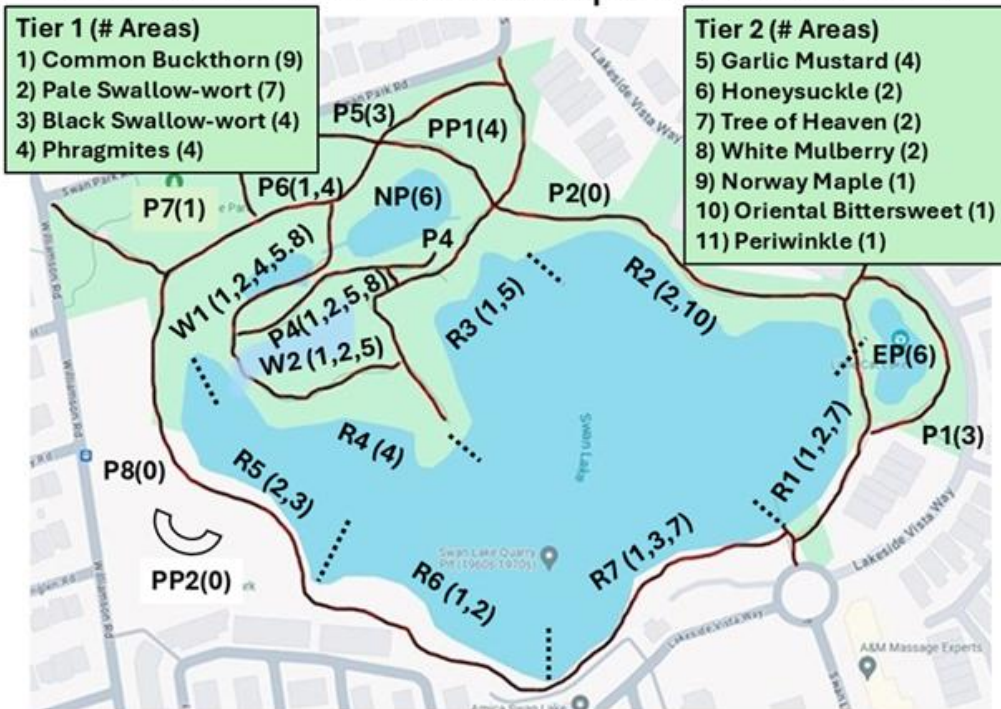


Proposal to Remove Invasive Plants from Swan Lake Park 2026 - 2027

Swan Lake Park: Invasive Species Tiers 1 & 2



**Submission to the Markham Subcommittee
April 30, 2026**

Invasive Species Pilot Project in Swan Lake Park (2026 – 2027)

The following report outlines a proposal by Friends of Swan Lake Park (“FOSLP”) for a 2-year pilot project for the removal of certain invasive species from Swan Lake Park.

Markham’s Invasive Plant Species Policy

In May 2024, Markham Council approved the Natural Area Management Guidebook and an Invasive Species Management Plan for managing natural heritage assets throughout the city. The following extract from the Invasive Species report outlines the issues associated with invasive plant species.

Invasive species pose the second greatest threat to biodiversity after habitat loss (Erlach, 1998; Wilson, 1992). Invasive plant species can displace native species in a community, negatively impacting ecosystem function and services, and are a growing threat to human health and the economy. Many invasive plants have the ability to spread rapidly and aggressively, leading to a decline in ecological health and recreational enjoyment. The following are some of the significant impacts on natural ecosystems in urbanized environments:

Biodiversity loss, habitat degradation, and disruption of ecological and hydrological processes – Invasive plants can outcompete native plants for resources such as water, light and nutrients, leading to a decline in native plant populations. As native plants decline, the habitat structure and composition of ecosystems are altered. The degradation of ecosystems can impact native animals by reducing nesting sites and foraging opportunities or disrupt natural ecological and hydrological processes such as dispersal, pollination, water quality and nutrient cycling.

Human health, safety, and recreational enjoyment – Some invasive plant species pose risks to human health causing severe skin irritations or injuries, impacting the enjoyment of outdoor activities. Certain invasive plant species can limit visibility in rights-of-way increasing the risk of vehicle accidents or they can intensify fire risk by increasing fuel loads or altering fire regimes. Other invasive plants can reduce the aesthetic value or accessibility of recreational land and waterbodies.

Economic impacts – Invasive plant species can have significant economic consequences including the costs of control and management, such as surveys, eradication programs, and public awareness campaigns. In addition, costs can be incurred due to damaged infrastructures, reduction in property values, and negative effects on agriculture and landscaping industries.

The Invasive Plant Species Plan identified 41 species of concern throughout Markham and recommended an expansion of the scope of the city’s current program. At the time of the report, Markham staff were actively managing 5 of the species of concern which became known as the Tier 1 species. The report recommended extending the scope of the current

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

city program to address 14 other invasive species – known as Tier 2 species. It was recommended that the other 21 species rated as Tier 3 should be addressed when resources permit.

The staff report noted that “increased investment into volunteer stewardship and ecosystem restoration would be required to accelerate the maintenance and rehabilitation of natural assets” and recommended facilitation of community volunteer and stewardship programs.

Markham has a strong history of relying on volunteer groups to help manage its naturalized areas with programs such as:

- a) The Adopt-a-Park program that encourages volunteer groups to support annual clean-up of the park areas and to be “on-call” to support Markham staff with plantings.
 - The Markham Lions Club adopted Swan Lake Park in 2022.
 - FOSLP has supported the Lions’ spring and fall park clean-ups and the installation of bird houses in the park.
 - In 2024, FOSLP supported Markham staff in planting a pollinator garden.
- b) Other volunteer-based programs such as 10,000 Trees and the David Suzuki Foundation incorporate the removal of invasive plants into their planting programs with Markham’s consent.

FOSLP’s Proposed Program for 2026 and 2027

FOSLP is seeking approval for a 2-year pilot program. The goal is to develop a program like Markham’s Adopt-a-Park program that places minimal demands on staff time. FOSLP will ask staff to review and pre-approve the areas to be stewarded, to provide bags and assist in the removal of bagged debris as they do for the annual park clean-ups and to assess the area in the fall after the work is completed. Staff will be welcome to be more hands-on in the monitoring or management if they prefer, but that should not be necessary.

FOSLP or its volunteers will provide gloves and tools required for the removal of the plants.

FOSLP’s pilot program will accomplish two things:

- 1) Reduce certain invasive plant species in Swan Lake Park
- 2) Provide Markham with first-hand insight into the benefits and issues associated with a volunteer-led initiative for the removal of invasive plants as it considers the broader application throughout Markham.

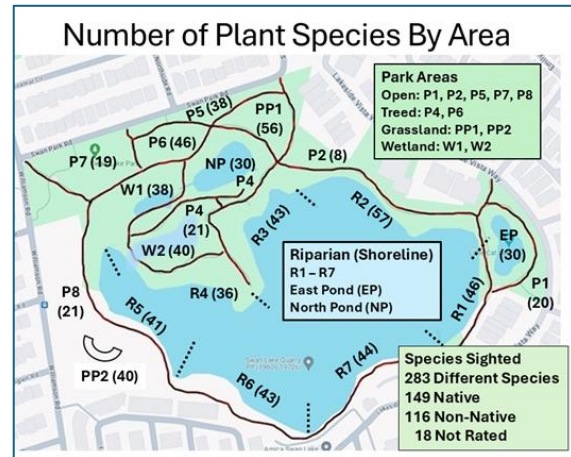
FOSLP has developed its approach for removing invasive species based on the successful model of the Toronto Nature Stewards (“TNS”). Over six years, TNS has developed a volunteer-led model that involves over 1,000 volunteers removing invasive species in over 40 Toronto parks with minimal involvement by City of Toronto staff. Details are available on their website [Toronto Nature Stewards – Stewardship on Public Land](#)

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

On February 26, 2026, the Markham Environmental Advisory Committee (“MEAC”) endorsed Friends of Swan Lake Park proposal for a pilot project based on the approach by TNS for the removal of invasive species from Swan Lake Park.

Plants in Swan Lake Park

In 2024, FOSLP volunteers undertook a survey of all of the plants in Swan Lake Park. The park was divided into 20 different segments. The survey provided information on the location within the park of both native (149) and non-native (116) plants, including 20 of the 41 invasive plant species highlighted in Markham’s invasive plant report.

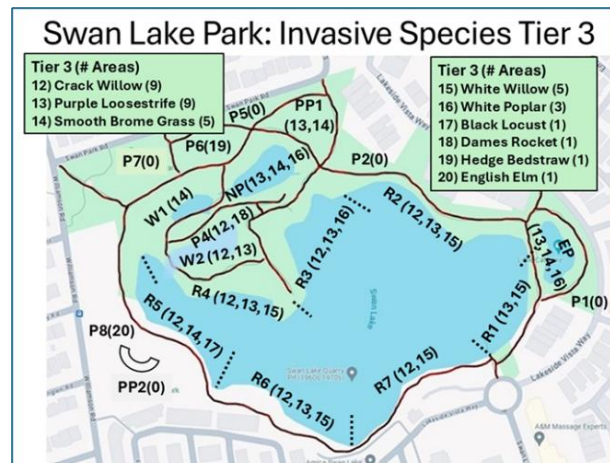
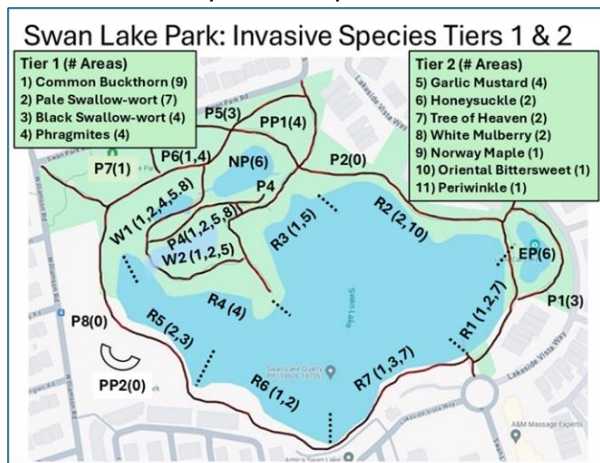


Invasive Plant Species in Swan Lake Park

In June 2020, FOSLP volunteers undertook a field survey and identified 8 invasive plant species in Swan Lake Park. Markham staff have used this summary to address certain areas, specifically Dog-strangling Vine along the southern pathways and in 2022 engaged the TRCA to remove Phragmites along the eastern shoreline and around the North Pond.



The 2024 survey, identified the location of 20 of the 41 invasive species listed in Markham’s Invasive Plant Species report.



SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

A successful invasive species removal program will take several years and require follow-up in remediated areas. The two-year program will focus on eight areas and address four invasive plant species prevalent in those areas. If successful, FOSLP will request that the program continue with a focus on remediation in the areas targeted in 2026 and 2027 and the removal of invasive species from other areas in the park.

The pilot project will focus on the four species most prevalent in Swan Lake Park:

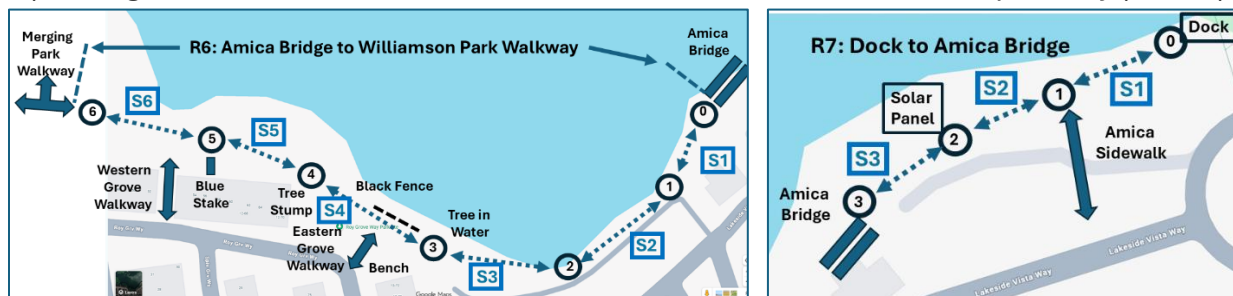
TIER 1	Locations	TIER 2	Locations
Common Buckthorn	9	Garlic Mustard	4
Dog-strangling Vine	10		
Phragmites	4		

Particular attention will focus on Dog-strangling Vine because of its wide distribution throughout the park and because it undermines the development and health of Monarch Butterflies. Monarchs are threatened by dog-strangling vine, an aggressive invasive plant in the same family as milkweed, the primary plant that sustains monarchs. Monarchs lay their eggs on both milkweed and dog-strangling vine; however, since the larva can eat only from milkweed plants, the eggs laid on the dog-strangling vine do not survive.

Plans for 2026

For 2026, the focus will be on four species found in easily accessible areas:

- 1) Along the southern shoreline, from the dock to the end of the Amica pathway (R6, R7)



Common Name	Scientific Name	Markham Invasive Tier (2024)	Riparian/Shoreline R6	Riparian/Shoreline R7
Common Buckthorn	<i>Rhamnus cathartica</i>	T1	T	F
Dog Strangling Vine (Black)	<i>Vincetoxicum nigrum</i>	T1		T
Dog Strangling Vine (Pale)	<i>Vincetoxicum rossicum</i>	T1	T	
Garlic Mustard	<i>Alliaria petiolata</i>	T2	F	

A listing of all the plants identified in the R6 and R7 areas in the 2024 survey is provided in Appendix E.

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

2) In the treed areas along the south side of Swan Park Road (P5, P6)



Common Name	Scientific Name	Markham Invasive Tier	Treed P6	Open P5
Common Buckthorn	<i>Rhamnus cathartica</i>	T1	F	
Dog Strangling Vine (Black)	<i>Vincetoxicum nigrum</i>	T1		F
Dog Strangling Vine (Pale)	<i>Vincetoxicum rossicum</i>	T1		
Garlic Mustard	<i>Alliaria petiolata</i>	T2		
Phragmites	<i>Phragmites australis americanus</i>	T1	T	

A listing of all the plants identified in the P5 and P6 areas in the 2024 survey is provided in Appendix F.

After the field level work for 2026 is complete, FOSLP will compile a report on the year's activities. It will include information on:

- A summary of areas completed and any areas requiring further work
- An estimate of the volume of plants removed by type
- Recommendations related to follow-up activity for each area in 2027, including whether planting needs to be considered
- A summary of volunteer hours worked
- Recommendations on ways to improve or optimize volunteer efforts in 2027

Preliminary Plans for 2027

The preliminary plans for 2027 will be revisited in February of 2027, but it is expected that the priority will be to revisit the areas stewarded in 2026 with follow up on any further work required in those areas. Work for 2027, starting with a detailed inventory of the work areas, will be undertaken at locations in the interior of the park (P4), including the North Channel (W1) and Turtle Inlet (W2)

Common Name	Scientific Name	Markham Invasive Tier	Wetland W1	Wetland W2	Treed P4
Common Buckthorn	<i>Rhamnus cathartica</i>	T1	T	T	T
Dog Strangling Vine (Black)	<i>Vincetoxicum nigrum</i>	T1			
Dog Strangling Vine (Pale)	<i>Vincetoxicum rossicum</i>	T1	T	T	F
Garlic Mustard	<i>Alliaria petiolata</i>	T2	T	D	F
Phragmites	<i>Phragmites australis americanus</i>	T1	F		

The density codes in the above tables were applied during the 2024 survey. The first step each year will be to revisit each area of concern to detail and mark the specific location and record the density of the targeted species.

Density Codes:

D: Dominant Plant in Area
T: Spotted Throughout the Area
F: Spotted Just a Few

The Bradley Method

FOSLP will follow TNS's recommendation on the use of the Bradley Method for addressing invasive species. The Bradley Method recommends that the initial focus should be on preventing deterioration of the healthiest sites first, then progressively direct efforts towards heavily degraded sites. It involves removing invasive plants in small patches and allowing the area to be repopulated by the surrounding native plants without active replanting. The Bradley Method is described in the article "The Bradley Method of Eliminating Exotic Plants from Natural Reserves" by Fuller and Barbe.

Replanting

Using the Bradley Method should minimize the need for replanting native plants during the pilot program. Before proceeding with the clearing of a large patch of invasive plants, FOSLP will discuss with Markham staff whether there is the need for replanting of native plants in the area and, if so, which plants they would recommend.

Stewardship Guidance



The Invasive Species Centre and the Ontario Invasive Species Plant Council provide background information on numerous invasive species including a technical bulletin for each of the species of concern in Swan Lake Park. Visit the Invasive Species Centre's website at [Invasive Species Centre – Preventing the Spread of Invasive Species](#)

The attached appendices provide extracts from the Technical Bulletins for the four invasive plants targeted in the pilot program. FOSLP will align its operating procedures with the guidelines set out by these guidelines subject to any refinements or restrictions recommended by Markham staff.

The following table summarizes their recommendations on the optimal time for the removal of the four invasive species.

	Jan.	Feb.	Mar.	Apr	May	June	July	Aug	Sept	Oct.	Nov.	Dec.
Common Buckthorn				O	O	S	S	S	S	O	O	
Dog-Strangling Vine			S	S	O	O	O	O	S	S	S	
Garlic Mustard			S	O	O	S	S	S				
Phragmites					P	P	O	O	O	O	P	

O: Optimal Times

S: Suboptimal Times

P: Prohibited

Source: Ontario Invasive Species Centre

There are chemical treatments that can be used for removal of the various invasive plant species, but FOSLP will be relying only on physical techniques for the removal of the plants.

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

The Markham Invasive Species Plan outlined the following approaches for mechanical control of the species highlighted in FOSLP's pilot project.

	Hand Pulling/ Digging	Mowing/ Cutting	Physical Cover	
			Mulching	Tarping
Common Buckthorn	X	X		
Dog-strangling Vine		X		X
Phragmites		X		X
Garlic Mustard	X	X	X	X

Source: Markham Invasive Species Management Plan (2024)

FOSLP does not expect to employ mulching or tarping techniques during the pilot program.

Disposal of Invasive Plants

Reproductive areas of the plants, such as seeds, will be placed in garbage bags for disposal at landfills. Other portions of the plants not considered likely to reproduce will be left on site to decompose.

Volunteers

FOSLP is fortunate in having access to a number of volunteers with diverse backgrounds in plants and invasive species. The Toronto Nature Stewards has provided guidance on how their program works by permitting FOSLP to “audit” its training program for new stewards. One of the senior TNS stewards has reviewed FOSLP's plans and provided field level guidance for the 2026 program.

Appendix A: Common Buckthorn

Best Management Practices Technical Document for Land Managers, Ontario Invasive Species Centre

The prevention and early detection of common buckthorn is essential for an effective plant management strategy. Use this document after you have assessed your site(s) to help identify appropriate control options. An Integrated Pest Management approach, which involves using a combination of control tactics (e.g., herbicide application, cutting, and prescribed burns), is strongly encouraged. For more information on the biology and life cycle of this invasive plant, please refer to the Ontario Invasive Plant Council's Best Management Practices document. Common buckthorn is listed as a Noxious Weed under the Weed Control Act.

Strategy and Cautions

- > Remove the outlying populations (isolated plants or satellite populations) and the most prolific seed producers (female plants) first to prevent further spread.
- > Small populations (=300 m²) of small plants (=5 cm in diameter) can be removed manually.
- > Large populations of seedlings or young trees for which pulling is not practical can be treated with a foliar application of a systemic herbicide.
- > Large trees (>5 cm in diameter) should be cut at the base and stump-treated with a systemic herbicide. Alternatively, the standing stems can be sprayed with a systemic herbicide (basal bark application). These stems can either be left standing or cut down once dead.

Caution: Because of the thorns, it is recommended that protective clothing, including gloves and safety glasses, be worn when conducting manual control. Re-sprouting can be considerable after a failed control attempt. Cutting and not applying systemic herbicides leads to increased work due to multi-stem regrowth. Make sure that boots, clothing, and all equipment is cleaned at the site to ensure seeds or root fragments are not transported from the site. See the Ontario Invasive Plant Council's Clean Equipment Protocol for more details.

Management of Small Populations (=300 m²) and Saplings(<5 cm Diameter)

Small populations of small plants (up to 1 m tall) can be hand-pulled any time of the year. Small populations of plants 1- 5 cm in diameter can be removed using a weed pulling tool. Plants under 1 cm can be hand pulled without the use of a tool. However, gloves are recommended. Remove as much of the root mass as possible to prevent re-sprouting. Disturbed soil will result from these techniques and should be tamped down or covered in a thick layer of mulch to reduce new buckthorn seedling germination. Manual control is easiest after rain when the soil is soft and pliable. If possible, cut off branches with berries in the summer, before the berries ripen and fall off. Then come back in the fall and pull out the cut stems. Common buckthorn leaves remain green longer than most native plants, which makes identification easier into the late fall, allowing for manual control until the ground freezes. This reduces disturbance to surrounding plants that have gone dormant.

Management of Large Populations (>300 m²) and Large Trees (>5 cm Diameter)

When manual control is no longer an option, chemical control is the most effective method for managing large populations. Foliar application of a systemic herbicide is recommended for leaves of small trees. Large trees (>5cm) can be cut and the stumps treated with a systemic herbicide. Alternatively, the standing stems can be sprayed with a systemic herbicide (basal bark application). These stems can either be left standing or cut down once dead. Systemic herbicides must be translocated to the roots to be effective. Some herbicides must be applied during the growing season, therefore read the labels to determine appropriate application times. Herbicide drift may prohibit pesticide use near water. At the time of publication, a bioherbicide is available for the control of common buckthorn and is an alternate treatment option for large populations and large trees. It is effective at inhibiting the resprouting and regrowth from cut stumps. This product must be applied to the plant when it is fully leafed out and must be applied to the cambium layer (inner bark) of freshly cut stumps and girdled trees because it does not translocate through the bark. Plant death occurs over three years.

Common Buckthorn Treatment Times

Hand Pulling or Digging	J	F	M	A	M	J	J	A	S	O	N	D
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Disposal

Do not compost viable plant material (fruits, seeds and roots) at home or send to landfill. Viable plant material must be solarized before disposal by placing it in sealed black plastic bags and leaving them in direct sunlight for 1 – 3 weeks. Plant material can be sent to large-scale municipal composting facilities where the compost pile reaches temperatures high enough to kill living plant material. Ontario composting facilities are required to routinely monitor the compost process and meet strict, provincially regulated time-temperature parameters for pathogen kill. Consult your local municipality to determine if this is an appropriate course of action.

When seedlings or young shrubs are pulled, they should be disposed of in a manner that will ensure that their roots will dry out completely. When feasible, it is advised to remove limbs containing dense clusters of berries. The remaining biomass can be sent to municipal composting facilities while the seed-containing berries are best disposed of after solarization at the landfill. Alternatively, dried branches and stems (without fruits) can be safely incinerated, for example in burn barrels or fire pits, where local bylaws permit. Buckthorn makes excellent firewood. Common buckthorn can also be disposed of through chipping. It is important to ensure all fruit has been removed or you are only doing so with male trees.

Rehabilitation and Monitoring

Control is much more successful when heavily infested areas, often with seed-saturated soil seedbanks, are re-planted with native trees, shrubs, and plant species that can compete with new buckthorn growth. See the Ontario Invasive Plant Council's Best Management Practices document for more details. Follow-up monitoring and removal of new growth is crucial for successful control. Common buckthorn seeds can remain viable in the soil for up to 5 years.

Appendix B: Dog-strangling Vine

Best Management Practices Technical Document for Land Managers Ontario Invasive Species Centre

The prevention and early detection of dog-strangling vine is essential for an effective plant management strategy. Use this document after you have assessed your site(s) to help identify appropriate control options. An Integrated Pest Management approach is strongly encouraged - which involves using a combination of control tactics (e.g., herbicide application, cutting, and prescribed burns). For more information on the biology and life cycle of this invasive plant, please refer to the Ontario Invasive Plant Council's Best Management Practices document. Dog-strangling vine is regulated under Ontario's Invasive Species Act as a restricted species and is also listed as a Noxious Weed under the Weed Control Act. In addition to dog-strangling vine, Ontario has regulated black dog-strangling vine as a restricted invasive species under the Invasive Species Act, 2015.

Strategy Overview and Cautions

- > Remove the outlying populations (isolated plants or satellite populations) first to prevent further spread and treat smaller patches before they develop into larger patches.
- > Dog-strangling vine, once established, is extremely persistent and complete eradication may take several years. As such, early detection and rapid response is essential.
- > Small populations (=50 stems) are most effectively eradicated by digging up the entire root crown. Care must be taken to remove the entire root system to prevent resprouting. Digging up the root crown is more effective than hand pulling.
- > Small populations that occur in the full-sun can also be tarped in late spring. This involves cutting or mowing plants and covering the infestation with a plastic tarp that is opaque where no light can penetrate. Monitor the tarp edges for re-growth.
- > Large populations (>50 stems) are most effectively controlled using a systemic herbicide.
- > Follow-up is required to make sure seedlings do not germinate from the seed bank or re sprout from missed rootstocks.

Caution: Some people may have an allergic reaction to the plant sap. Wear gloves when handling it and wash exposed skin with liquid dishwashing soap afterward. Make sure that boots, clothing, and all equipment is cleaned at the site to ensure seeds or root fragments are not transported from the site. See the Ontario Invasive Plant Council's Clean Equipment Protocol for more details.

Management of Small Populations (=50 stems)

Digging is the most effective means of eradication for small populations. Care must be taken to remove the entire root crown, as the plant will re-sprout from buds on the rootstock if not properly removed. Hand pulling is not recommended as the plant will send up multiple shoots from root fragments. If digging is not an option, then cut plants at ground level repeatedly to prevent seed production. If an infestation occurs in the full-sun, tarping can be an effective control measure. This involves mowing or cutting the plants to ground level and covering them with a tarp made from opaque dark material where no light can penetrate. This prevents

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

photosynthesis. In addition, this method “cooks” the plants under the tarp which is also referred to as “solarization”. This method is less effective in the shade.

Management of Large Populations (>50 stems)

When manual control is not an option, chemical control with a systemic herbicide is the most effective method for managing large populations. Unless otherwise indicated on the product label, plants should be treated after leaves are fully developed but before onset of seed production. Single treatments are insufficient for complete control. Two to three treatments are recommended for best results in year one for established populations, with annual follow-up treatments for 3 or more years, as required. Drift may prohibit pesticide use near water.

Dog-strangling Vine Treatment Times

Digging	J	F	M	A	M	J	J	A	S	O	N	D
Chemical (Foliar)	J	F	M	A	M	J	J	A	S	O	N	D

No Treatment Times

Optimal Treatment Times

Suboptimal Treatment Times

*Note: The above treatment times for herbicide application must consider weather conditions.

Disposal

Do not compost viable plant material (fruits, seed pods and roots) at home or send to landfill. Dog-strangling vine can resprout from a small root fragment. Viable plant material must be solarized before disposal by placing it in sealed black plastic bags and leaving them in direct sunlight for 1 – 3 weeks. Plant material can be sent to large-scale municipal composting facilities where the compost pile reaches temperatures high enough to kill living plant material. Ontario composting facilities are required to routinely monitor the compost process and meet strict, provincially regulated time-temperature parameters for pathogen kill. Consult your local municipality to determine if this is an appropriate course of action. If flowers or seed pods have not formed, allow stems and roots to dry out completely before disposing of them. It is also important to safely dispose of any soil/sediment containing dog-strangling vine at an appropriate location to avoid further spread.

Rehabilitation and Monitoring

Heavily infested areas should be rehabilitated after control to avoid colonization by other invasive plants. Dog-strangling vine may change the soil chemistry of the habitat. Rehabilitation of the soil may be necessary before planting. Consult the Ontario Invasive Plant Council’s Best Management Practices document for more details. It is recommended to monitor dog strangling vine control sites for at least three years following management. Seedlings can quickly mature from established seed banks or adjacent source populations, making monitoring an important component of long-term control. Dog-strangling vine can re-establish via plants that were missed in the previous years treatment, suppressed or shaded by larger plants or have grown from new seed that came into the area. Thus, monitoring is an important component for long-term control.

Appendix C: Phragmites

Best Management Practice Technical Document for Land Managers

Ontario Invasive Species Centre

February 2024

- DISCLAIMER -

This document conveys information recommended by leading professionals across Ontario. It contains the most up-to-date information available at the time of publication. It is not intended to provide legal advice. It is subject to change as new information emerges, tools and techniques evolve or as legislation or permitting requirements change. Tailor the timing of control to your region.

The prevention and early detection of Phragmites is essential for an effective plant management strategy. Use this document after you have assessed your site(s) to help identify potential control options that are appropriate on your site. An Integrated Pest Management approach is strongly encouraged - which involves using a combination of control tactics (e.g. herbicide application, cutting, and prescribed burns). This technical bulletin is only a summary of practices - for more information on the biology and life cycle of this invasive plant, please refer to the Ontario Invasive Plant Council's Best Management Practices document for Invasive Phragmites.

Strategy and Cautions

- Invasive *Phragmites australis* (herein called Phragmites) is regulated under Ontario's Invasive Species Act as a Restricted species.
- Preventing the spread and establishment of Phragmites is essential for long-term success. Early detection and rapid response is key.
- Remove the outlying populations (isolated plants or satellite populations) first to prevent further spread and treat smaller patches before they develop into larger patches.
- Small populations (< 1000 plants) in water and on land can be successfully controlled using selective cutting; this includes underwater cutting at the sediment level with a cane cutter or saw, and terrestrial cutting under the soil with a spade.
- Large, expansive populations (> 1000 plants) terrestrial or aquatic environments can be most effectively controlled using an approved systemic herbicide and/or cutting. Please note: In terrestrial environments, if only the spading method is being used, many years of consistent cutting is required for successful management.
- Apply herbicide late summer to early fall. Do not cut after viable seed heads have developed as this may facilitate spread. If cutting seed heads is the only option to control the spread of Phragmites, do so before they are viable in late summer.
- Targeting only a portion of a Phragmites cell with herbicide or cutting is not recommended as it can be ineffective, waste resources and over the long-term will increase the need for herbicide.

Regardless of the control method, Phragmites management activities may disturb native plants, fish, wildlife and Species at Risk. To minimize potential impacts to these species and their habitats, control activities should be strategically timed to reduce disruption and threat to

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

wildlife, and other mitigative actions should be taken. The Ontario Invasive Plant Council's Best Management Practices document for Invasive Phragmites provides some guidance on timing windows to consider.

Confirm that Phragmites stands are of the invasive subspecies and not the desired native species (Phragmites americanus). Hybrids have not yet been described in Ontario but may be present. Consult the Ontario Invasive Plant Council's Best Management Practices document for Invasive Phragmites for identification information.

Management of Small Populations (<1000 plants) In Terrestrial Environments

Selective cutting to drown during the growing season is the most effective control option if the use of herbicides are not advisable. This method can be used where the site is accessible by walking, including wet areas. Sandy soil is easiest. In areas where Phragmites is growing in sand or other soft substrates, the stalk could be cut below the sediment surface at the point where it is attached to the rhizome. This is best done using a sharpened spade with minimal disturbance to the sediment and surrounding plants. Removal using this method is most effective when done between mid-July to mid- August before flowering occurs. Removal twice during this time reduces the density of the stalks more than one cut. Removal below the soil surface makes the area safe to walk on after the stalks are removed. Consult this spading infographic for more information. This method is most effective when done between mid-July to mid- August before flowering occurs, over a period of about five years.

Please note: This timeline depends upon the initial size of the infestation and site conditions (e.g. high-density sites in nutrient-rich soil will take longer to control). If cutting can only occur once, the best time is when the plant reaches peak height, just as the seed head emerges. If seed heads are present, carefully remove and dispose of them first.

Caution: Do not carry out work during fish spawning season or during the time of other critical fish life stages as set out in the In-W ork Timing Windows. In addition, it is important to minimize the removal of native aquatic vegetation (e.g. wild rice).

Management Populations in Aquatic Environments [Note: FOSLP will not employ herbicides]

There is currently one pesticide approved to control Phragmites in or near water in Ontario (Habitat Aqua, PCPA Registration No. 32374), however, selective cutting to drown during the growing season is the most effective control option if herbicides are not advisable. Under flooded conditions, cutting may also cause drowning. First, remove and dispose of seed heads, if present. Use hand-held cutters, pruners, knives or sharp spades for smaller stands, larger cutters for medium stands, and a motorized cutting device for large stands. Reach down under the water and cut the stalk as close to the sediment as possible or even beneath it, ensuring the entire cut plant is still well covered with water. Caution: Cut stalks will be hazardous if stepped on. Use proper footwear. Depending upon water depths, this may need to be repeated throughout the growing season and for several consecutive years. If only one cut per year is feasible, cut mid-

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

July to mid-August to prevent seed development. All cut stalks must be removed from the water to reduce further spread

Consult this Cut-to-Drown Infographic.

https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf

Phragmites Treatment Times:

Selective Cutting	J	F	M	A	M	J	J	A	S	O	N	D
*Herbicide Application	J	F	M	A	M	J	J	A	S	O	N	D

Optimum Treatment Times

Prohibited Treatment Times

*Note: The above treatment times for herbicide application must consider weather conditions.

Disposal

Viable plant material must be solarized before disposal or sent to large-scale municipal composting facilities where the compost pile reaches temperatures high enough to kill living plant material. Ontario composting facilities are required to routinely monitor the compost process and meet strict, provincially regulated time-temperature parameters for pathogen kill. Consult your local municipality to determine if this is an appropriate course of action. Place material into thick, industrial-grade garbage bags (to prevent stems from piercing the bag) and tie securely, or pile cut stalks under a dark-coloured tarp, or dark plastic bag, and leave in the sun for 1-3 weeks until the material has dried or decayed and is no longer viable. Bags can then be sent to a municipal landfill that will accept invasive plant waste. Alternatively, dried Phragmites can be safely incinerated, for example in burn barrels or fire pits, where local bylaws permit. The cut plants that are removed should be piled on dry land to prevent it from re-entering the water.

Rehabilitation and Monitoring

In order to promote growth of native species, removal of the biomass is recommended. A long-term management and monitoring plan is imperative to achieve control success. Remove isolated populations as they appear. Revegetate the site with competitive native grasses, forbs and wood plants to resist future Phragmites invasions. Phragmites management areas which are very close to or among natural areas with native plant communities may require minimal or even no reseeding. However, sites in more disturbed and unnatural areas, far from native plant seed sources, are likely to require more extensive restoration. It can be beneficial to start reseeding with native annual species after the first treatment, even in cases where follow up treatment will be required. Native annual species can start filling the ecological niche being made available by Phrag removal and make the site more robust against Phragmites reinvasion, and invasion by secondary invasive species. Perennial native species can be added later in the treatment cycle when the majority of the Phragmites has been managed.

Appendix D: Garlic Mustard (*Alliaria petiolata*)

Best Management Practices Technical Document for Land Managers Ontario Invasive Species Centre

- DISCLAIMER -

This document conveys information recommended by leading professionals across Ontario. It contains the most up-to-date information available at the time of publication. It is not intended to provide legal advice. It is subject to change as new information emerges, tools and techniques evolve or as legislation or permitting requirements change. Tailor the timing of control to your region.

The prevention and early detection of garlic mustard is essential for an effective plant management strategy. Use this document after you have assessed your site(s) to help identify control options that are appropriate on your site. An Integrated Pest Management approach is strongly encouraged - which involves using a combination of control tactics (e.g., chemical, manual, mechanical or cultural methods).

This technical bulletin is only a summary of practices - for more information on the biology and life cycle of this invasive plant, please refer to the Ontario Invasive Plant Council's Best Management Practices document.

Strategy and Cautions

- > Garlic mustard spreads exclusively through seed production, making the prevention of seed development the top priority for effective control. Efforts should be focused on managing the seed-producing second-year plants to minimize reproduction and limit further spread.
- > Remove the outlying populations (isolated plants or satellite populations) first to prevent further spread.
- > Pulling plants before or while they are in flower, but before they set seed, is the most effective control method for all populations sizes.
- > If garlic mustard roots are damaged but not entirely removed, small buds (called axillary buds) on the roots will sprout additional stems.
- > Even if the plants are damaged, they can produce replacement flowers as late as September. Pulled flowering plants, that are left on site, will continue to the seed formation and ripening stage.

Caution: Other manual control methods including mowing or cutting, unless combined with chemical control, may increase densities by stimulating growth. These methods are very labour intensive and not effective for long-term control. Make sure that boots, clothing, and all equipment is cleaned at the site to ensure seeds or root fragments are not transported from the site. See the Ontario Invasive Plant Council's Clean Equipment Protocol for more details.

Management of Small and Large Populations

Pulling works best for small or large infestations. The entire "s" shaped root must be removed to prevent re-sprouting. Pulling is easiest when the soil is soft and pliable (in early spring (April/May)

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

and after a rain) but must be done continuously throughout the growing season to ensure all stems are removed. Stop all control activities when garlic mustard starts to produce seeds to prevent spreading seeds. If pulling is not an option (for example, in areas where erosion is an issue) cut the stem of the plants at soil level. Repeat this several times throughout the growing season to prevent the plant from flowering and producing seeds.

Garlic Mustard Treatment Times

Hand Pulling	J	F	M	A	M	J	J	A	S	O	N	D
Chemical (Foliar)	J	F	M	A	M	J	J	A	S	O	N	D

No Treatment

Optimal Treatment Times

Suboptimal Treatment Times

Note: The above treatment times for herbicide application must consider weather conditions.

Disposal

Do not compost viable plant material (seeds and roots) at home or send them to a landfill. Pulled plants that have flowered are still able to produce seeds, so viable plant pieces should be removed and solarized. If your municipality has a high-heat compost program, plants can be sent there. Ontario composting facilities are required to routinely monitor the compost process and meet strict, provincially regulated time-temperature parameters for pathogen kill. Consult your local municipality to determine if this is an appropriate course of action.

Alternatively, solarize viable plant material by placing it in sealed black plastic bags and leaving it in direct sunlight for 1-3 weeks. Plant material can also be placed in yard waste bags, covered with a dark-coloured tarp and left in the sun for 1-3 weeks. Allow stems and roots to dry thoroughly before burning or disposing of them.

Rehabilitation and Monitoring

Garlic mustard invades disturbed areas readily and soil disturbances, such as pulling out plants, stimulates seed germination. Rehabilitation of disturbed areas is therefore vital for long-term control. Because garlic mustard roots produce chemicals that change the soil chemistry and prevent other species from growing nearby (allelopathy), soil rehabilitation may be required before re-planting. It is important to seed or plant native plant species that have been shown to out compete garlic mustard. See the Ontario Invasive Plant Council's Best Management Practices document for details. Experts estimate that garlic mustard seeds are viable for at least 7 years. Follow-up monitoring and removal of new growth during this time period is necessary for complete control.

Appendix E: 2024 Survey: Plants Identified in R6 and R7

Common Name	Scientific Name	Other Names	Class	Native/ Non Nativ	Ont Inv Plant Counc	Ontario Noxious Weed	Markham Invasive Tier (2024)	Markham Forest Comp 202	TRCA Rank	Riparian/ Shoreline R6	Riparian/ Shoreline R7
Amur maple	Acer tataricum		Sapindaceae	NN					L+		F
Basket willow	Salix viminalis		Salicaceae						L+	T	F
Bird's foot trefoil	Lotus corniculatus		Fabaceae	N					L+	T	T
Bittersweet nightshade	Solanum dulcamara	climbing nightshade	Solanaceae	NN					L+	F	
Black medick	Medicago lupulina		Fabaceae	NN					L+		T
Black Walnut	Juglans nigra		Juglandaceae	N				N	L5	T	F
Broad-leaved cattail	Typha latifolia		Typhaceae	N					L4		T
Brown-eyed Susan	Rudbeckia triloba		Asteraceae	N					L+		F
Bull Thistle	Cirsium vulgare	Spear Thistle	Asteraceae	NN		Y			L+		F
Bur Oak	Quercus macrocarpa		Fagaceae	N				N	L4	F	
Canada goldenrod	Solidago canadensis		Asteraceae	N					L5	T	
Canada Thistle	Cirsium arvense	Field Thistle	Asteraceae	NN		Y			L+	T	
Catnip	Nepeta cataria		Lamiaceae	N					L+	F	
Chicory	Cichorium intybus		Asteraceae	NN					L+		F
Clammy locust	Robinia viscosa		Fabaceae						L+	F	
Common Buckthorn	Rhamnus cathartica	European Buckthorn	Rhamnaceae	NN	WA	Y	T1	NN	L+	T	F
Common burdock	Arctium minus		Asteraceae	N					L+	F	
Common Motherwort	Leonurus cardiaca			NN					L+	F	
Common tansy	Tanacetum vulgare		Asteraceae	NN					L+	T	F
Crack Willow	Salix euxina		Salicaceae	NN			T3	NN	L+	T	F
Curly dock	Rumex crispus		Polygonaceae	NN					L+		F
Damask Rose	Rosa damascena			NN						F	
Dandelion	Taraxacum officinale		Asteraceae	NN					L+		F
Dog Strangling Vine (Black)	Vincetoxicum nigrum	Black Swallow-Wort	Apocynaceae	NN		Y	T1		L+		T
Dog Strangling Vine (Pale)	Vincetoxicum rossicum	Pale Swallow Wort	Apocynaceae	NN	DFWCRP	Y	T1		L+	T	
European water-horehound	Lycopus europaeus	Gypsie wort	Lamiaceae	NN					L+		T
Field Sow-thistle	Sonchus arvensis			NN		Y					T
Flat-top goldenrod	Euthamia graminifolia		Asteraceae	N					L5		F
Fragrant Sumach	Rhus aromatica			N					L+	F	
Great burdock	Arctium lappa		Asteraceae	N					L+		F
Green Ash	Fraxinus pennsylvanica		Oleaceae	N				N	L5	F	
Ground-nut	Apios americana		Fabaceae	N					L4	T	
Heal-all	Prunella vulgaris	self heal	Lamiaceae	N					L+?		F
Helleborine	Epipactis helleborine		Orchidaceae	NN					L+	T	
Hound's-tongue	Cynoglossum officinale		Boraginaceae	NN					L+		F

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

Common Name	Scientific Name	Other Names	Class	Native/ Non Native	Ont Inv Plant Counc	Ontario Noxious Weed	Markham Invasive Tier (2024)	Markham Forest Comp 202	TRCA Rank	Riparian/ Shoreline R6	Riparian/ Shoreline R7
Marsh pennywort	Hydrocotyle americana		Araliaceae	N					L4	T	
Nannyberry	Viburnum lentago		Viburnaceae	N					L5	F	
Narrow-leaved cattail	Typha angustifolia		Typhaceae	NN					L+	T	T
New England Aster	Symphyotrichum novae-angliae		Asteraceae	N					L5	T	
Norway Spruce	Picea abies	common spruce	Pinaceae	NN				NN	L+	F	
Purple Loosestrife	Lythrum salicaria		Lythraceae	NN	DYACRP		T3		L+	T	
Purple milkweed	Asclepias purpurascens			N							F
Quaking Aspen	Populus tremuloides	trembling aspen	Salicaceae	N				N	L5	F	
Queen Anne's lace	Daucus carota	Wild Carrot	Apiaceae	NN					L+	T	F
Red clover	Trifolium pratense		Fabaceae	NN					L+	T	
Red mulberry	Morus rubra		Moraceae	N					LX		F
Red-osier dogwood	Cornus stolonifera		Cornaceae	N					L5	T	F
Ribbon grass	Phalaris arundinacea		Poaceae	NN					L+?		F
Riverbank Grape	Vitis riparia		Vitaceae	N					L5	T	F
Rough Fleabane	Erigeron strigosus	common easter fleabane	Asteraceae	N					L5		T
Siberian crab-apple	Malus baccata		Rosaceae	NN					L+		F
Silver Maple	Acer saccharinum		Sapindaceae	N				N	L4	F	F
Smaller evening-primrose	Oenothera parviflora		Onagraceae	N					L4		F
smooth sumach	Rhus glabra		Anacardiaceae	N					L+	T	
Staghorn Sumach	Rhus typhina		Anacardiaceae	N				N	L5	T	
Stinking mayweed	Anthemis cotula	chamomile	Asteraceae	NN					L+		F
Sugar Maple	Acer saccharum		Sapindaceae	N				N	L5	F	F
Tall buttercup	Ranunculus acris		Ranunculaceae	NN					L+	F	
Tall Fleabane	Erigeron elatior			N						T	
Tall goldenrod	Solidago altissima		Asteraceae	N					L5		F
Tarragon	Artemisia dracunculoides		Asteraceae	NN					L+?	T	
Tartarian Honeysuckle	Lonicera tatarica		Caprifoliaceae	NN				NN	L+	T	F
tufted vetch	Vicia cracca	cow vetch	Fabaceae	N					L+	F	T
White Sweet Clover	Melilotus albus		Fabaceae	NN	P				L+		T
white vervain	Verbena urticifolia		Verbenaceae	N					L5	T	F
White Willow	Salix alba		Salicaceae	NN			T3	NN	L+	F	F
Wild Grapes	Vitis vinifera			N							F
Wild Strawberry	Fragaria virginiana		Rosaceae	N					L5		T
Yellow avens	Geum aleppicum		Rosaceae	N					L5		T

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

Appendix F: 2024 Survey: Plants Identified in P5 and P6

Common Name	Scientific Name	Other Names	Class	Native/ Non Nativ	Ont Inv Plant Counc	Ontario Noxious Weed	Markham Invasive Tier (2024)	Markham Forest Comp 202	TRCA Rank	Treed P6	Open P5
American Reed	Phragmites australis americana	reed grass, common reed	Poaceae	NN			T1		L1	T	
Amur Honeysuckle	Lonicera maackii	bush honeysuckle	Caprifoliaceae	NN				NN	L+	T	
Basket willow	Salix viminalis		Salicaceae						L+		F
Basswood	Tilia americana	American basswood	Malvaceae	N				N	L5	F	F
Bird's foot trefoil	Lotus corniculatus		Fabaceae	N					L+		T
Bishop's weed	Ammi majus									F	
Bittersweet nightshade	Solanum dulcamara	climbing nightshade	Solanaceae	NN					L+	F	
Black medick	Medicago lupulina		Fabaceae	NN					L+		T
Black Oak	Quercus velutina		Fagaceae	N					L2	F	F
Black Walnut	Juglans nigra		Juglandaceae	N				N	L5	F	
Blackwell switch grass	Panicum virgatum		Poaceae	N					L3		F
Brown-eyed Susan	Rudbeckia triloba		Asteraceae	N					L+	F	
Bur Oak	Quercus macrocarpa		Fagaceae	N				N	L4		F
Canada goldenrod	Solidago canadensis		Asteraceae	N					L5		F
Canada Thistle	Cirsium arvense	Field Thistle	Asteraceae	NN		Y			L+	F	F
Canada wild rye	Elymus canadensis canadensis		Poaceae	N					L4	F	
Canadian Service Berry	Amelanchier Canadenses			N						F	
Carolina poplar	Populus canadensis		Salicaceae	N					L+	F	
Chicory	Cichorium intybus		Asteraceae	NN					L+	F	
Clammy locust	Robinia viscosa		Fabaceae						L+	F	
Colorado spruce	Picea pungens		Pinaceae	NN					L+		F
Common Buckthorn	Rhamnus cathartica	European Buckthorn	Rhamnaceae	NN	WA	Y	T1	NN	L+	F	
Common burdock	Arctium minus		Asteraceae	N					L+	F	
Common milkweed	Asclepias syriaca		Apocynaceae	N					L5	F	
Common Ragweed	Ambrosia artemisiifolia		Asteraceae	N		Y			L5	F	
Crack Willow	Salix euxina		Salicaceae	NN			T3	NN	L+		F
Dog Strangling Vine (Black)	Vincetoxicum nigrum	Black Swallow-Wort	Apocynaceae	NN		Y	T1		L+		F
Early Goldenrod	Solidago juncea		Asteraceae	N					L4	T	
Eastern Cottonwood	Populus deltoides			N							F
Field bindweed	Convolvulus arvensis	Wild Morning Glory	Convolvulaceae	NN					L+	F	
Field Sow-thistle	Sonchus arvensis			NN		Y				F	
Fool's Parsley	Aethusa cynapium										F
Freemanii Maple	Acer freemanii		Sapindaceae	N				N	L4	F	
Greater bird's foot trefoil	Lotus pedunculatus			NN						T	
Green Ash	Fraxinus pennsylvanica		Oleaceae	N				N	L5	F	F

SWAN LAKE INVASIVE PLANT SPECIES REMOVAL PROGRAM

Common Name	Scientific Name	Other Names	Class	Native/ Non Nativ	Ont Inv Plant Counc	Ontario Noxious Weed	Markham Invasive Tier (2024)	Markham Forest Comp 202	TRCA Rank	Treed P6	Open P5
Hedge Bedstraw	Galium album	White Madder		N			T3			T	
Hoary alyssum	Berteroa incana		Brassicaceae	NN					L+		F
Lady's venus-comb	Scandix pecten-veneris	Shepherd's needle		NN						T	
Little-leaf Linden	Tilia cordata		Malvaceae	NN				NN	L+		F
Manitoba Maple	Acer negundo	Boxelder	Sapindaceae	NN	DFCP			NN	L+?	F	F
Nannyberry	Viburnum lentago		Viburnaceae	N					L5		F
New England Aster	Symphyotrichum novae-angliae		Asteraceae	N					L5	T	F
Northern dock	Rumex longifolius	long leaved dock	Polygonaceae	NN					L+	F	
Old Field Aster	Symphyotrichum pilosum pilosum		Asteraceae	N					L2	T	T
Perennial rye	Lolium perenne		Poaceae	NN					L+		F
Periwinkle	Vinca minor		Apocynaceae	NN			T2		L+		F
Pignut hickory	Carya glabra			N						F	
Purple-flowering raspberry	Rubus odoratus		Rosaceae	N					L5	F	
Queen Anne's lace	Daucus carota	Wild Carrot	Apiaceae	NN					L+	T	F
Red Maple	Acer rubrum		Sapindaceae	N				N	L4	F	F
Red-berried elder	Sambucus racemosa		Viburnaceae	N					L5		F
Red-osier dogwood	Cornus stolonifera		Cornaceae	N					L5		T
River Birch	Betula nigra		Betulaceae	N						F	
Sandbar willow	Salix interior		Salicaceae	N					L5	F	
Sea couch grass	Elymus pungens			NN							F
Silver Maple	Acer saccharinum		Sapindaceae	N				N	L4		F
Smaller evening-primrose	Oenothera parviflora		Onagraceae	N					L4	F	
Sugar Maple	Acer saccharum		Sapindaceae	N				N	L5		F
Tall goldenrod	Solidago altissima		Asteraceae	N					L5		F
Tarragon	Artemisia dracunculoides		Asteraceae	NN					L+?	T	
Tartarian Honeysuckle	Lonicera tatarica		Caprifoliaceae	NN				NN	L+		F
Thicket creeper	Parthenocissus vitacea	false Virginia creeper	Vitaceae	N					L5	F	
Ticklewort	Hypericum annulatum										F
Trefoil	Lotus tenuis			NN						T	
tufted vetch	Vicia cracca	cow vetch	Fabaceae	N					L+	F	F
White Bedstraw	Galium mollugo		Rubiaceae	NN		Y			L+	T	
White Cedar	Thuja occidentalis		Cupressaceae	N				N	L4	F	F
White oak	Quercus alba		Fagaceae	N					L3		F
White Pine	Pinus strobus	Eastern white pine	Pinaceae	N				N	L4	F	F
White Sweet Clover	Melilotus albus		Fabaceae	NN	P				L+	T	
Witch-hazel	Hamamelis virginiana		Hamamelidaceae	N					L3	F	
Yellow avens	Geum aleppicum		Rosaceae	N					L5		F