

# Invasive Species Centre

## Stratford Invasive Plant Plan

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Completed for the Corporation of the City of Stratford

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## Introduction

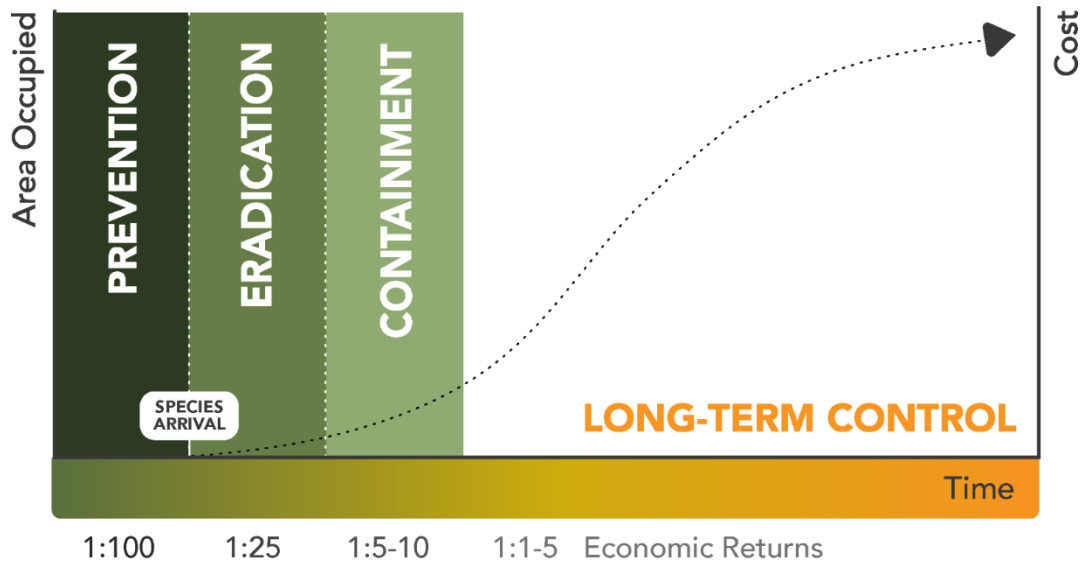
Invasive species are considered one of Canada’s greatest threats to the survival of our native biodiversity. Non-native species arrive from other parts of the world unintentionally through several different pathways or are brought intentionally through horticulture or pet trades. When they establish, spread, and cause negative ecological, societal, or economic impacts in their non-native range, they are considered invasive. These species arrive, often accidentally, and establish in the absence of natural predators. Because Ontario is highly urbanized with a large, mobile population and is a hub for international trade, it has more species of invasive plants than any other province in Canada and is at the highest risk of new introductions (MNR, 2012). These plants often outcompete native flora and create poorer quality habitat for native fauna, compromise human recreational activities and aesthetic values, and are costly and labour-intensive to manage. Invasive plants pose threats to agriculture and forest ecosystems due to their ability to spread quickly, out-compete crop and forest plants, and deteriorate soil quality. Some invasive plants even pose health risks and safety hazards, like giant hogweed, which causes severe chemical burns to the skin after contact, or *Phragmites australis* (henceforth referred to as invasive *Phragmites*), which can obstruct the sight line of drivers.

Municipalities are on the frontlines of invasive species management in Canada. Spending an estimated \$247.9 million annually on invasive species, most respondents to a 2021 National Municipal Expenditures survey reported that they expect the costs of management to increase over the next five years (Vyn, 2021). Out of the five invasive species most frequently reported as a top priority in the province of Ontario, three of them (invasive *Phragmites*, giant hogweed, and wild parsnip) were plants (Vyn, 2021). In Ontario, municipalities and conservation authorities incur immense expenditures for the prevention, detection, control and management of invasive plants. A 2019 survey found that over \$1.3 million was spent by municipalities and conservation authorities on invasive *Phragmites* alone, making up 6.3% of total expenditures on invasive species (Vyn, 2019). Out of the 25 invasive species reported in this survey, 11 were invasive plants, and 4 of these species were in the top 10 most costly invasive species.

To reduce the long-term impacts of invasive species, more investments in prevention are needed across all levels of government. Investing in prevention provides economic returns of up to 100 times higher than the management costs after a species has arrived and spread (Figure 1). Management costs increase and the likelihood of eradication decreases as time passes. At a certain point, populations become impossible to eradicate from an ecosystem and are either managed at a cost to the municipality, or they are left to spread across a landscape causing ever-increasing impacts and losses to the economy, society, and environment.

Although prevention is the most cost-effective approach to mitigating the impacts of invasive species, less than 20.4% of funds spent by Ontario municipalities are spent on prevention programs while an estimated 79.6% of municipal budgets available are spent on control and management (Vyn, Richard, 2019). This suggests that expanded investments in prevention can reduce the community’s long-term

management costs.



**Figure 1.** The Invasion Curve illustrates the rising costs of invasive species as they establish and spread over time and the economic impact that is potentially gained as the species is contained and eradicated. Prevention is the most cost-effective approach to invasive species management (Image via the [Invasive Species Centre](#); Adapted from the Generalized Invasion Curve ([Agriculture Victoria, 2010](#)).

The City of Stratford has demonstrated a clear willingness to manage invasive plants through its collaboration with the Upper Thames River Conservation Authority and the Energy and Environment Committee, who suggested that the City develop an invasive plant plan. It is noted in the City's *Urban Forestry Plan* that while tree removal is a last resort in the care and maintenance of the urban canopy, a tree may be removed if it is host to virulent insects or diseases or is chronically invasive to public or private property. Decisions about what species to control, what programs to implement to prevent new arrivals, and how to ensure resources are shared and used effectively across implicated City departments are all challenges that can be addressed with some strategic thinking and an initial pilot program. Natural areas such as T.J. Dolan and Lake Victoria, where commendable invasive plant management efforts are already in progress, offer the City an opportunity to adopt a broader strategic approach to invasive species management.

The Invasive Species Centre (ISC) is a non-profit organization that offers expertise in invasive species management, policy, economics and education. The ISC presents the *Stratford Invasive Plant Plan (SIPP)*. The plan is built around three lists of invasive species: the Occurrence List, the Management List, and the Watch List created for the City of Stratford. It synthesizes work done to date by the City and partners on invasive plants in and around the T.J. Dolan natural area and Lake Victoria. Recommendations and resources to improve prevention and management of invasive plants are included. The scope of management outlined by the SIPP includes City-owned and operated lands, as well as the situations where the City holds relevant oversight such as those governed under the Weeds Act (e.g., Noxious Weeds List) and Lot Maintenance by-law.

### Invasive Species Management

The Invasion Curve (Figure 1) demonstrates that the most cost-effective way to address invasive species is prevention and early containment. Unfortunately, many invasive plants arrive undetected and spread

rapidly causing significant harm to Canada's environment, economy, and society. By the time a strategy is underway, there is typically already a long list of invasive plants that have been established in the focus area and require management. Additionally, it is very uncommon to have sufficient resources to remove every invasive species, so prioritizing where to allocate limited resources becomes a wise step to maximize public investment. Prioritization frameworks can be developed to help make management decisions, starting with sorting invasives into occurrence, management and watch lists. To maximize effectiveness, invasive plant management should be combined with new or updated policies, strategies and implementation plans, and public education.

## Prevention

Prevention intercepts pathways of spread to stop a potentially invasive species from arriving in the first place. Pathways of spread are how invasive species move to new locations. They may include the movement of whole species or viable parts of a species via humans, wildlife, vehicles, and commodities, both locally and through international trade routes and borders.

Pathways analyses can inform prevention work. They can be species-specific or address an entire taxon such as invasive herbaceous plants or aquatic invasive species. Pathways can also be identified using geographic areas, such as a natural area or a city park. A natural area can be vulnerable to invasive species depending on the health and integrity of the ecosystems present, recreation and development pressure, and surrounding land use.

Prevention programs are most effective when they focus on multi-species-specific pathways and include a clear call to action. Preventative activities can include monitoring and detection, public education and awareness, and/or specific activities to reduce the likelihood of arrival.

## Examples:

- The [Clean-Drain-Dry campaign](#) aims to reduce the spread of aquatic invasive species through public education and the installation of watercraft decontamination stations. These stations enable boaters to clean their boats to reduce the likelihood of spreading invasive plants and invertebrates to other bodies of water. Accompanying signage educates the public about the impacts of invasive species and ways they can reduce their spread.
- Boot brush stations placed at trail heads encourage trail users to brush their boots clean of plant materials and seeds before entering the trail. They can stand alone or be associated with interpretive signage.
- The [Play-Clean-Go campaign](#) targets anyone who recreates outdoors with messaging about cleaning their boots and equipment, checking their pets, and staying on trails to prevent the spread of invasive plants and insects. It also encourages the public to learn to identify common invasive species and report them.
- The [Grow Me Instead campaign](#) targets the horticultural industry with information for the consumer about what native species can replace commonly sold ornamental plants that often escape gardens and establish in parks and natural areas. The campaign aims to encourage consumers to choose native species for their landscaping and gardening projects.
- The [Don't Move Firewood campaign](#) encourages the public to buy and burn their firewood locally. The movement of firewood is a major pathway of spread for many invasive insects, but invasive plant material and seeds can also travel on firewood.

## Management

### *Eradication/Containment*

When prevention is not successful, invasive plants establish and begin to spread. There is a limited time for eradication efforts to occur and succeed; more often the task is about containment.

Containment involves stopping the spread of an invasive species and containing it to one area and requires confidence that the extent of a new invasive species is fully known. Eradication of a contained species can take years, depending on how many reproducing individuals have established and whether the containment activities were successful.

Eradication and containment of invasive species necessitates early detection and rapid response (EDRR). EDRR programs need to be informed to be effective: what species are coming next, what species are just arriving and have not yet widely spread, and what species will require rapid response and pre-arrival preparations for control. EDRR programs commonly focus on newly arriving invasive species from outside the management area, but some property management plans, or city-wide plans, may include species on the containment list when they are recently established, or slow spreading, and there is potential to eradicate them from the focus area. Decisions about rapid response investments are often guided by existing priorities, strategic plans, and property management plans as well as investments being made in adjacent jurisdictions. A land manager may sometimes be required to move quickly and prepare for a new invasive species. A notable example is the emerald ash borer (EAB). EAB arrived in Detroit on wood packaging materials in the early 1990s, reaching Stratford Ontario by 2011. When EAB arrived in North America, not much was known about these insects. The CFIA and local municipalities moved fast with attempts to contain its spread, but EAB proved too aggressive for any containment effort in southwestern Ontario. EAB continues to spread across Canada today.

Effective containment programs will include regular check-ins with a broader invasive species field of professionals to regularly update the watch list, and to keep land manager's alert. Regular updates to the public could increase the likelihood of detecting an incoming invader.

Successful containment and eradication programs are not common, but the eradication of Asian longhorned beetle is one example. After ten years of control work aimed at eliminating the Asian longhorned beetle from Toronto and Vaughan, the Canadian Food Inspection Agency declared the pest eliminated in 2013. The program involved cutting and chipping infested trees and all potential host trees within 400 metres of an infested tree, followed by surveys to determine if any beetles remained. After 5 years of no detection of beetles or infested trees, the pest was declared eradicated.

### *Long-term Management*

If an invasive plant is not successfully prevented, contained, or eradicated, it may establish and spread beyond any possibility of eradication without a longer-term management strategy. Any species targeted for long-term management without a strategic plan for how to control its extent and spread will often fail to achieve containment of the target species.

Long-term management strategies can be specific to a species, a taxon (like in the case of a plant management plan) or more comprehensive. They usually include occurrence mapping to understand the pattern of infestation, control planning, hiring contractors for control implementation, and long-term monitoring. Some strategies may also include new policies, training and professional development, and extensive education and outreach programs to ensure the public is supportive and aware of control methods.

While controlling an invasive plant population, challenges will surface, new methods may arrive, and some species may develop resistance to tried and true methods. Long-term management programs should include research, monitoring and development activities because learning from the results of different techniques and adapting methodologies accordingly is essential to long-term success.

Some examples of long-term management programs include:

- The County of Norfolk where the Long Point *Phragmites* Action Alliance is leading a watershed approach to *Phragmites* management. The Control Implementation Plan suggested a Phrag-free watershed within 8 years and incorporates control activities on private and public land.
- Lambton Shores *Phragmites* Community Group has been implementing a *Phragmites* Management Plan over the last 10 years. Their work has transformed the shoreline into a *Phragmites*-free zone. This program engaged municipal drain superintendents, road departments, and associated private land, to ensure *Phragmites* was entirely controlled in these areas. The program is shifting to long-term management activities to ensure invasive *Phragmites* does not re-establish in the community.
- The York Regional Forest Invasive Species Action Plan includes a detailed prioritization framework that helps city staff make decisions about when to manage an invasive species.
- The Nature Conservancy of Canada will implement invasive species management on their properties using Property Management Plans. The non-profit organization will start with occurrence maps and then track stewardship activities over time, remapping target invasives using appropriate intervals (e.g., 5 years). Property Management Plans will target aggressive invasive species that threaten the specific ecosystems that occur on the property.

## Goals and Objectives

The Stratford Invasive Plant Plan has 3 goals and 10 objectives.

### **Goal 1: Increase the efficiency of invasive plant management in the City of Stratford**

- Compile a comprehensive occupancy list of invasive plants already present in the City
- Identify invasive plants that are high priority for long term management
- Provide resources that can support management and control of high priority species and containment species
- Recommend actions, programs, and initiatives the City of Stratford can implement to improve the effectiveness and efficiency of invasive plant management in the City

### **Goal 2: Prevent new invasive plants from arriving in the City of Stratford**

- Review current policies that are aimed at preventing invasive plants
- Recommend policy, actions, programs, and initiatives that will prevent invasive plants
- Create a Watch List of invasive species that are not in the City of Stratford but are nearby or at a high risk of being introduced
- Provide resources that can support prevention activities

### **Goal 3: Increase public awareness about invasive plants in the City of Stratford**

- Recommend actions, programs, and initiatives the City of Stratford can implement to increase public awareness and support for invasive plant management in the City



## Using this Strategy

The Stratford Invasive Plant Plan is presented as two interrelated pieces:

1. **The Stratford Invasive Plant Plan** is this document that describes the Plan and includes 5 appendices.
2. **The Stratford Invasive Plant Plan Lists and Resources** is an associated Excel Spreadsheet that contains various lists associated with the Plan as well as resources and links to external information to help City staff find relevant information quickly. The written plan will refer to the spreadsheet as required throughout the document.

## Priority Areas

Under the SIPP, the T.J. Dolan Natural Area and Lake Victoria are designated as priority areas for invasive plant management within the City of Stratford. This is to reflect the importance of maintaining the ecological integrity of natural recreation spaces within the City and to protect gains made in invasive plant management in these areas.

The T.J. Dolan Natural Area encompasses a heavily used trail that runs along the Avon River. A residential subdivision, seniors' home, and public school back onto the area to the north. It is also near a wastewater treatment plant and across the river from the Avondale Cemetery.

Lake Victoria is a seasonal reservoir within the City of Stratford, with the Avon River feeding into it. Located centrally in a tourist friendly part of the city, it is vulnerable to the establishment of invasive plants. Stabilization and the planting of cattails has taken place along its shores.

## Invasive Species Management in Priority Areas

The City of Stratford's Parks, Forestry and Cemetery Department is responsible for the stewardship and management of the city's parks, natural areas, urban forest, and the Avondale Cemetery. City staff within this department have been collaborating with staff from the Upper Thames River Conservation Authority (UTRCA) and volunteers with the Energy and Environment Committee (ENE, an advisory committee to City Council) to conduct mechanical and chemical control of invasive plants largely within and around the above-noted priority areas.

The Parks, Forestry and Cemetery Department:

- Conducts trail inspections and integrates invasive plant management into regular operations
- Trims garlic mustard before it goes to seed, preventing it from proliferating, and pulls it in gardens and on other manicured properties along with other weeds
- Cuts down Japanese knotweed and pulls other weeds along the bank of Lake Victoria
- Conducts manual removal of buckthorn in woodlots and ravines
- Sprays giant hogweed, sometimes through a contractor
- Has a social media coordinator post information about spraying
- Manages invasive *Phragmites*

The UTRCA:

- For the last 6-7 years has been hired by the City annually for invasive plant control; there are informal agreements in place to do work as it comes up
- Uses an Integrated Pest Management (IPM) approach and will be rewriting its internal pesticide use policy in 2024

- Has managed buckthorn, Japanese knotweed, and dog-strangling vine over the course of two years, carrying out chemical control of buckthorn
- Has community education and stewardship staff who are active on social media, send out a monthly newsletter, and work with community and school groups
- Puts up educational signage alongside signs noting pesticide use well in advance of pesticide application and takes phone and email inquiries regarding chemical control

#### The ENE Committee:

- Advises City Council on matters pertaining to the environment, including invasive species
- Put forward a successful motion to put invasive *Phragmites* and Japanese knotweed on the noxious weed list
- Has allocated funding from their committee budget (which comes from the City) for invasive *Phragmites* and Japanese knotweed removal
- Conducts invasive species management through their Ecology Working Group, including invasive *Phragmites*, Japanese knotweed, oriental bittersweet, periwinkle, Himalayan balsam, and buckthorn
- Gets volunteer support from its own members, Parks, Forestry and Cemetery Department summer students, former UTRCA employees, and local community groups

#### Challenges and Needs

The City of Stratford is facing challenges concerning invasive plants, including but not limited to:

- While invasive plants have been managed collaboratively by City staff and the UTRCA annually for several years, there is no formal agreement, schedule, or progress reporting in place.
- Management is largely taking place on a reactive basis.
- The City of Stratford straddles a rural area, making it vulnerable to invasive plants that thrive in agricultural fields or acting as a pathway of spread for those plants into rural areas.
- Public perception of spraying is negative and the City and UTRCA have to field questions and complaints. Public understanding of invasive plants in general could be improved, as calls are often received regarding plants that are not actually invasive.
- Resources are needed for future staff to ensure continuity of knowledge.
- Being in a tourist friendly area, Lake Victoria is both highly susceptible to invasive plant establishment and highly impacted by it. Invasive *Phragmites* is a priority concern as it will have recreational and aesthetic impacts on the lake. Japanese knotweed is also a key species to manage as best as possible, as it is a very aggressive species that is one of the most difficult to control. The introduction of European water chestnut, water hyacinth, and water lettuce is a concern.
- Funding for the UTRCA, like many Conservation Authorities, to manage invasive plants has been inconsistent and insufficient.
- The process for applying for permits to manage aquatic invasive plants from the Ministry of the Environment, Conservation and Parks (MECP) is time-consuming and it can be challenging to complete. A lot of planning is required.
- There are concerns over other invasive plants establishing and spreading after buckthorn removal. Plans for native plant restoration should be in place before removal.
- Giant hogweed is being managed, but there is lots of it along the Thames River so it is an ongoing concern.
- Dog strangling vine has been cited by City and UTRCA staff and volunteers as a concern, as it could spread further from infestations just outside the city.

## Collaborative Projects

The City of Stratford will work with partners to implement invasive plant management activities:

- The City will formalize a plan for each field season delineating what plants will be managed in which areas, assigned to City staff or UTRCA staff depending on resources and expertise.
- The UTRCA will manage invasive plants in accordance with the above-noted plan. They will summarize progress and challenges in a formal report after each field season for areas they managed.
- The ENE Committee will support the City by coordinating volunteer activities and engaging in public outreach and education in alignment with the priorities laid out in the SIPP.

## Invasive Plants in the City of Stratford

Decisions about what prevention and management activities are best to reduce the impacts of invasive plants in the City of Stratford should concern the invasive plants that are already in the city, plus the invasive plants that are nearby enough or at a high risk of introduction to warrant preventative actions. To provide the City of Stratford with some species-specific guidance, the ISC created several lists of invasive species. Each List is presented on a Tab in the associated Excel spreadsheet titled: *Stratford Invasive Plant Lists and Resources*.

- **Occurrence List:** a comprehensive list of all invasive species known to occur in the city
- **Management List:** a shortlist of species that are considered higher priority to manage based on the level of threat each species poses to the forest and aquatic ecosystems in the T. J. Dolan Natural Area and Lake Victoria
- **Watch List:** a list of invasive species at risk of introduction to the city that are not yet recorded inside the city

The Source Material is a collection of species mentioned in the consultation meetings and species collected from reports on iNaturalist and EDDMapS that are present within the City of Stratford. Additions to this list include references to regulated species under the Ontario *Invasive Species Act* and Canadian Food Inspection Agency, and notable species from the Ontario Noxious Weed List and the Provincial Weed ID for Field Crops guide. Everything in the Source Material is then sorted into the above lists.

### The Occurrence List

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** Occurrence List

The Occurrence List is a comprehensive list of non-native and invasive species currently known to the City of Stratford. There are 202 species on the Occurrence List. Three species on the list are currently being managed by either the UTRCA or the City of Stratford, including giant hogweed (*Heracleum mantegazzianum*), Japanese knotweed (*Reynoutria japonica*), and common buckthorn (*Rhamnus cathartica*).

To determine what invasive species are already in the City of Stratford, the ISC used the Early Detection and Distribution Mapping System (EDDMapS) and iNaturalist, a well-known and respected citizen science database.

The EDDMapS distribution function was used to search for positive invasive plant identifications reported within the City of Stratford. These results are verified by EDDMapS and were added to the Occurrence List. The iNaturalist Observation function was used to filter by area, plants, and non-native to search positive identifications of non-native species in the City of Stratford. These iNaturalist reports are verified by community scientists and were added to the Occurrence List. Additional species were included on the Occurrence List from the consultation meetings conducted by the ISC with the UTRCA, City of Stratford, and ENE Committee members and other volunteers.

The complete Occurrence List is presented in the associated Excel spreadsheet under the tab labelled: Occurrence List.

## Legislation

17 invasive species in the City of Stratford are regulated under one or more of the following three resources, and should be prioritized for control and management:

- [Canadian Food Inspection Agency](#) (3 species)
  - The Canadian Food Inspection Agency (CFIA) prevents the introduction of invasive species through import regulations. The CFIA is concerned about species that may cause serious damage to Canada's economy and the environment when they invade farmland, forests, parks and other natural areas.
- [Ontario Invasive Species Act](#) (2 species)
  - The Ontario Invasive Species Act, 2015, S.O. 2015, c.22 – Bill 37 includes 33 regulated invasive species. Species are chosen for regulation based on their invasive qualities and their potential impact on the environment, the economy, and society well-being.
- [Ontario Noxious Weed List](#) (14 species)
  - The Ontario Weed Control Act, R.S.O. 1990 contains a list of plants that includes difficult to manage species on agricultural land once established and will reduce yield and quality of the crop being grown, negatively affects the health and well-being of livestock, or poses a risk to the health and well-being of agricultural workers.

The Source Material tab in the Stratford Invasive Plant Lists and Resources spreadsheet indicates which species appear on which piece of legislation.

## Threat References

54 invasive species appear on one or both of the following two resources that were used to identify any species reported in the City of Stratford that have already been listed as a threat to the environment, economy, or society. Threat References can be used as a guide for prioritizing management resources.

- Urban Forest Associates Inc. Category 1 species (14 species)
  - Aggressive invasive exotic terrestrial plant species that can dominate a site to exclude all other species and remain dominant on the site indefinitely.
- Provincial Weed ID for Field Crops (40 species)
  - Species commonly found in agricultural areas or in Ontario and may pose a risk to human or crop health.

The Source Material tab in the Stratford Invasive Plant Lists and Resources spreadsheet indicates which species appear on which threat reference.

## The Management List

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** Management List

The Management List consists of species present in the City of Stratford as identified by the SIPP consultation meetings and select species that are considered a threat to the city ecologically, socially, or economically.

There are 26 species on this list in total, with 5 that are already being managed by the City of Stratford or the UTRCA, including invasive *Phragmites* (*Phragmites australis*), Giant hogweed (*Heracleum mantegazzianum*), Common buckthorn (*Rhamnus cathartica*), Japanese knotweed (*Reynoutria japonica*), and Dog-strangling vine (*Cynanchum rossicum*).

The complete Management List is presented in the associated Excel spreadsheet under the tab labelled: Management List.

**Table 1.** The Management List is the shortlist of invasive plants that are a priority to control in the City because they are considered to be economic, ecological or social threats.

Management List Species		
Management Categories	Scientific name	Common name
Aquatic	<i>Iris pseudacorus</i>	Yellow iris
	<i>Lythrum salicaria</i>	Purple loosestrife
	<i>Phragmites australis</i>	Common reed (phragmites)
Herbaceous	<i>Aegopodium podagraria</i>	Goutweed
	<i>Alliaria petiolata</i>	Garlic mustard
	<i>Concallaria majalis</i>	Lily of the valley
	<i>Heracleum mantegazzianum</i>	Giant hogweed
	<i>Hesperis matronalis</i>	Dame’s rocket
	<i>Impatiens glandulifera</i>	Himalayan balsam
	<i>Vinca minor</i>	Periwinkle
Woody	<i>Berberis thunbergii</i>	Japanese barberry
	<i>Celastrus orbiculatus</i>	Oriental bittersweet
	<i>Elaeagnus angustifolia</i>	Russian olive
	<i>Elaeagnus urbellata</i>	Autumn olive
	<i>Ligustrum vulgare</i>	Common privet
	<i>Lonicera tatarica</i>	Tatarian honeysuckle
	<i>Lonicera x bella</i>	Bell’s honeysuckle
	<i>Morus alba</i>	White mulberry
	<i>Reynoutria japonica</i>	Japanese knotweed
	<i>Rhamnus cathartica</i>	Common buckthorn
	<i>Robinia pseudoacaia</i>	Black locust
	<i>Rosa multiflora</i>	Rambler rose (Multiflora rose)

The Watch List

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** The Watch List

The Watch List is a list of aggressive invasive plants that are close enough to the City of Stratford or are at a high enough risk of introduction to warrant concern and investment in preventative programs and activities. The Watch List was created with suggestions from the SIPP consultations and through using a search in EDDMapS and iNaturalist looking for invasive plant reports in Ontario, areas around Ontario, and areas around the City of Stratford. Additional species were added to the Watch List using the Noxious Weed List in Ontario from the Ontario Ministry of Agriculture, Food and Rual Affairs (OMAFRA). These species are known to cause significant economic, ecological, or social damage once present in the

city. The list was then compared to the Occurrence List and if not yet reported in the city, was left on the Watch List.

The resulting list of invasive species was compared to the Occurrence List. If a species appeared on both lists, it was already reported in the city. If it was not yet reported in the city, it was left on the Watch List. The complete Watch List is presented in the associated Excel spreadsheet under the tab labelled: Watch List.

There are 21 invasive species on the City of Stratford Plant Species Watch List.

**Table 2.** The Watch List identifies invasive plant species that are not known to occur in the City of Stratford, and possibly not yet in Ontario, but justify future awareness based on potential ecological and economic consequences.

Watch List	
Species	
Scientific name:	Common name:
<i>Abutilon theophrasti</i>	Velvetleaf
<i>Ailanthus altissima</i>	Tree-of-heaven
<i>Cicuta maculata</i>	Spotted water-hemlock
<i>Cuscuta spp.</i>	Field dodder
<i>Erochloa villosa</i>	Woolly cup grass
<i>Euphorbia cyparissias</i>	Cypress spurge
<i>Euphorbia esula</i>	Leafy spurge
<i>Galium mollugo</i>	Hedge bedstraw
<i>Jacobaea vulgaris</i>	Tansy ragwort
<i>Microstegium vimineum</i>	Japanese stiltgrass
<i>Miscanthus sinensis</i>	Silvergrass
<i>Nassella trichotma</i>	Serrates tussock
<i>Persicaria maculosa</i>	Spotted lady's thumb
<i>Pilosella aurantiaca</i>	Orange hawkweed
<i>Pueraria montana</i>	Kudzu
<i>Reynoutria x behmica</i>	Bohemian knotweed
<i>Reynoutria sechalinensis</i>	Giant knotweed
<i>Sonchus arvensis</i>	Perennial sow thistle
<i>Stratiotes aloides</i>	Water soldier
<i>Trapa natans</i>	European water chestnut
<i>Ulmus pumila</i>	Siberian elm
<i>Vincetoxicum rossicum</i>	Dog-strangling vine

## Improving Management of Invasive Species

To improve the management of invasive plants across the City of Stratford, the SIPP focuses on high priority species that are good candidates for long term control and/or eradication. It is intended to identify drivers of decision making, helping the City navigate working within both ecological and species-priority frameworks. Working under an ecological framework, the City may take a specific plot of land and determine what their ecological goals are for the plot and how removal of certain invasive plants and post-removal restoration can achieve those goals. If feasible, different plant species with similar removal techniques and timing windows can be grouped together for management. Under a species-priority framework, the City may decide to significantly reduce or eradicate a particular plant species

from all areas of occurrence within the City. These frameworks are not mutually exclusive and may complement each other.

The SIPP does not provide specific control implementation plans for target invasive species, but it does provide some high-level advice on when to implement common control methods along with links to resources and information to allow the City to access information quickly.

## Management Resources

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** Management Resources

The Management Resources tab provides helpful resources meant to support control and management of these high priority invasive plants. Links to Ontario Best Management Practices are provided, along with links to other beneficial resources in Ontario or from other jurisdictions.

Ontario Best Management Practices (BMPs) guide the implementation of control for specific invasive plants. They are helpful to consult because they include all the possible control methods that are permitted, and/or have been tried by Ontario land managers. Not all invasive plants have associated Ontario BMPs, but since other jurisdictions have high quality resources that are applicable, these have been included in the Resources Tab. While utilizing resources from other jurisdictions, it is important to remember that there will likely be differences in legislation and regulations between Canada and other countries.

## Management Timing Windows

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** Management Timing Windows

Management Timing Windows provides a summary of the time of year to best control each invasive species on the management list. The visual includes some text indicating what control method is suitable for that time of the year. The Ontario BMPs are used wherever possible, but other sources may be referenced if an Ontario BMP was not available.

**Table 3.** BMP Timing Windows for all control methods for species on the Management List.



**Best Management Practices Timing Windows for all control methods**

Scientific name	Common name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<i>Aegopodium podagraria</i>	Goutweed						Hand Pulling						
<i>Ailanthus altissima</i>	Tree-of-heaven						Herbicide/Cutting						
<i>Iris pseudacorus</i>	Yellow iris				Manual Removal								
<i>Lythrum salicaria</i>	Purple loosestrife						Before going into seeds						
<i>Phragmites australis</i>	Common reed (phragmites)	Remove Biomass					Cutting			Herbicide			
<i>Alliaria petiolata</i>	Garlic mustard				Before seed production								
<i>Centaurea maculosa</i>	Spotted knapweed					Herbicide							
<i>Concallaria majalis</i>	Lily of the valley				Herbicide								
<i>Dipsacus fullonum</i>	Common teasel				Cut plants at ground level								
<i>Heracleum mantegazzianum</i>	Giant hogweed				Before it flowers								
<i>Hesperis matronalis</i>	Dame's rocket									Herbicide/hand pull			
<i>Pastinaca sativa</i>	Wild parsnip					Mowing							
<i>Vinca minor</i>	Periwinkle				During active growth								
<i>Berberis thunbergii</i>	Japanese barberry									Herbicide			
<i>Elaeagnus angustifolia</i>	Russian olive									Herbicide			
<i>Elaeagnus urbellata</i>	Autumn olive									Herbicide			
<i>Euonymus euroaeus</i>	Spindle				Anytime the ground is not frozen (cut stump method)								
<i>Impatiens glandulifera</i>	Himalayan balsam				Hand Pulling before going into seeds								
<i>Ligustrum vulgare</i>	Common privet												
<i>Lonicera tatarica</i>	Tatarian honeysuckle								Cut Stump method				
<i>Lonicera x bella</i>	Bells honeysuckle								Cut Stump method				
<i>Morus alba</i>	White mulberry								Herbicide			Cut Stump Method	
<i>Reynoutria japonica</i>	Japanese knotweed					Herbicide		Herbicide					
<i>Rhamnus cathartica</i>	Common buckthorn						Herbicide/Cutting						
<i>Robinia pseudoacaia</i>	Black locust						Cutting/Girdling						
<i>Rosa multiflora</i>	Rambler rose (Multiflora rose)						Cut Stump Method						

## Partner Advice

### *Upper Thames River Conservation Authority*

- Distribute UTRCA pamphlets on waste disposal in parks to the public
- Try to keep giant hogweed out of the city and invasive *Phragmites* out of Lake Victoria
- Japanese knotweed is a key species to keep under control, as mechanical methods do not work and applying glyphosate can have low effectiveness
- Should not worry too much about garlic mustard; it can be a problem in conifer plantations, but it is easy to get a community group to remove
- Black locust puts out a bumper crop of seeds every year, which becomes a problem if you are planning to do restoration after for e.g. buckthorn removal
- Continue to use signage to educate the public on the use of herbicides on invasive plants

### *Energy & Environment (ENE) Committee and Other Volunteers*

- Ensure that there is proper solarization or disposal of invasive plants
- Verify that the ornamentals the City plants every year do not have the potential to be invasive, and use native plants in gardens as much as possible
- Enforce Lot Maintenance by-law with regards to yard waste dumping on properties bordering park lands
- Restoration after the removal of invasive plants needs to be coordinated. Some invasive plants are being left alone because removing them will leave an area without any greenery
- It is essential to keep track of progress and continue monitoring. Ongoing monitoring and adjusting is key to managing future plant invaders, like dog-strangling vine
- Map out and study the full extent of an invasive plant infestation and detail a pragmatic plan to manage it in advance. Quality maps and graphics, plans and budget estimates will help management actions to get approved by City Council. For e.g. create a GPS map of an infestation and overlay it on a map with property boundaries and trails
- Touch base with the with the Perth County weed inspector, neighboring farmers or certified crop specialists at local companies selling pesticides to determine priorities for managing invasive plants that are prominent in agricultural fields
- A presentation from the Canadian Wildlife Service on their management of invasive *Phragmites* in a sensitive biosphere site just 1.5 hours away from Stratford would lend credibility to managing invasive *Phragmites*
- Time is of the essence; an invasive plant infestation only gets more expensive over time
- Invasive species are not a problem that is traditionally dealt with by municipalities, but community needs are changing and people increasingly value nature, parkland and trails, especially in the wake of the pandemic

## Recommended Actions for Management

1. Continue with:
  - a. Conducting trail inspections and integrating invasive plant management into regular operations
  - b. Managing invasive plants and restoring the shoreline along the banks of Lake Victoria
  - c. Delegating certain management activities to the UTRCA or the ENE Committee/community volunteers where appropriate
2. Know and track the pattern of infestation for high priority species

- a. Compile available species maps and/or create original maps for species on the management list.
  - b. Create a GIS project that holds occurrence data layers (original infestation pattern) along with a stewardship layer to hold information about control implementation each year.
  - c. Connect the GIS project to ArcGIS Field Maps and ensure Field Staff and/or Contractors can update the project as control activities are implemented.
3. Implement control of high priority species
- a. Use occurrence maps and the Management List Timing Windows to create Control Implementation Plans. Plans can be created for one species (e.g., invasive *Phragmites*), or a group of species that can be managed at the same time with the same methods (e.g., invasive honeysuckles). They can include staff activities, hired help, and/or volunteer roles. Creative mapping can incorporate colours and legends to help differentiate what control methods are planned for certain areas, species polygons, or entire parks and make dividing the work easier (e.g., contractor, staff, volunteer event). Archive stewardship layers and start fresh each year; this will make it easier to layer the history of stewardship activities by species or park.
  - b. Review control plans well ahead of implementation and send staff for any necessary professional training and certifications. Some examples may include chainsaw safety, exterminator licenses, or prescribed burns. The application of newly registered products like Habitat Aqua may require additional certifications (Aquatic Pesticide License).
  - c. Continue obtaining a Letter of Opinion on a 5-year rotation and add all management and watch list species that require herbicide use.
4. Identify potential candidates for eradication, if applicable. This might be an invasive plant that is relatively contained and feasible to remove, even if not the highest priority in terms of impacts.
5. Incorporate research and adaptive management
- a. Consider opportunities to partner with research teams on new management techniques such as biological control. Some municipalities have found mutually beneficial opportunities through contributing research sites. These research projects are often looking for new partners and project sites at scale. Two great examples are the biocontrol research for *Phragmites australis* and garlic mustard underway by the University of Toronto.
6. Increase staff knowledge and develop supporting resources
- a. Host Invasive Species Training Days for City staff to review identification resources for management list species. Include Watch List species and other prevention measures that may be added to annual work plans (see Prevention Recommendations).
  - b. Train all field staff on reporting protocols and move toward the creation of one GIS project for invasive species.
  - c. Distribute public messaging and helpful resources to ensure staff are consistent and well-informed about invasive species.
  - d. Implement the Clean Equipment Protocol (see prevention recommendations and refer to the Clean Equipment Protocol for Industry [summary](#) and [full document](#)). The Clean Equipment Protocol is also used to prevent the spread of established invasive species and is particularly effective on invasive *Phragmites*. Several municipalities have reported that implementing the Protocol is only effective if a cleaning station and paid time to clean equipment is also provided.
7. Increase collaboration on invasive species management

- a. Supplement the hiring of Ontario Federation of Anglers and Hunters (OFAH) Hit Squad students to implement invasive species control in the Complex every year (May to September). The OFAH Hit Squad program is funded by Canada Summer Jobs and may provide up to 8 weeks of funding for multiple students to work on invasive species control and programs.
  - b. Formalize a plan for collaborating with UTRCA and the ENE Committee/community volunteers. Formal reports should be submitted in between field seasons by collaborating groups to help the City keep track of progress.
8. Increase public engagement in invasive species management
- a. Offer volunteer events for local naturalists' clubs to target species like garlic mustard and Himalayan balsam. Offer Corporate Workdays for local corporations looking for team building and community projects. For volunteer events, choose species which are amenable to stewardship, even if they are not high management priorities. These plants should be easier to identify and manage, enabling volunteers to gain a sense of satisfaction and empowerment which helps with volunteer retention.
  - b. Create a Communications Plan to employ consistent messaging, expectations, and signage that can be used to support all invasive species control implementation activities on an annual schedule. Consider targeted campaigns (e.g., Grow me Instead).
  - c. Utilize existing capacities and networks. Existing groups in the area (naturalists clubs, master gardeners and other environmental organizations) can be brought on as either direct partners or to help get the word out through their email list. Reach out to school groups and guidance counselors to showcase the activity as an avenue to gain high school credits or to be integrated into science class curricula.
  - d. Use social media and traditional media (local newspaper ads, local radio interviews) to reach new people outside of the existing networks above. Media can be especially powerful as on the ground action garners a lot of attention and invasive species can be framed as both the "negative catch for a story" and the "empowering ending."
  - e. If you are working in a neighborhood, invite the neighbors. This accomplishes multiple goals: (1) increased volunteer recruitment; (2) increased understanding from neighbors of why certain plants are being removed; (3) increased awareness and the likelihood that they will manage or avoid planting invasive plants in their own yards; (4) creating a neighborhood watch for this species in the future when it becomes less abundant; (5) increased awareness of pathways of spread by using this plant as an example which will limit the introduction of future species. Neighborhoods could be reached through neighborhood Facebook groups, associations and flyer mailouts explaining the project and inviting them to the event.
  - f. Consider a "train the trainer" approach to distribute the workload.
  - g. When working with multiple organizations, create and use common messaging to amplify your voice and remain consistent.
  - h. When budgets allow, consider including contests and incentives for management efforts (on public or private lands) and monitoring efforts (i.e. reporting to iNaturalist or EDDMapS). Reporting contests can help increase knowledge of distribution of your target species and inform future management plans or event locations. Other incentives could include food at an event or native plants or seeds if the public replaces invasive plants on their own property.
  - i. Focus on engagement, not just eradication. Use this opportunity to educate and reach new audiences to prevent further introductions in the future.

- j. Consider a two-tier approach for more difficult to manage species like buckthorn. One day is focused on public removal of smaller stems, with a second day planned for contractors to go in with chainsaws and herbicide applicators or buckthorn baggies.
- k. Look to what your neighboring municipalities are doing, and you could do similar events or projects and amplify your voice by advertising the same things at different locations.

## Preventing Invasive Species

The City of Stratford straddles a rural area, making it vulnerable to invasive plants that thrive in agricultural fields. It is also vulnerable to aquatic and riparian invasive plants due to the Thames River flowing through it. As a tourist destination, the city brings in thousands of visitors each summer, who can easily transfer invasive plant seeds or fragments into and around the city via trail or boat use.

To prevent an invasive plant species from arriving in Stratford, the City must know where and when to look and what to look for. The Watch List Resources are meant to help the city know what to keep a look out for and provide the city with quick access to relevant resources and information, such as common pathways of spread and preferred habitats. Comprehensive pathways analysis is more informative, but at a high-level, vehicles, gardening, and contaminated soil are the more common artificial pathways for the Watch List (select species). Knowing how a species might arrive is important for intercepting its arrival.

### Watch List Resources

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** Watch List Resources

This tab includes links to external resources to help identify each invasive species on the Watch List, along with training opportunities, and links to Best Management Practices available for control and management of these species.

### Watch List Timing Windows

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** Watch List Timing Windows

This tab lays out what time of year to look for each invasive species on the Watch List and an associated identification resource.

### Watch List Pathways

**See:** The Stratford Invasive Plant Lists and Resources

**Tab:** Watch List Pathways

This tab lays out common natural and artificial pathways for each invasive species on the Watch List along with the nearest municipality to Stratford where each species is present.

**Table 4.** Common pathways of spread for each species on the Watch List.

Common Pathways				
Scientific Name	Common Name	Proximity to Stratford	Natural Pathways	Artificial Pathways
<i>Ailanthus altissima</i>	Tree-of-heaven	Kitchener, ON	Seed dispersal through wind, sprouts from shoots	Planted intentionally as an ornamental
<i>Microstegium vimineum</i>	Japanese stiltgrass	Niagara, ON	Seed dispersal through wind, water, and animals	Contaminated recreational equipment (boots, bikes)
<i>Pueraria montana</i>	Kudzu	Kingsville/Leamington, ON	Stolons, rhizomes, seeds	Contaminated soil, recreation equipment (boots, bikes, vehicles)
<i>Reynoutria sechalinensis</i>	Giant knotweed	Brantford, ON	Fragmentation, rhizomes, water	Pruning activities, improper disposal
<i>Reynoutria x behmica</i>	Bohemian knotweed	Kitchener, ON	Rhizomes, fragmentation, water	Pruning activities, improper disposal
<i>Stratiotes aloides</i>	Water soldier	Lucan, ON	Fragmentation through offsets or clones	Boating through infested areas and dislodging plants
<i>Trapa natans</i>	European water chestnut	Welland, ON	Dropping seeds from parent plants, attached to waterfowl feathers	Boating through infested areas and snapping floating seeded plants
<i>Vincetoxicum rossicum</i>	Dog-strangling vine	St. Marys, ON	Seed dispersal through wind	Contaminated equipment (mowing, tires)

## Recommendations for Prevention

1. Stay informed on emerging and arriving threats
  - a. Sign up for Invasive Species Centre quarterly newsletter, *The Spread*
  - b. Sign up for Invasive Species Centre events, media, and news updates
  - c. Attend relevant conferences and workshops (e.g., Ontario Invasive Plant Council Annual Conference)
  - d. Invest in professional training for staff to learn about Watch List species when training courses are available
  - e. Join the Invasive Species Centre's Municipal Community of Practice and attend spring and fall conference calls to connect with municipal practitioners in Ontario
  - f. Learn from other land managers by creating and facilitating an annual meeting about invasive plant management in forest and freshwater habitats. Bring land managers together from Ontario and close U.S. states to share knowledge about emerging threats and new invaders, and what control methods are working to contain them.
2. Enhance monitoring for Watch List species in the Priority Areas
  - a. Use the Watch List Resources to create a training program for staff. Ensure all city staff who do work in and around the Priority Areas can identify Watch List species and know how to report potential observations.
  - b. Use the Watch List Resources and timing windows to create a monitoring program for Priority Areas.
  - c. Designate Highly Probable Areas (HPAs) in the City. HPAs are places where invasive plants are more likely to arrive (parking lots, shorelines, trail heads, disturbed areas, fence lines, etc.). Use HPAs to prioritize monitoring activities.
3. Increase public awareness and engagement opportunities
  - a. Create a webpage where residents can report concerning and/or invasive plant species. Include information on the Watch List. Require all submissions to include photos. Have 311 direct calls about invasive plants to the webpage so staff can respond via email and use photos to triage complaints that require a site visit.
  - b. Construct and install boot-brush stations at trail heads throughout the T.J. Dolan Natural Area. Include interpretive signs about invasive species and explain why boot-brushing helps prevent invasive species.
  - c. Purchase 'Grow Me Instead' program materials and make them available at locations across the city such as public libraries, recreation centres, and plant nurseries.
  - d. Share the Watch List with the UTRCA, the ENE Committee, and local naturalist clubs and encourage reporting of any potential observations of Watch List species.
  - e. Create species-specific calls-to-action and send information to residents with property adjacent to the T.J. Dolan Natural Area. E.g., a one-page sheet on a priority plant including instructions on how to make a report (using the reporting webpage).
4. Introduce new policies
  - a. Require all city staff and contractors hired to do work in and around Priority Areas to follow the [Ontario Clean Equipment Protocol](#) as a component of their work. Prepare to pay for the time required to invest in this Protocol and consider providing a Cleaning Station at an appropriate location where crews would go to wash equipment.

## Summary of Recommendations

The Stratford Invasive Plant Plan includes recommendations to improve prevention and management of invasive plants. The City is already investing in detection and management activities, with most resources being absorbed by long-term management. Investing in additional prevention activities will reduce the likelihood of new invasive plants establishing in Stratford. Meanwhile, continuing to improve and grow the long-term management program will help the City begin to observe reductions in occurrence and spread of invasive plants already present in Priority Areas. Table 5 summarizes the key proposed prevention and management activities in this plan to illustrate a balanced approach to invasive species management. Undertaking these activities will lead to a reduction of impacts from invasive plants in the City of Stratford.

**Table 5.** Summary of high-level prevention and management activities for invasive plants in the City of Stratford.

Prevention	Management
<ul style="list-style-type: none"> <li>• Stay informed on emerging and arriving threats</li> <li>• Enhance monitoring for Watch List species in the Priority Areas</li> <li>• Increase public awareness and engagement opportunities</li> <li>• Introduce new policies</li> </ul>	<ul style="list-style-type: none"> <li>• Continue with current trail inspections and management activities</li> <li>• Know and track the pattern of infestation for high priority species</li> <li>• Implement control of high priority species</li> <li>• Identify potential candidates for eradication</li> <li>• Incorporate research and adaptive management</li> <li>• Increase collaboration on invasive species management</li> <li>• Increase public engagement in invasive species management</li> </ul>

## Funding Invasive Species Action

Funding for invasive species management and prevention activities is often a limitation. While any budget is helpful, there is a certain level of funding that should be established and maintained to ensure the strategy is making progress. Knowing what the number is will require more information about the extent of invasive species, chosen activities and control methods, timelines, and staffing resources. Budgets for invasive species management tend to be high when control programs are just getting started, and over time will decrease as the invasion is brought under control. Budgets for this strategy should be placed in categories: Prevention, Containment, Management.

Generally invasive species programs are initiated using existing staff within key departments. Mapping and some control activities can easily be done by seasonal or part-time staff. Projects involving more comprehensive responses generally seek out external funding sources to support additional costs including contracted control services, significant staff time, specialized equipment, etc.

### Integration into City Operations

- Establishing a small, annual baseline funding amount is an important first step in the implementation of an invasive plant strategy. This baseline funding should be designed to cover



key staffing time, as well as some regular control activities in known scenarios (e.g., roadside nuisance vegetation control).

- When more costly invasive species are identified in neighbouring communities, it's wise to begin planning for more substantial investments in a species-specific response. Many municipalities were faced with considerable budget pressures when emerald ash borer became widely established in Ontario, with some municipalities being forced to spend millions of dollars annually to remove and replace lost ash trees throughout the urban environment.
- Asset Management / Natural Asset Management (NAM) is widely used by Ontario municipalities and is an important approach to guide invasive species program implementation. Using asset management opportunities to complete an inventory of select species of that may be at risk to new noteworthy pests is one example of how municipalities can leverage asset management to support invasive species program goals.

## External Funding Sources

Grants and donations are an important addition to baseline funding provided by municipalities in implementing invasive species activities. They can be valuable additions to specific priority projects benefiting one or more locations.

- The Invasive Species Centre administers the Invasive Species Action Fund. This fund supports municipalities in implementing projects to address an array of priority invasive species such as giant hogweed and dog strangling vine. During the 2023 cycle, 3 streams were available with funding caps ranging from \$2,500 to \$25,000.
- The Invasive Species Centre also administers the Invasive Phragmites Control Fund. This fund supports municipalities in implementing mapping and control activities on invasive Phragmites. During the 2023 cycle, projects were capped at \$10,000.
- There are a range of other sources of funding that can support municipalities in implementing invasive species projects, however they are typically designed to support other activities as a primary focus. Some funding programs that other municipalities have been successful with include Ontario's Ministry of Environment, Conservation and Parks (e.g., Wetlands Conservation Partner Program, Species At Risk Stewardship Fund, Ontario Community Environment Fund, etc.), Environment and Climate Change Canada (e.g., Eco Action, Environmental Damages Fund, Habitat Stewardship Program, etc.) and Fisheries and Oceans Canada (e.g., Habitat Stewardship Program, Aquatic Invasive Species Prevention Fund, etc.). Some of these funding programs include municipalities as eligible recipients, however some may require a key partner (e.g., Conservation Authority, etc.) to lead an application to meet eligibility requirements.

## References

Agriculture Victoria. 2010. "Invasive Plants and Animal Policy Framework". Published by The State of Victoria, Department of Primary Industries, Melbourne, Victoria, Australia.

Canadian Food Inspection Agency (last updated 2021-07-13) "List of pests regulated by Canada" (<https://inspection.canada.ca/plant-health/invasive-species/regulated-pests/eng/1363317115207/1363317187811>)

Cowbrough, M., F. Tardif, J Letarte. Grain Farmers of Ontario. Weed ID Guide for Ontario Crops. ([omafra\\_weedIDguide\\_final\\_web.pdf \(dropbox.com\)](#))

Invasive Species Centre (last updated 2022) “Ontario Invasive Species Act” Species List. ([Ontario Invasive Species Act – Invasive Species Centre](#))

Ministry of Agriculture, Food and Rural Affairs (last updated 2022-12-08) “Noxious Weeds in Ontario”. ([Noxious weeds in Ontario | ontario.ca](#))

Ontario Ministry of Natural Resources and Forestry. July 2012. Ontario Invasive Species Strategic Plan. ([Invasive species strategic plan \(2012\) | ontario.ca](#))

Urban Forest and Associates Inc. Invasive exotic species found in southern Ontario. ([Invasive Species – Urban Forest Associates Inc. \(ufora.ca\)](#))

Vyn, Richard. 2019. “Estimated Expenditures on Invasive Species in Ontario: 2019 Survey Results.” Report prepared for the Invasive Species Centre.

Vyn, Richard. 2021. “Estimated Annual Expenditures on Invasive Species by Canadian Municipalities: 2021 National Survey Results.” Report prepared for the Invasive Species Centre.

York Region Nuisance Species List (unpublished data).

## APPENDIX 1: Partner Interview Summaries

Brandon Williamson, Land Management Coordinator, Upper Thames River Conservation Authority

The Upper Thames River Conservation Authority (UTRCA) has conducted invasive plant removal in Stratford for the last several years through informal agreements with the City.

*Species that have been managed by UTRCA in the past include:*

- European buckthorn and other buckthorn species
- Invasive *Phragmites*
- Dog strangling vine
- Periwinkle
- Japanese knotweed
- Giant hogweed

*Concerns about incoming species:*

- Water chestnut
- Water hyacinth
- Water lettuce
- Forest pests and pathogens – beech leaf disease, beech bark disease, oak wilt, spotted lanternfly, hemlock woolly adelgid, emerald ash borer

*Challenges:*

- Public understanding regarding herbicide use
- Funding

- Obtaining herbicide permits for aquatic invasive species

*Recommendations:*

- Get a community group to remove garlic mustard
- Suggest putting on a watchlist, especially to look out for after buckthorn removal - Norway maple, honeysuckle, oriental bittersweet, autumn olive, Scots pine, black locust

**Anita Jacobsen, Volunteer, Energy and Environment Committee**

The Energy and Environment (ENE) Committee advises City Council on matters pertaining to the environment and coordinates volunteer management of invasive plants.

*Species that have been managed by the ENE Committee in the past include:*

- Invasive *Phragmites*
- Japanese knotweed
- Oriental bittersweet
- Himalayan balsam
- Periwinkle
- Buckthorn

*Concerns about incoming species:*

- Oak wilt
- Dog strangling vine

*Challenges:*

- Volunteer recruitment
- Few access points along river to get materials and equipment for invasive plant removal to T.J. Dolan
- Volunteers require permission to remove invasive plants

*Recommendations:*

- Conduct invasive plant removal on a scheduled rather than reactive or complaint-driven basis
- Enforce lot maintenance by-law
- Distribute UTRCA waste disposal pamphlets to the public
- Coordinate native plantings after invasive plant removal
- Avoid any potentially invasive species for City property plantings and establish native plant gardens

**Jeff Brick, Volunteer**

Jeff is a former staff member at the UTRCA and former CAO of West Perth, where he managed invasive *Phragmites*, Japanese knotweed, and giant hogweed.

### *Concerns about incoming species:*

- Weeds on the Perth County noxious weeds list
- Dog strangling vine

### *Recommendations:*

- A presentation from the Canadian Wildlife Service on their management of invasive *Phragmites* in a nearby, environmentally sensitive biosphere would lend credibility to invasive *Phragmites* management in and around Stratford
- Time is of the essence as invasive plant management only gets more expensive as a population expands and spread
- Community needs are changing and people increasingly value nature, parkland and trails, especially in the wake of the pandemic
- Ongoing monitoring and adjusting (i.e. adaptive management) are key to managing future invasive species
- Watch out for hogweed and other invasive plants when monitoring for invasive *Phragmites* and Japanese knotweed
- When developing a plan to control an invasive plant population, start with a GPS map and overlay the map with property and trail boundaries. A pragmatic plan with good maps and graphics, plans, and budget estimates will likely help these projects get approved by City Council.

## APPENDIX 2: Policy Review Summary

### Lot Maintenance By-law 94-2008

This by-law requires the owner of the land to clean and clear the land. In essence, property owners must keep their natural or landscaped area free from weeds, and they cannot allow grass or weeds to grow more than 20 centimetres in height. Weeds designated as noxious under the *Weed Control Act* R.S.O. 1990, c.W.5. that are on private property are dealt with through this by-law. However, it does not affect the application and enforcement of the *Weed Control Act* including in natural or landscaped areas.

### Urban Forestry Plan (Revised 2023)

The objective of the City of Stratford's Urban Forestry Plan places emphasis on diversification and risk management in the care and maintenance of trees. One of the goals of the Urban Forestry Plan is to train staff in recognizing tree hazards, including rot and disease. The Plan outlines 5 main responsibilities for the City: the safety of city trees, plant health care, which includes insect and disease consultation, public education and outreach, and work with other organizations, emergency response, a tree planting program, and environmental protection.

Large tree maintenance, which is supervised by the City Parks and Forestry Manager, runs on a 5-year cycle and is contracted out due to high equipment costs. Tree removal is a last resort that entails comprehensive tree inspection. A tree may be removed if it is "host to virulent insects or diseases" or is "chronically invasive to public or private property", especially if "the health and vitality of the City's Urban Forest is at risk". Under this plan, a mature, healthy tree could therefore be removed if deemed to be harmful due to its invasive properties.

Demand for forestry maintenance services will continue to grow as trees in newer subdivisions mature. There is increasing pressure on the City's response time due to increasing parkland, aging subdivisions, aging trees in neighborhoods between 90-120 years old, the silver maple monoculture that was planted in the 19th century (which is over 90% of the trees planted in older neighborhoods), and an increasing number of traffic intersections.

An increasing percentage of the City's operating budget is going towards tree removal and stumping charges, due to the aging of trees in the 90–120-year-old age class and the declining health of the silver maple monoculture. The plan states that tree diversification is the only solution to the monoculture problem. 20 different species of trees, many of them native to Ontario, have been selected as having potential for street plantings. Ash species were eliminated as an option in Stratford in 2006 due to the invasive emerald ash borer. Overall, the workload demand is expected to increase dramatically.

### Energy and Environment Advisory Committee 2023 Update

The ENE Committee's invasive species work is completed under an Ecology Working Group, which also carries out a native grasses project, shoreline work, and work in the T.J. Dolan Natural Area. Volunteer support with these projects comes from Parks department summer students, former UTRCA employees, and community groups.

The Ecology Working Group manages invasive *Phragmites*, Japanese knotweed, oriental bittersweet, Himalayan balsam, periwinkle, and buckthorn, with support from an Invasive Species Centre grant in 2023. Shoreline restoration, including erosion control, is being conducted along Lake Victoria, and a native grasses project is being carried out along T.J. Dolan Drive. With seedlings from the Chestnut Council of Canada, American Chestnut is being planted in the T.J. Dolan Natural Area.

Future projects and priorities for the ENE Committee include:

- Working with the City to contract the development of an invasive species management plan
- Finish native grasses planting on T.J. Dolan Drive
- Liaise with and support local environmental groups and service clubs
- Explore the feasibility of a "Friends of..." group to help improve and protect the ecology of the T.J. Dolan Natural Area
- Continue with Lake Victoria shoreline maintenance and improvement
- Develop education initiatives

### APPENDIX 3: The Occurrence List

Definition: The Occurrence List is a comprehensive list of invasive plants currently known to occur in the City of Stratford.

### APPENDIX 4: The Management List

Definition: The Management List is the shortlist of invasive plants that are a priority to control in the City because they are considered to be economic, ecological or social threats.

## APPENDIX 5: The Watch List

Definition: The Watch List identifies invasive plant species that are not known to occur in the City of Stratford, and possibly not yet in Ontario, but justify future awareness based on potential ecological and economic consequences. Several species have been indicated for priority consideration based on Legislation and other research materials used to sort the Occurrence List, as well as professional advice and expertise.





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