (Fraxinus spp.) in London and most species of ash are now listed as endangered. EAB was first identified in Windsor, Ontario in 2002; the earliest record of a potential EAB outbreak then assigned to "unknown cause" was in a private woodlot in the southwest of the City of London in 2005. Since implementing the Emerald Ash Borer Strategy in 2011, the City's response used existing resources to conduct ash tree removals, while some trees (about 600) that were still healthy, received injections of a pesticide (TreeAzin™) approved under a special license. The injections were conducted every two years until 2018, with an attrition rate (i.e. unhealthy ash trees that were no longer suitable for injecting) of about 15% in each round. The last survivors of those that were injected are now being removed or planned to be removed soon due to the injections no longer being effective to maintain tree health. The total cost of EAB over the course of nine years from 2012 - 2021 was over $2 million. There was also a loss in ecosystem services that would have been provided by those trees. Tree canopy cover in the UGB reduced from 24.7% in 2008 to 23.7% in 2015 (a 4% canopy cover reduction) attributed to the impact of EAB.

Case Study #2: Spongy Moth/*Lymantria dispar dispar* (LLD)

Native to Europe, the Spongy Moth was released accidentally in the early 20th century after an attempt to boost the American silk industry, which had unintended consequences. After a province wide outbreak of this pest in 2008, the City of London responded to Londoners' concerns about defoliated trees by surveying both the damage to trees and counting egg masses in areas of concern.

Responses have included reviews of Spongy Moth population dynamics and counting and measuring overwintering egg masses. Treatments are not always based on saving the tree – most host trees would survive a Spongy Moth epidemic, for example, and recover. Rather, it has been the unpleasant social impacts of the pests in the caterpillar phase, affecting homeowners at a time of year when they wish to be enjoying the outdoors. Other factors include the speed and range of spread, and the large number of individual trees on streets and in public parks that may pose a threat to public safety and utilities after they die.

Spraying of the bacteria *Bacillus thuringiensis* var. *Kustaki* (BTK) was performed in 2009 to the most severely impacted park areas. As this pest has a known cyclical peak infestation roughly every ten years, monitoring was conducted in preparation for the next expected outbreak. Yearly surveys conducted from fall 2019 to 2023 were used to determine when to spray BTK by helicopter to the worst afflicted park woodlands, with spraying completed in late spring 2021 and 2022. This was successful in reducing the population of Spongy Moth in the targeted woodlands, however it was noted that London and South West Ontario region saw a peak in Spongy Moth infestation in both of these years regardless of treatment. This two-year peak was not a feature of historic infestations, which experienced a single year peak before the pest population crashed from predation and lack of resources. Results from pheromone trapping in London woodlands during this peak infestation period suggested that the Spongy Moth might be completing two life cycles with two hatchings and successful metamorphoses into adult males happening in the same year; this was also an unexpected development, and the Canadian Food Inspection Agency (CFIA) may revisit this issue in the next peak epidemic. Treatment also involved egg mass scraping to physically remove egg masses from trees every year from 2020 through to 2023. The latest egg mass survey was undertaken in November 2024 with results confirming the population to be at a low point in its cycle.

Post-treatment surveys of tree defoliation and overwintering egg masses were conducted. The 2023 survey revealed lower levels of defoliation than expected, indicating that the Spongy Moth population in London has collapsed since 2022, and that treatment procedures have been effective. Oaks and basswood were the primary species impacted by Spongy Moth. Oak canopies were thinner than normal, with oak-dominant areas having trees displaying discoloration, leaf scorch, dead branches and overall poor to fair condition. Yearly monitoring has continued through to November 2024 and this data will assist in planning for the cyclical nature of future population outbreaks and potential controls.

To date, the City has spent approximately $360,000 to manage and monitor Spongy Moth outbreaks. Annual monitoring costs are built into existing budgets and will continue to mitigate the costs associated with an outbreak due to early detection and intervention.