Draft – London Invasive Plant Management Strategy

1.0 Executive Summary

~~The City of London's Official Plan policies support and direct The City to protect, restore and enhance the Natural Heritage System.~~ Council's Strategic Plan for the City of London (2015-2019) identifies areas of focus for the city's long-term vision which includes the protection and enhancement of the Natural Heritage System and specifically the control of invasive species. In addition, the newly adopted London Plan (2016) builds on the City's environmental policies and the importance of the Natural Heritage System, its biodiversity, ecosystem health, and how it is an essential component of the City's landscape and character.

The City of London is currently a leader in Ontario regarding invasive species management. Within our Environmentally Significant Areas (ESA), the council approved Conservation Master Plans direct and emphasize the need for invasive species control projects. The City has a woodland management fund that is used in part to addresses invasive species management issues.

However, the City of London, as with all Ontario municipalities, lacks a ~~city-wide~~ comprehensive strategy to address invasive species concerns over the long-term. It is widely recognized that if invasive species are ignored, not only does this affect the health of ecosystems in the long-term, but drastically increases costs associated with controlling invasive species once they can be no longer ignored and action must be taken. ~~In effect,~~ this lack of a long-term strategy and clear focus ~~will~~ limit our ability to control priority invasive species throughout the Natural Heritage System and substantially increase control and restoration costs.

With the help of the Ontario Invasive Plant Council's (OIPC) strategic framework for developing a city-wide invasive species management strategy, London will be the first City in Ontario to ~~bring this forward to~~ address city-wide invasive species control over the long-term. This will be accomplished ~~through~~ applying the ~~strategic process identified in the~~ London Invasive Plant Management Strategy (LIPMS) ~~and by~~ specific management programs for priority invasive plant species~~.~~ ~~These species~~ include *Phragmites* (Common Reed), Japanese Knotweed, Dog Strangling Vine, and Giant Hogweed.

A major component of the LIPMS is to include multiple city departments in the identification and control of the priority species, making the LIPMS truly "city-wide". The City of London will create its own Phragmites control program~~, similar to and~~ in consultation with the City of St. Thomas, which has recently adopted a "Phrag Free City by 2020" program. Working with regional partners will enhance the effectiveness and sustainability of invasive species control efforts over the long-term. The LIPMS is intended to be a working document and the recommendations identified in the LIPMS will form the basis for the implementation of the LIPMS

2.0 Introduction

Defined as any plant species that has been introduced and exerts substantial negative impact on native biota, economic values, or human health (Lodge et al. 2006), invasive plants are becoming an increased threat to London ecosystems, ~~the~~ economy, and social and recreational environments. As many invasive plant species lack natural enemies, they easily out-compete many colonies of important native vegetation, negatively altering existing ecosystem function.

Invasive species are the second most significant cause of species extinctions worldwide, after habitat loss (IUCN, 2014). The ecological effects of invasive species can be irreversible and, once established, they are difficult and costly to control.

A survey conducted in 2012 by the OIPC with the Invasive Species Centre (ISC), the Ontario Ministry of Natural Resources and Forestry (MNRF) and the Ontario Federation of Anglers and Hungers (OFAH) identified that many municipalities face significant challenges with regards to invasive plant management. Section 15.3.7 of the Official Plan states that "The City will encourage rehabilitation and enhancement measures that protect the ecological function and integrity of the Natural Heritage System." The City of London is the first municipality in Ontario to create a comprehensive invasive plant species management plan following the publication of the "Creating an Invasive Plant Management Strategy: A Framework for Ontario Municipalities" by the OIPC in March 2015. Establishing a city-wide ~~LIPMS~~ with specific attention drawn to ESAs, wetlands, significant woodlands, and the Thames Valley Corridor, recognized by the City as "its most important natural, cultural, recreational and aesthetic resource (Section 2.9.3. iv London OP, 2006), will be a crucial step towards achieving this goal for the City of London.

3.0 Impacts of Invasive Plants

3.1 Degradation of the Natural Heritage System

Natural areas such as forests, prairies, wetlands and aquatic habitat provide many services and benefits to the economy, society, and the environment. Natural areas provide shelter and food for wildlife, remove pollutants from air and water, produce oxygen through photosynthesis and provide valuable recreational and educational opportunities. They are the green infrastructure that helps buffer the impact of climate change and severe weather, which in turn ~~buffers~~ the impact on the municipal budget. Invasive plants can have a large impact on natural areas and threaten these important services that they provide.

Invasive plants ~~impact~~ species diversity and species richness by competing heavily for resources such as light, moisture and soil nutrients that native plants require to establish and grow. These changes in ~~species~~ composition affect wildlife that are adapted to native plant communities. ~~They~~ can change the entire composition of vegetation over time and ~~change the nature of what a feature is~~. Invasive plants can reduce forest regeneration through direct competition with tree seedlings, resulting in reduced density and slowed growth rate. Reduction in forest regeneration results in the loss of wildlife habitat, and decreases the diversity of a stand, making it more vulnerable to insects and disease as well as to the incursion of other invasives. Ultimately, invasive plants affect the intricate linkages that make ecosystems strong and resilient.

Protecting the City's Natural Heritage Features from the threats of invasive plant species is imperative to maintaining the overall ecological integrity and ecosystem health of the Natural Heritage System.

3.2 Danger to Human Health and Safety

Some invasive plants cause human health concerns because their sap is toxic to skin. Other plants can cause injuries to the body. ~~Human safety may also be impacted by fast-growing invasive plants, as is the case with *Phragmites australis* which may reduce visibility at rights of way, increasing the risk of car accidents.~~ Dead, dry stalks of these plants are also highly combustible and can become a fire hazard. Many native plant species can pose similar risks to human health and safety, but a key difference with invasive plants is they become widespread

and prevalent much faster than native plants. This makes preventing their spread and controlling them and the risks they pose to humans more difficult and important.

3.4 Socio-economic

Invasive plants can have a large economic impact on individual landowners, businesses and municipalities. Due to the invasive leafy spurge (*Euphorbia esula*), Manitoba has experienced a $30 million reduction in land values (CFIA, 2008). Leafy spurge infests 340,000 acres of land in Manitoba, costing taxpayers an estimated $19 million per year to protect grazing land, public land, and rights-of-way (CFIA, 2008). In Ontario, the MNRF has been involved with *Phragmites* control pilot projects since 2007 and to date control costs range between $865 and $1,112 per hectare (OMNRF, 2012). Invasive species have an impact on approximately 20% of Species at Risk on Ontario (OMNRF, 2012).

The Trinational Commission for Environmental Cooperation reported that economic losses and the costs of environmental impacts caused by invasive species exceed $100 billion annually in the U.S. alone (OMNRF, 2012). In Ontario, over $30 million has been spent by the Canadian Food Inspection Agency (CFIA) to slow the spread of emerald ash borer (EAB) (OMNRF, 2012). On a municipal scale, the City of Toronto has estimated emerald ash borer (*Agrilus planipennis*) management costs for 2013-2020 to be $71.2 million for tree removal, wood disposal, pesticide injection, replacement plantings and staff resources (City of Toronto, 2012). The City of London has perhaps passed its peak operational costs of the emerald ash borer invasion. The total cost of responding to that outbreak will eventually total about $35 million and the “opportunity lost” due to this genus being lost from the landscape will continue for generations.

Of particular concern to London is the presence and spread of the invasive plant species *Phragmites australis*. See *Appendix A: Phragmites australis (European Common Reed) – Canada’s Worst Invasive Plant* for a more in-depth look at the threat of Phragmites currently present in London’s Natural Heritage System. A stronger focus on this species is necessary and is being addressed by the City of St. Thomas. ~~London’s neighbour,~~ the City of St. Thomas, has recently approved a “Phrag Free City 2020” management plan, which outlines action items to ~~reach the goal to~~ eradicate Phragmites from all public and private lands by the year 2020. See Appendix B *Case Study 1 – City of St. Thomas* for more information.

4.0 Policy Context

Regulatory agencies and legislative authorities have established a number of policies, outlined below, in an effort to protect native ecosystems and minimize the impact of invasive species. ~~The important take-away is that developing a comprehensive strategy is necessary to address invasive species over the long term and that there are numerous supporting policies and tools to support a city-wide strategy.~~

- Council's Strategic Plan for the City of London (2015-2019)
- City of London Official Plan, Office Consolidation, 2006
- The London Plan (2016)
- Invasive Species Act, 2015 (Ontario)
- Provincial Policy Statement, 2014
- Ontario Invasive Species Strategic Plan, 2012
- Thames Valley Corridor Plan, 2011
- ESA Conservation Master Plans
- City of London Urban Forest Strategy, 2014
- City of London Environmental Management Guidelines, 2007

In addition there are numerous sections of federal legislation and policy related to invasives, and although there is no cohesive approach, the federal government has the lead in preventing invasives from arriving and becoming established in Canada.

<u>Council's Strategic Plan (2015-2019)</u>

Strategic Plan for the City of London 2015-2019

The Invasive Species Strategy is consistent with the Strategic Plan, the four areas of focus and directly aligns with many of the implementation strategies.

Strengthening Our Community
• Amazing arts, culture, and recreation experiences • Healthy, safe, and accessible city • Help Londoners understand how we provide safe drinking water and protect the Thames River
Building a Sustainable City
• Strong and healthy environment • Plant more trees and better protect them from deforestation, invasive species, and other threats • Work together to protect all aspects of our natural environment including woodlands, wetlands, river and watercourses, and air quality as our city grows

• Fund innovative ways to adapt to Climate Change • Invest in making London's riverfront beautiful and accessible for all Londoners • Protect and promote London's Thames Heritage River status
Growing our Economy
• Strategic, collaborative partnerships • Partner with the London Community Foundation on the "Back to the River Project" • Diverse employment opportunities
Leading in Public Service
• Proactive financial management • Make sure that financial issues are not created and pushed to the future, creating problems for future generations • Use innovative and best practices in all organizational and management activities

The London Plan (2016)

The environmental policies of the London Plan, approved by council in 2016, build on the current Official Plan policies. The London Plan has a strong focus on protecting and improving the City's Natural Heritage System. Specifically, the goals of the City with respect to Natural Heritage focus on the following:

> 1308_ We will plan for our city to ensure that London's Natural Heritage System is protected, conserved, enhanced, and managed for present and for future generations by taking the following actions:
>
> 1. Achieve healthy terrestrial and aquatic ecosystems in the city's subwatersheds.
> 2. Provide for the identification, protection, rehabilitation, and management of natural heritage features and areas and their ecological functions.
> 3. Protect, maintain, and improve surface and groundwater quality and quantity by protecting wetlands, groundwater recharge areas and headwater streams.
> 4. Enhance, protect and conserve the Natural Heritage System through well planned built form and community design.
> 5. Maintain, restore, monitor and improve the diversity and connectivity of natural heritage features and areas and the long-term ecological function and biodiversity of Natural Heritage Systems.
> 6. Encourage, through education and incentive programs, the cooperation of property owners in the maintenance of, or enhancement to, the naturalization of lands and the sustainable use of our Natural Heritage System.

7. Monitor the potential impacts of climate change to maintain the integrity and resiliency of the Natural Heritage System and adjust management activities accordingly.
8. Provide opportunities for appropriate recreational activities based on the ecological sensitivities of the area.

Furthermore, the London Plan speaks to management, restoration and rehabilitation priorities for the City of London:

> 1417_ The City will encourage rehabilitation and enhancement measures that protect the ecological function and integrity of the Natural Heritage System. The City of London Subwatershed Plans provide guidance for the types of measures that may be identified through secondary plans, environmental impact studies, the Environmental Assessment process or other environmental studies or programs. Rehabilitation and enhancement measures may be implemented through conservation master plans, woodland management plans, or invasive species management plans on publicly-owned land and through stewardship and conservation programs for privately-owned lands.

Once the London Plan is approved by the province ~~and is in force and effect~~, the LIPMS will be updated to replace the current Official Plan policies identified for the LIPMS (as detailed below).

<u>City of London Official Plan, 2006</u>

The City of London's Official Plan aims to balance the goals of economic prosperity, community vitality, environmental responsibility, enriched cultural identity and infrastructure sustainability. Chapter 2, Planning Framework, of the Official plan provides for the direction of long term land use planning. Protection of the natural environment and conservation of heritage resources are identified as strategic priorities:

- 2.1.3 iv) Environmental Leadership – Valuing our natural heritage environment. Our goal is to protect a healthy and sustainable environment and encourage an environmentally-sensitive City

- 2.9 Environmental Planning
    - 2.9.1. Natural Heritage: While very little of the original landscape remains, there is a framework of naturally vegetated areas, natural features, corridors and

ecological functions, mostly associated with the City's valleys, ravines, and moraines, that can form the basis of a natural heritage system for London. It is our Green Infrastructure…equally as important as our built systems of roads, water and power supplies, recycling and waste management.

- 2.9.2. Environmental Goal:
  - i) Promote a healthy natural environment in London;
  - ii) Protect and enhance the Natural Heritage System for the benefit of present and future generations of Londoners
- 2.9.3. Environmental Strategies:
  - i) The City will promote an ecosystem approach to environmental planning… Recognizing that natural heritage areas are valued for the natural features they contain and the ecological functions they perform, the City will utilize area planning processes, environmental impact studies and guideline documents to ensure that natural heritage areas are evaluated and protected both individually and cumulatively as part of an interrelated Natural Heritage System.
  - ii) The City shall encourage a net gain in environmental quality through the implementation of the Official Plan. The City shall develop and implement monitoring programs to measure changes in environmental quality and assess the effectiveness of the Official Plan's environmental goal, objectives and policies.
  - iii) The City shall promote the rehabilitation of degraded ecosystems throughout the municipality and support appropriate rehabilitation works identified through the Subwatershed Planning Studies, community planning processes, or other environmental studies. Rehabilitation works may be undertaken in co-operation with landowners and other agencies and interest groups.
  - iv) The City recognizes the Thames Valley Corridor as its most important natural, cultural, recreational and aesthetic resource.
  - v) The City shall encourage, support and initiate, as appropriate, public education and awareness initiatives for the protection, rehabilitation and enhancement of the Natural Heritage System.

Chapter 15, Environmental Policies, of the Official Plan provides for the recognition, protection, and rehabilitation of significant natural features and ecological function in the City of London through the following applicable objectives:

- 15.1.1 ii) Provide for the identification, protection and rehabilitation of significant natural heritage areas.
- 15.1.1 iv) Enhance the contribution of the Natural Heritage System to urban form and community design.
- 15.1.1 v) Maintain, restore, and improve the diversity and connectivity of natural features, and the long-term ecological function with biodiversity of natural heritage systems.
- 15.1.1 vi) Encourage, through education and incentive programs, the cooperation of property owners in the maintenance of or enhancement to the naturalization of lands.

Section 15.2.2, Purpose of Natural Heritage Policies, of the Official Plan states that the Natural Heritage policies establish the requirements for the refinement and protection of the Natural Heritage System through public ownership/acquisition, stewardship, management and rehabilitation, ecological buffers and the preparation of area planning studies, environmental impact studies, environmental assessments or conservation master plans.

Section 15.3.5, Stewardship, of the Official Plan states that where natural heritage areas are privately owned, the City will encourage individual property owners to provide for their protection and conservation. In this regard, the City may use the following techniques:

(a) Stewardship agreements;

(b) Conservation easements;

(c) Education programs to inform landowners of maintenance and stewardship options available to protect or rehabilitate natural features and ecological functions;

(d) Encouraging the establishment of land trusts and the utilization of existing land trusts, as well as other mechanisms to purchase land and to rehabilitate, create or conserve natural heritage areas.

Invasive plant species management site priorities will follow the structure outlined in 15.3.7 of the Official Plan:

i) The City's highest priority for rehabilitating and enhancing the Natural Heritage System shall be those areas linking or adjacent to natural heritage areas that are subject to flood or erosion hazard constraints.

ii) With respect to specific components of the Natural Heritage System, the City's management and rehabilitation priorities are:

(a) Environmentally Significant Areas - to protect the existing ecosystem features and functions, to increase the amount of interior forest habitat, and to strengthen corridors.

(b) Wetlands - to protect the natural features and ecological functions of all Provincially and Locally Significant wetlands.

(c) Significant Woodlands and Woodlands - to protect existing ecosystem features and functions, to increase the amount of interior forest habitat, and to retain or restore linkages between isolated natural areas.

(d) River, Stream and Ravine Corridors - to protect existing ecosystem features and functions, maintain water resource functions, and rehabilitate eroded banks and channels.

(e) Upland Corridors - to retain or create linkages between isolated natural areas.

Ontario Invasive Species Act, 2015

The Ontario Invasive Species Act comes into force November 3, 2016. This Act was designed to provide enabling legislative framework to better prevent, detect, respond to and where feasible eradicate invasive species; promote shared accountability for managing invasive species; use risk-based approach that considers the full range of threats, costs and benefits to the environment, society and the economy; and complement the role of the federal government in managing invasive species

In the future, the Act may introduce regulated areas in Ontario as control areas for invasive species, and will work towards establishing measures to prevent introduction and/or control the spread of existing invasive species. Inspectors may make an order declaring land to be an “Invaded Place” if there is evidence that a regulated invasive species is present and the order is required to:

- Prevent the invasive species from spreading to areas outside of the place, or
- To control, remove, or eradicate the invasive species that is on or in the place

The Ontario Invasive Species Act supports the creation of additional plans, as these will enable enhanced partnerships and actions to support the prevention and control of invasive species across the province. The Act also provides tools for preventing the sale and distribution of invasives. The capability of the Act will be limited to dealing with the species that get listed in the regulations as being either “prohibited” or “restricted”.

Provincial Policy Statement, 2014

Section 2.0 of the Provincial Policy Statement recognizes the health of the environment and social well-being of Ontario is dependent on the conservation of biodiversity and the protection of natural heritage systems. This LIPMS deals specifically with policy 2.0, Wise Use and Management of Resources; and 2.1, Natural Heritage.

- Policy 2.1 recognizes the importance of ecological function and interconnectivity of natural heritage features.

- Policy 2.1.1 states “Natural features and areas shall be protected for the long term.”

- Policy 2.1.2 states “The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.”

Ontario Invasive Species Strategic Plan, 2012

The Ontario Invasive Species Strategic Plan was designed to outline objectives emphasizing the need to prevent new invasives from arriving and establishing in Ontario, to slow or reverse existing colonies, and reduce the negative impacts of established species.

There is no single piece of federal legislation that comprehensively deals with the control, prevention, and management of invasive species. Ontario is the only jurisdiction in Canada with such focused legislation. The strategic plan addresses the need for an Ontario perspective on invasive species management, and highlights the need for improved communication and

coordination between federal, provincial, and municipal levels of government, and the integration of industry and non-government organizations

Thames Valley Corridor Plan, 2011

The Thames Valley Corridor Plan addresses key land planning and management issues along the Corridor. The TVCP establishes an overall concept plan for the Thames River and associated corridor lands, and relates to the preservation and protection of the Natural Heritage System in the following manner:

- "The City recognizes the Thames Valley Corridor as its most important natural, cultural, recreational and aesthetic resource."
- 3.1 Natural Heritage, Stewardship, and Protection
    - NH-3: Internally, identify potential private land acquisition areas that may facilitate the restoration and/or expansion of forest cover and contiguous natural vegetation along the length of the Thames Valley Corridor. Priority areas for acquisition are those with a high diversity of Carolinian plant species or SAR as identified on the City's Ecological Land Classification (ELC) database, or that support interior forest habitats, or provide natural connections to the larger system.
    - TR-1: Protect and manage areas with unique or rare plant and animal species.
    - TR-2: Develop and implement a comprehensive restoration and management program focused on existing and new vegetation patches with objectives to protect, maintain and enhance natural areas and habitats.
    - TR-3: Target management efforts on vegetation patches with evidence of invasive species presence. Management initiatives should include invasive species removal, litter clean-up, and management of random trail use. The target habitats for invasive species management are those natural areas in good condition that currently have low abundance of invasive/non-native species. Containment of non-native species is more effective and less costly if control can begin at the first detection of invasion. The sites with heavy abundance are lowest priority unless they are associated with rare species or unusual communities or wildlife habitat that is compromised by their presence.
    - Table 1: Action Plan
        - E-4: Produce an informational brochure such as the 'Living With Natural Areas" pamphlet for residents living near the Thames River and its tributary

creeks, concerning impacts of household products on water quality, illegal dumping, managing yard waste, use of native species in landscaping, responsible use of natural areas.

Conservation Master Plans for Environmentally Significant Areas (ESA)

Conservation Master Plans (CMP) are completed to emphasize the protection and enhancement of the ecological integrity and ecosystem health of the Environmentally Significant Areas in the City of London. Invasive species management and control is addressed in detail for some of the City's ESAs. Recommendations, timelines and potential costs may also be identified in CMPs.

Urban Forest Strategy, 2014

The Urban Forest Strategy is a plan designed to outline the steps the City of London must take to protect, enhance, and monitor the urban forest system. The integration of invasive species management into the management of the urban forest system is a critical step in improving the health of the City's natural environment.

Section 4 focuses on the preservation and enhancement goals to achieve local natural biodiversity.

- 4.2: Manage natural areas to enhance biodiversity (i.e., enrichment planting, retention of wildlife trees and coarse woody debris, uneven distribution of plantings, proactive management of invasive species to enhance native species, etc.)

The importance of addressing the threats associated with invasive species and their influence on the health of the natural environment is outlined in Section 6 Improve urban forest health:

- 6.4: Develop and implement an integrated pest management plan encompassing insects, disease, and invasive species. The plan should address prevention, control and restoration within City-owned natural areas, and identify budgets and measurable targets for implementation. The plan should address pests on private property and provide the authority and empower the City to control pests on private property as required to ensure the overall health of the urban forest.

Best management practices for reducing the risk of invasive species establishment in newly naturalized areas are highlighted in Section 9:

- 9.4: Reduce the area of turf grass in the City through tree planting, with more selective mowing, to reduce costs. Areas with modified mowing require monitoring and management for invasive plants.

5.0 The Need for a Strategic Plan

Due to favourable environmental conditions and the nature of our society including industrialized, urbanized, locally and globally mobile, high population density, the large quantity of imports, the geographical location in close proximity to multiple access points to the American border, and the degraded habitat and ecosystems in the ecological regions; Ontario is home to the largest number of invasive species compared to any other province or territory. The City of London is located ~~within the Carolinian Life Zone, which although only totals <1% of Canada's land mass, is home to over 2,200 species of herbaceous plants. This species diverse life zone is also~~ Ontario's most ecologically threatened region (Carolinian Canada, 2016).

The LIPMS is designed to address the need to identify and prioritize invasive plants posing a direct threat to the City of London's Natural Heritage System. This strategy will provide direction for municipal action currently absent from documentation at the federal and provincial level. Canada's National Strategy, An Invasive Alien Species Strategy for Canada, and the provincial strategy, the Ontario Invasive Species Strategic Plan (2012), are essential tools in developing the framework of a London-specific strategy.

London is in need of additional strategies designed to assist in protecting the health of the Natural Heritage System. The LIPMS will use existing provincially-recognized best management practices for the identification, monitoring, treatment, and eradication of priority invasive plant species within the City of London. This management strategy will "encourage rehabilitation and enhancement measures that protect the ecological function and integrity of the Natural Heritage System," a priority identified in section 15.3.7 of the Official Plan. The maintenance and protection of the Natural Heritage System through the use of the LIPMS will reduce economic costs associated with invasive plant species control in the future, as well as improve social and recreational experiences and opportunities within the City of London.

The LIPMS is a working document that sets clear direction for the management of invasive plants within the City of London, specifically the Natural Heritage System; it includes the identification of priorities for management and control and public and landowner education.

The bottom line from the taxpayer's perspective is that invasive plants require residents to pay multiple times. They pay their share of the City's necessary control actions through their property taxes, they pay to control or respond to invasives on their own property (i.e. removal of killed trees), and they pay their provincial and national share of the increased costs of many amenities such as for electricity, food and clean water.

6.0 London's Vision

"*To improve the City's commitment to managing and protecting the Natural Heritage System from the threats, dangers and costs associated with invasive plant species presence*."

~~As identified in section 15.3.7 of the Official Plan, management of invasive plant species and associated restoration efforts will focus on specific components of the Natural Heritage System including the following:~~

a) Environmentally Significant Areas - to protect the existing ecosystem features and functions, to increase the amount of interior forest habitat, and to strengthen corridors.
b) Wetlands - to protect the natural features and ecological functions of all Provincially and Locally Significant wetlands.
c) Significant Woodlands and Woodlands - to protect existing ecosystem features and functions, to increase the amount of interior forest habitat, and to retain or restore linkages between isolated natural areas.
d) River, Stream and Ravine Corridors - to protect existing ecosystem features and functions, maintain water resource functions, and rehabilitate eroded banks and channels.
e) City of London Parks – to control invasive species and remove vectors into the Natural Heritage System
f) Upland Corridors - to retain or create linkages between otherwise isolated natural areas.

The implementation of the LIPMS will build on the successes achieved by current management practices in the City's ESAs and woodlands. These practices have occurred as outlined in various

Conservation Master Plans and the City of London's Urban Forest Strategy, and should expand into the Thames Valley Corridor and associated features.

The City of London must also consider following in the footsteps of the City of St. Thomas, that have committed to having the City 'Phragmites free' by 2020 (see *Appendix A*). When controlling invasive species it is important to work with regional partners and neighbours, as dispersal of invasive species can occurs from areas beyond a City's control. Co-operation at the local, regional, provincial, and federal levels will provide for the best opportunities to effectively control a species more quickly and reduce the long term economic costs and ecological consequences of priority invasive species.

7.0 Strategic Process

The LIPMS proposes to respond to the City's priority of rehabilitating and enhancing the Natural Heritage System as outlined in Section 15.3.7 of the Official Plan by addressing the spread of priority invasive plants in London through a hierarchical approach prioritizing the following processes:

1) Inventory/Mapping of existing priority invasive plants;
2) Early Detection and Rapid Response to new invasions;
3) Management of established invasive plant colonies (using containment, eradication control measures);
4) Restoration of native communities; and
5) Prevention of new invasions.

This strategic process will act as a guide to highlight invasive species management techniques suggested for implementation above and beyond currently performed by the City of London.

7.1 Inventory/Mapping

Goal: Identify and record specific priority invasive plant species within the Natural Heritage System in London, with a focus on the City's ESAs, Wetlands, and the Thames Valley Corridor.

Purpose: To create a benchmark for future management activities and ability to monitor the spread and reduction of priority invasive plants within the focus areas.

An invasive plant inventory provides the foundation for all management decisions and supplies critical information including the following details:

- What invasive plant species are present
- Where the invasive plant species located
- Potential vectors/pathways of introduction
- Presence of rare species and/or rare community types
- What control activities have already been taken
- How effective previous control activities were and status of the infestation

The LIPMS will ~~primarily~~ focus on addressing priority invasive plants on City-owned lands. Identifying priority invasive plants found within Natural Heritage Features on Schedule B1 on City lands will be the focus for City resources, invasive plant inventories and management.

Early Detection and Distribution Mapping System (EDDMaps) Ontario is a web-based mapping system for documenting invasive species distribution. This existing provincial system is a fast and easy way to map invasive species without requiring any GIS or technical computer experience. Promoting the use of EDDMaps to the public not only helps homeowners become more engaged, but also educates them about invasive species recognition. Using a common reporting tool allows the distribution information to be kept in one central database, using existing framework that can be easily accessed by City staff.

Currently identified invasive plant species of concern in London's Natural Heritage System that will be included in the City of London's "watch-list" will include:

- Phragmites
- Japanese Knotweed
- Common and Glossy Buckthorn
- Goutweed
- Garlic Mustard
- Dog Strangling Vine
- Giant Hogweed
- Periwinkle
- Purple Loosestrife
- Black Locust

~~From the above list, due to both economic reasons and potential significant impacts to the City's Natural Heritage System or human health concerns, efforts must be focused on "priority species".~~ Effective invasive species control can only come from focused and sustained efforts over the long term. Without consistent and sustained efforts, reintroduction into managed areas is likely and the original time, resources, and funds put into the project could be wasted. The City of London will focus on the following species and designate them as "priority species":

- Phragmites
- Japanese Knotweed
- Dog Strangling Vine
- Giant Hogweed

Developing a watch list to highlight particular species of concern in the London area will increase the likelihood of new invaders being caught quickly. Identifying and recording all vectors (or pathways of introduction) is crucial to managing the introduction of future invasive plant species. Vectors can include the following:

Vectors (Pathways of Introduction)

- River, stream and ravine corridors
- Drainage ditches (along roadways)
- Garden escapes/disposal of yard waste in natural areas
- Nursery sales
- Contaminated topsoil/mulch
- Contaminated equipment
- Long lasting seedbank on heavily invaded sites

7.2 Early Detection & Rapid Response

Goal: Identify new, priority listed invasive plant species within the Natural Heritage System as early as possible to prevent establishment and future spread.

Purpose: Initiate Best Management Practices when environmental, social, and economic costs are lowest.

Early Detection and Rapid Response (EDRR) is a proactive approach to managing invasive plant species within the Natural Heritage System by reducing the likelihood that new arrivals will establish. Early detection of newly arrived invasive plants, followed by a well-coordinated rapid response, increases the likelihood of control or eradication. EDRR has proven to be the most cost-effective means of controlling the expansion of invasive species in North America.

An EDRR plan consists of six key steps:

1) Early detection – Observation, preliminary identification and reporting of invasive plants believed to be new to the area
2) Identification – Species verification
3) Alert Screening – Confirms whether the species is new to the area and present at an extent deemed eradicable; evaluated risk and determines if the species is designated as prohibited provincially or federally
4) Risk Assessment – Measures probability of entry, establishment and spread, and the associated economic, environmental and social impacts. Assign assessed species a risk rating of high, medium, or low – this determined how the EDRR process will proceed
5) Rapid Response – Development and implementation of a response plan, including obtaining land access and treatment permits
6) Monitoring & Reassessment – Evaluation of the success of the response and whether the EDRR objectives were achieved; reassessment of the pan as new monitoring becomes available

Areas within the Natural Heritage System with a priority invasive plant species present that are within or in close proximity to rare native species or rare community types should be addressed with a higher priority. Newly established areas that contain priority invasive plant colonies are also important to identify and control as early as possible to prevent spreading and long-term establishment of the priority invasive species in the area.

7.3 Management

Goal: Use published Best Management Practices (BMPs) for invasive species removal and control.

Purpose: Control invasive species in London's Natural Heritage System. Appropriate biological, physical/mechanical, and/or chemical strategies can be determined through the consultation of current BMPs for each identified priority invasive plant species. Control decisions should be made based on the knowledge of potential damage, costs, and environmental impacts.

7.4 Restoration

Goal: Reintroduce native species to management areas following invasive species removal.

Purpose: Restore native vegetation to the Natural Heritage System.

Removing invasive plants can result in the loss of all vegetative cover, creating an ideal condition for new invasive plants to move in. In some areas, native plants will return naturally after treatment. In these cases, there are enough native plants to re-vegetate newly cleared areas through seed germination or plant spread. However, other areas may require restoration through selective planting and/or other methods to reduce the risk of soil erosion and re-invasion by non-native plants.

Suggested restoration methods include:

- Natural colonization or succession
- Seeding with native grasses/herbaceous species
- Planting appropriate native trees and shrubs
- Planting live cuttings
- Use of landscape cloth or heavy mulching

Seeding should also be used in areas where new naturalization plantings occur to reduce the risk of invasive plant establishment on newly disturbed soils. Seed mixes and procedures shall follow the updated City of London's Construction Specification for Seeding and Cover protocol (2015). The use of native, pollinator-friendly seed mixes is required.

Current BMPs for select invasive plant species have been identified and outlined on the OIPC website and associated publically available documents. These BMPs will be the reference for mechanical, chemical, and biological control measures when managing invasive plant species.

7.5 Prevention

Goal: Reduce the risk of reintroduction and spread of invasive species into the Natural Heritage System.

Purpose: Minimize the rehabilitation costs associated with delayed treatment of established and new invasive species colonies.

Risk analysis and technical measures will be utilized to minimize the risk of unintentional invasive plant species introductions. Prevention strategies will include increasing risk assessment capacity, accessing and conducting scientific research and staying up-to-date on the more current BMPs for identified priority invasive plant species, and the development of public education and engagement programs to promote awareness of invasive plant species management to engage local homeowners and volunteers on municipal properties.

Continued promotion of the Clean Equipment Protocol (available on the OIPC website) is essential to preventing additional spreading of invasive plant species from various sites within the Natural Heritage System.

Private landowner education is imperative to the reduction of invasive species presence and dispersal, especially to those homeowners with property within or adjacent to the Natural Heritage System.

Eliminating and/or prohibiting the growth and resale of invasive plant species in nurseries, as well as at non-commercial plants sales and “swaps”, is a necessary future step to reducing the establishment of new invasive plant species in London. Educating homeowners about the risk of impacting environmental health with the introduction of invasive species in private gardens, and promoting native species is also important. The City of London’s existing “Growing Naturally” program is an example of how the City is currently educating homeowners about ways to conserve water, and plant native species at home.

Other municipalities, conservation authorities, Aboriginal communities, and many private and non-government organizations are also active in the management of invasive plant species.

Building an effective communication network with these external stakeholders will be imperative to invasive plant species prevention.

The London Environmental Network (LEN) is currently a not-for-profit organization in London that hosts a variety of workshops and develops resources for local businesses and community partners looking to learn how to make more environmentally friendly decisions. Utilizing local partners like LEN and their existing networks will be extremely beneficial to the City's goal to educate the public about responsible invasive species management practices and reach a larger audience.

8.0 What Have We Done?

a) *Invasive Terrestrial Plant Species* Overview – UTRCA, 2012

The Upper Thames River Conservation Authority (UTRCA) completed a survey in 2012 of invasive terrestrial plant species within the following seven ESAs:

1. Kains Woods;
2. Warbler Woods;
3. Medway Valley Heritage Forest;
4. Kilally Meadows;
5. Sifton Bog;
6. Meadowlily Woods; and
7. Westminster Ponds/Pond Mills.

Priority invasive plant species were identified prior to the observation survey based on species listed by the Ontario Ministry of Natural Resources; species posing a significant threat to Ontario's biodiversity; previous knowledge of London's invasive species presence within ESAs; easily identifiable species; and invasive species with available control methods (UTRCA, 2012).

Eleven invasive terrestrial plant species were surveyed for infestation level (compared to native species presence), and density (in relation to total ground cover of the observation area).

b) *Environmentally Significant Areas (ESAs)*

The City of London has been consistently implementing ecological restoration projects in ESAs since 2006. With a focus on invasive species removal, these restoration projects are essential to protecting the ecological integrity of ESAs. The City is an identified leader in demonstrating a proactive approach to the management and control of invasive species in protected natural areas and the policies, actions, and best management practices implemented by the City are under review by the MNRF as they work to determine how to implement the Ontario Invasive Species Act when it comes into force on November 3, 2016.

Habitat protection, restoration and stewardship work is a priority in London's public Environmentally Significant Areas (ESAs) in order to protect and enhance their ecological integrity. This restoration work is consistent with the Conservation Master Plan recommendations for ESAs. The City and members of the Upper Thames River Conservation Authority (UTRCA) ESA team complete most of the restoration work through their contract with the City. Trained volunteers with the City's Adopt an ESA program also participate in restoration projects demonstrating their commitment to local stewardship.

Conservation Master Plans have been completed for many ESAs within the City of London. These council-supported documents outline recommendations that highlight the importance of actively managing the natural features and functions of an ESA, including the management of invasive species, recording and monitoring invasive plant species presence, and recognizing that the removal of aggressive invasive species is a priority. The City of London developed and successfully implemented an Invasive Species Management Plan for the Medway Valley Heritage Forest (MVHF) ESA to mitigate impacts to Species at Risk (SAR) and Conservation Concern species.

c) *Community Engagement*

The City's Adopt-A-Park, Adopt-An-ESA and "Friends of" groups have been donating volunteer time over the past decade to assist in the physical removal of various invasive plant species from parks and ESAs. Community "Buckthorn Busting" events are promoted

by the City in ESAs and parks in partnership with the City of London Urban Forestry section and UTRCA. In addition to this, the City holds dozens of naturalization planting events in partnership with ReForest London and various community groups, the majority of which are business or volunteer oriented, to promote the growth of native vegetation on public lands.

d) *Woodland Management*

The City has been treating invasive plants in parks and woodlands across London for years. Since 2012, $60,000-$70,000 has been spent in 13 parks and woodlands treating buckthorn, English ivy, garlic mustard, periwinkle, Japanese knotweed, and Norway Maple across 30 hectares of City-owned land.

On average, reactive invasive plant species management is costing $2000 per hectare to treat. This includes spot treatments, patch work, and up to three follow-up visits per site.

e) *Parks Operations*

The City of London is actively looking for areas to naturalize and reduce the amount of mowing that is required in City Parks. Parks Operation staff are being trained to identify invasive species while out in the field.

9.0 Next Steps

9.1 Incorporate Invasive Plant Management into Land Use Planning

Municipalities are responsible for land use planning, which ensures that natural heritage features and resources are considered in community development. It also helps to plan for the incorporation of goals such as an increase in urban forests, and a reduction in urban sprawl. There are considerations around development and the spread of invasive plants. The incorporation of invasive plant management strategies into development plans will help to address this issue. It is also important to look at the sources of topsoil/infill brought into development sites and what they could contain.

The OIPC has created the Grow Me Instead Guide which lists a number of alternative plants to many common garden invaders. This guide is geared towards individual landowners and can be incorporated into new housing developments as information to new homeowners.

9.2 Promote the use of EDDMapS in Ontario

Preventing invasive plants from arriving and becoming established in Ontario is critical in the fight against this growing threat. EDDMapS is a fast and easy way to map invasive species without requiring any GIS or technical computer experience. By promoting the use of EDDMapS to the public, this can help engage them in learning more about invasive plants. Promoting the web-based and smartphone app will improve tracking across the province, resulting in better species distribution maps. If more people are using the program, there is a higher change that detection of new species will occur, which will enable rapid response.

Although it is important to track the distribution of all invasive plants within the province, the focus within this municipal strategy will be on public tracking of species on the pre-determined Watch list. Tracking Watch List species using EDDMapS increases the likelihood of new invaders being caught quickly.

9.3 Contaminated Materials and Equipment (Clean Equipment Protocol)

Invasive plants and their seeds can be dispersed by many vectors including wind, water, animals, illegal dumping, vehicles, and contaminated material. It is not feasible to control all of these vectors; however, there are strategies that can be adopted to reduce the spread of invasive plants through those pathways.

One of the most common and preventable pathways through which invasive plants spread into natural areas is the illegal dumping of green waste. Natural areas, parking lots, borders shared by residential neighbourhoods sometimes becomes dumping sites that may lead to new invasions. Education and promotion of proper disposal techniques, including green waste that targets both residents and landscape contractors may help reduce this problem.

Control of potentially contaminated materials (e.g. fill, soil, gravel, excavated materials from construction sites, etc.) at the source also helps to prevent the spread of invasive plants. Raising

awareness of the problem among target audiences (e.g. construction, demolition and landscape contractors) is a first step towards addressing this issue. Simple measures such as inspecting and cleaning equipment and vehicles after they come in contact with contaminated materials will reduce the likelihood of spread.

9.5 Staff Training and Education

Municipal staff play an important role in invasive plan prevention and management. With adequate training, staff can assist with tracking and mapping invasive plants, as well as communicating with the public.

Most staff training and education can take place through workshops in partnership with local non-profit organizations that are specialized in invasive plants. Workshops can focus on a number of things including invasive plant identification, using EDDMapS Ontario, Invasive Plant Best Management Practices for control, tips on communicating with the public and the Clean Equipment Protocol. Staff should be updated regularly on new information regarding invasive plants and the strategy through emails, meetings or newsletters. Engage staff through encouraging participation in invasive plant volunteer events.

9.6 Public Education and Community Based Social Marketing

Engaging landowners and the general public is a key component in the prevention, introduction, spread, and management of invasive plants. Comprehensive outreach and education provides residents with information and tools to take appropriate action against invasive plants on their own property; and can include encouragement to support the work of local stewardship groups and non-profit organizations. Effective communication with residents and the public can be done in a number of ways (e.g. websites, social media, mail-outs, workshops, signage, etc.).

Taking advantage of the City of London's existing corporate communication strategies to educate and inform London residents of the threats and harms of invasive plant species will be an extremely valuable tool to managing the city-wide invasive plant species issue. In future, it would be an added benefit for the City of London to develop a communication plan solely focused on invasive plants.

An important component of this public awareness is effectively communicating the "before-and-after" appearance of the landscape in areas undergoing large-scale invasive plant species work. This will also be an excellent method of introducing the concept of replanting native vegetation to the site to prevent colonization of invasive plants in recently disturbed environments.

Using the City's EnviroWorks pamphlets that are currently distributed multiple times throughout the year to London residents, updating the City website, utilizing existing social media platforms, and hosting landowner workshops in partnership with local non-profits (like the London Environmental Network) and community groups are all examples of how the City can improve the promotion of invasive species management at a private landowner level.

In addition to more traditional programs on public education, Community Based Social Marketing (CBSM) emphasizes direct contact with community members and removal of barriers that are preventing behavioural change. It is one method of fostering behavioural change that is sustainable. Implementing a CBSM strategy in London will help to better understand what influences behaviour.

With a CBSM strategy based around invasive plant species management in London, the following five steps can be taken:

1. *Selecting desired behaviours* – preventing the spread of invasive plant species in London as a result of irresponsible private home owner and/or construction and contracting crews' activity.
2. *Identifying the barriers and benefits to an activity*

Barriers	Benefits
- Reaching a large-scale audience - Addressing challenges faced by private homeowners vs. construction crews	- Higher success rate of invasive species removal across London

3. *Developing a strategy that utilizes "tools" that have been shown to be effective in changing behaviour* – collecting existing resources to present to the public community (examples: clean equipment protocol, EDDMapS, species identification, reporting process).
4. *Piloting the strategy* – holding workshops, training sessions, webinars and community events in pilot neighbourhoods in London.

5. *Evaluating the strategy* – measuring the popularity and/or demand of continuing workshops, training sessions, webinars and community events and how effective these techniques were at physically removing and preventing the spread of invasive plant species in London.

9.8 Storm Water Management

As part of the LIPMS, it is critical to involve other departments in order to address invasive species from multiple angles and utilize various resources. The Stormwater management unit will help to conduct invasive species inventories of SWMFs (specifically for the priority species Phragmites) and look to implement invasive species control works on SWMFs adjacent to the Natural Heritage system or when conducting maintenance of their facilities.

9.10 Parks Operations

The Parks Operations unit will play a central role in the LIPMS. A new dedicated team will be conducting invasive species inventories of natural areas located within the parks and green space system. The next step for this team is to be directly implementing EDRR protocols for priority invasive species. This will greatly improve addressing invasive species invasions within City Parks and adjacent Natural Heritage features by eliminating vectors and promoting native species in naturalized areas.

Parks Operations in conjunction with Environmental and Parks Planning will look into developing a specific plan addressing Phragmites control along roadways and drainage ditches (these areas are maintained by Parks Operations), which is the primary vector for this priority invasive species. It would be greatly beneficial for Parks Operations to have licenced pesticide applicators as part of their team. This would increase the efficiency of this team, the implementation of the EDRR protocols, and allow for increased invasive species control options to effectively implement the LIPMS.

10.0 Recommendations

The LIPMS is the first to set out a vision for controlling multiple invasive species across the entire City. The following recommendations are direct applications needed to implement the strategy. Each recommendation will require specific funding to fully and effectively implement:

1) Develop a Phragmites control program according the strategic process (Section 7.0) outlined in the LIPMS. This is the City's highest priority species as it poses the biggest threat to the ecological integrity and long term health of the City's Natural Heritage System. This program is to be developed in conjunction with other City departments outside of Environmental and Parks Planning to make it a city-wide control program. This program will include reaching out to City of London neighbors and provincial and federal partners with the intent of creating a larger regional approach to controlling this species as quickly as possible.

2) Further expand what the City is already implementing in our ESAs. The UTRCA's ESA team funded by the City has been paramount in the City's invasive plant control activities for many years. Further expanding their capability to implement additional control measures following the Strategic Process (Section 7.0) on a regular basis throughout the ESAs will provide a significant net benefit to the City's ESAs over the long-term.

3) Implement the Council approved Thames Valley Corridor Plan, including the invasive species control and restoration works along the Thames River corridor.

4) Develop further control programs for listed priority species over time, once recommendations 1-2 have been implemented and their effectiveness has been tracked, monitored, and verified.

APPENDIX A: *Phragmites australis* (European Common Reed) – Canada's Worst Invasive Plant

Phragmites is an aggressively spreading grass that can reach heights of more than 5 metres (16.4 feet) and densities of over 200 plants per square metre. In 2005 it was recognized as Canada's worst invasive plant by scientists at Agriculture and Agri-food Canada. Since then it has spread throughout Ontario and become a significant threat to London's wetlands and riparian corridors where it has the potential to drastically reduce plant and animal diversity and threaten a high number of Species at Risk (SAR).

The known negative impacts of Phragmities include:

- Blocking recreational access and aesthetic enjoyment of riparian corridors and wetlands
- Standing dead biomass is a significant fire hazard to hydro corridors & residential areas
- Blocks sight lines along roads and at intersections
- Damage to asphalt roads from Phragmities rhizomes
- Plugging agricultural drainage ditches and tiles, impacting crop yields
- Native plant species cannot effectively compete against Phragmites
- Phragmities stands are monocultures that effectively become wildlife dead-zones
- Reduces or eliminates habitat for high number of Species at Risk

Recent studies have identified roads, rail lines and the movement of infested heavy equipment as the main vectors for the spread of Phragmities. Currently Ontario lacks the coordinated approach required to effectively deal with Phragmites and curtail its spread.

Local control programs are underway in many of Ontario's municipalities including London where Phragmities is managed in a number of our Environmentally Significant Areas and Parks. While this is an important first step, a Phragmities Management Plan should be developed for London while it is still feasible to protect our City and our Natural Heritage System from Canada's worst invasive plant. In 2015 the City of St. Thomas began implementing their Phragmities Management Plan to become a "Phragmities Free City by 2020" through an annual budget of $13,000.

The knowledge obtained through these control efforts is summarized in Best Management Practices (BMPs) endorsed by the MNRF and OIPC to provide guidance for the most effective and efficient way to manage Phragmities. City of London staff has experience in implementing BMPs and recently contributed to the development of a BMP for Controlling Invasive Phragmities in Ontario's Roadside Ditches.

The most important message is that **Phragmites must not be ignored**. Established Phragmites cells can expand at an exponential rate and will eventually become problematic. The quicker an infestation is dealt with, the easier and less costly it will be to manage.

Appendix B Case Study – City of St. Thomas "Phrag Free City 2020"

What is the geographic scope of your project?

- All lands located within the incorporated City of St. Thomas, Ontario

What type of project is this?

- Direct management
- Education and Outreach
- Planning

Why is Phragmites an issue in your area?

- Phragmites growing around lakes, along streams and rivers, along the road, hydro corridors, and at intersections is posing a public safety risk and is also impacting recreation opportunities and ecosystem-health.

What is your organization's approach to invasive Phragmites management?

- Mapped Phragmites (Fall 2014 and updated Fall 2015 update annually)
- Year 1 – Phragmites Management Plan created
- Budget provided by Council
- 5 year Letter of Opinion - MNRF (Pesticide Act & Ontario Regulation 63/09) & Council
- Eradication program implemented
- Eradication along shoreline of lake, meadow and two storm water management ponds
- Severe fire hazard areas eradicated as priority one
- Selected road corridors, ditches sprayed
- Years 2 to 5 - Visual check and re-spray as necessary
- Eradicate identified Phragmities cells in the City to limit of budget annually to 2020

Who are your partners in this effort?

- City of St. Thomas and Doug Tarry Homes – year 1
- City of St. Thomas – subsequent years
- Parks and Rec., Roads, Fire and Police Services

What are the funding sources?

- City of St. Thomas and Doug Tarry Homes shared equally – year 1
- City of St. Thomas – subsequent years (13k per year - 5 years)

What are your goals and objectives for the program?

- Phrag Free City by 2020

What type of land does your program target?

- All public and private lands within the city including those held by Conservation Authority

What is the status of the program and are you seeing results?

- Year 1 tremendous success around lakeshore even with no spraying over water
- Year 2 was equally successful in hydro and road corridors based on visual evidence
- Respray of Year 1 area indicates full eradication in those locations

Can you share important lessons learned - both about what worked and what did not work?

- Lobbying Federal Health Ministry to approve a safe over water pesticide for Phragmites
- Absolutely imperative to partner with the City Council
- At this time the Phrag Free City plan shows no down side