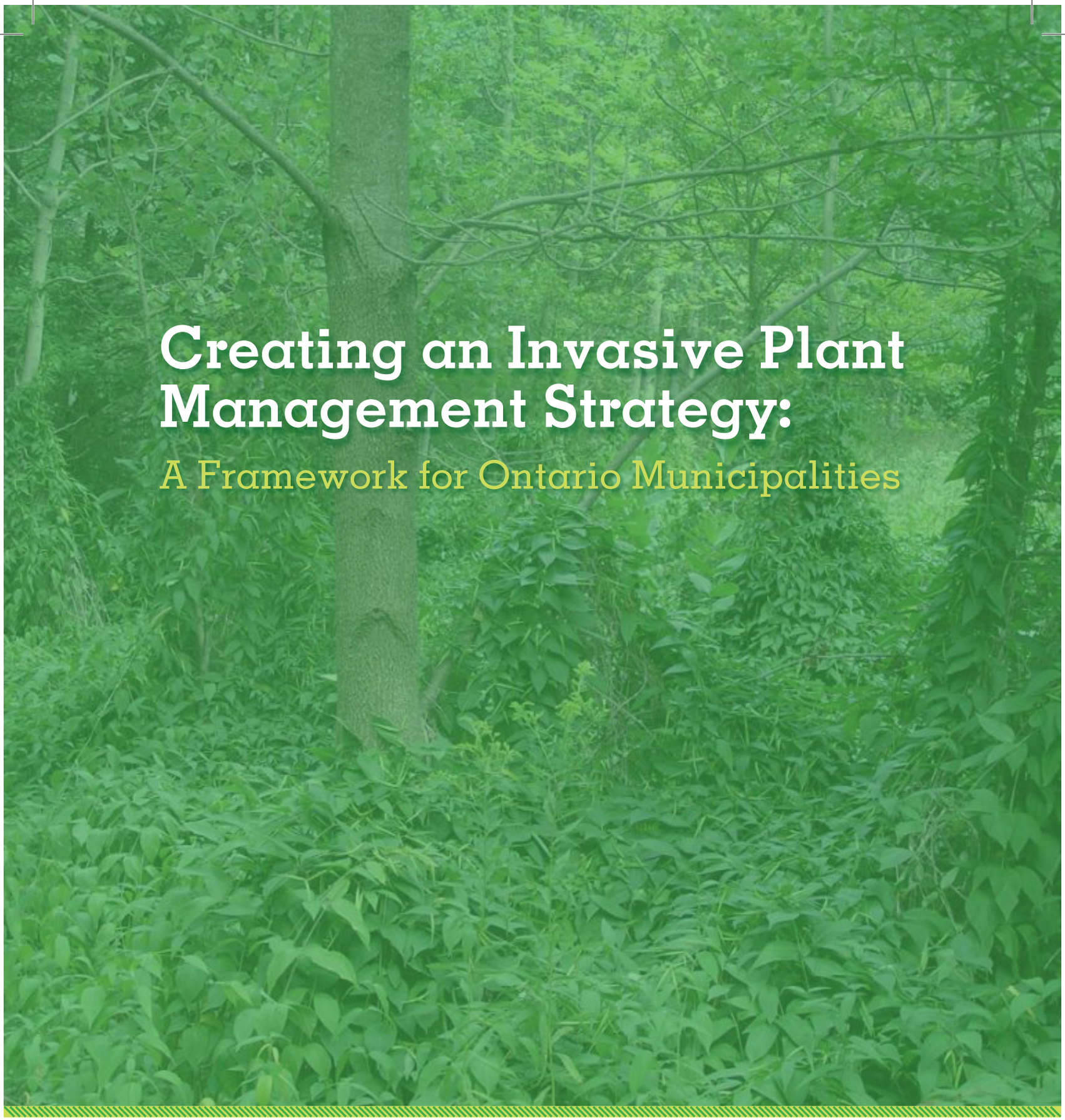

Creating an Invasive Plant Management Strategy:

A Framework for Ontario Municipalities

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Invasive Species Centre
Catalyst for research and response

Ontario Invasive Plant Council

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1. Executive Summary

Invasive plants are causing significant negative impacts to Ontario's natural environment, economy and society. Effective management and control of invasive plants presents challenges, but many harmful impacts can be reduced by working collaboratively on a local scale. Municipalities have a key role in responding to invasive plants, through local management, and educating the public to change perceptions and behaviours around their use and spread.

This framework was developed by the Ontario Invasive Plant Council (OIPC) through funding from the Invasive Species Centre (ISC). It provides municipalities with information on how to create an invasive plant management strategy, or strengthen existing measures.

This framework includes information on:

- The importance of local governments' actions
- Roles and responsibilities of those involved
- Ontario legislation and regulations for invasive plants
- Non-regulatory and regulatory management options
- Funding sources
- Additional resources

There is no single correct invasive plant management strategy, as features are different within each municipality. Municipalities need to identify their priority goals and objectives and then tailor the management strategy accordingly. An effective management strategy combines a number of different actions, including education and outreach, partnerships and collaboration, regulatory approaches and direct control.

Strategic plans are most effective as working documents that are updated as necessary to reflect current research, best management practices, new legislation and evaluation of effectiveness.

Japanese Knotweed is an aggressive invasive plant with an extensive root system that can cause major problems for public and private infrastructure.

Photo courtesy of Freyja Whitten.

2. Introduction

Invasive species, including invasive plants, are the second most significant cause of species extinctions worldwide, after habitat loss (IUCN, 2014). Invasive plants can negatively impact the natural environment and affect recreational, ecological and economic values. Some impacts include financial costs of management and control, ecological and economic impacts to agriculture and forestry, displacement of native species and degradation of native habitats (Environment Canada, 2010). Harmful or unpleasant invasive plants can reduce the recreational value of land and waterbodies. Some invasive plants, such as giant hogweed (*Heracleum mentegazzianum*), can affect human health by causing severe skin reactions.

A survey conducted in 2012 by the OIPC with the ISC, the Ontario Ministry of Natural Resources and Forestry (OMNRF) and the Ontario Federation of Anglers and Hunters (OFAH) identified that many municipalities face significant challenges with regards to invasive plant management. Many identified lack of resources and proper training, as well as being overwhelmed by the extent of some invasive plant infestations as specific challenges. Municipalities are some of the largest land managers in Ontario, so it is crucial to provide them with the tools required to take proper measures to effectively address the issue of invasive plants in their jurisdictions.

2.1 Purpose

An Invasive Plant Management Strategy is a working document that sets clear direction for the management of invasive plants within a municipality; it includes the identification of priorities for management and control and public and landowner education. A management strategy from one municipality may be adopted and adapted by other municipalities.

2.1.1 What are Invasive Plants?

Ontario's Invasive Species Strategic Plan (2012) defines alien species as plants, animals, and micro-organisms introduced by human activity outside their natural or past distribution. Invasive species are defined as harmful alien species whose introduction or spread threatens the environment, the economy or society, including human health.

An invasive plant often lacks natural enemies or other forms of competition to keep it in check; therefore it can quickly increase its range and form dense stands that completely take over an area in a short amount of time. An invasive species may also include species native to Ontario that have been introduced to a new geographic region due to human activity (OMNRF, 2012). Many invasive plants are being spread quickly to new areas through human activity alone.

3. Invasive Plants in Ontario

Ontario has more species of invasive plants than any other province in Canada and it is at a higher risk of new invasive plants entering and becoming established (OMNRF, 2012). This is due to its highly industrialized, urbanized and mobile population, a healthy economy with many imports and exports, and its geographic location on a major international shipping channel (OMNRF, 2012). International trade with countries that share a similar climate to Ontario pose a higher risk for the unintentional spread of invasive plant species, because similar environmental conditions make it easier for invasive plants to establish here. Traditionally the United States has been Canada's top trading partner, but imports from Asia have greatly increased in previous decades (CFIA, 2008). With increased trade and a changing climate, it may be easier for plants from these and other regions to arrive, establish and expand their range.

4. Impacts of Invasive Plants

Invasive plants pose a number of threats to municipal forests, natural areas, the local economy and residents. Ones of particular interest to municipalities include:

4.1 Degradation of Natural Areas

Natural areas such as forests, prairies, wetlands and lakes provide many services and benefits to the economy, society and the environment. Natural areas provide shelter and food for wildlife, remove pollutants from air and water, produce oxygen through photosynthesis and provide valuable recreational and educational opportunities. Invasive plants can have a large impact on natural areas and threaten these important services that they provide.

Invasive plants impact species diversity and species richness by competing heavily for resources such as light, moisture and soil nutrients that native plants require to establish and grow. These changes in species composition may affect wildlife that are adapted to native plant communities. Ultimately, invasive plants affect the intricate linkages that make ecosystems strong and resilient. For example, garlic mustard (*Alliaria petiolata*) often out-competes native woodland herbs like white trillium (*Trillium grandiflorum*) by changing the soil chemistry and making it less suitable for these native species (Queen's Printer for Ontario, 2012). Changes in these linkages can affect the services and benefits that natural areas provide.

4.2 Interference with Agriculture

Invasive plants can have a wide range of impacts on the agricultural industry. Invasive plants can act as new or additional hosts for new or existing crop diseases and crop pests, they can cause reductions in crop yields and may require increased use of pesticides to control them. This increases costs for farmers and reduces crop values. Invasive plants, such as leafy spurge (*Euphorbia esula*) or some knapweed species (*Centaurea* spp.) (both listed as provincial noxious weeds), can take over farmlands, reducing crop production and foraging space. The estimated annual economic impact of invasive plants on Canadian agriculture is $2.2 billion (Environment Canada, 2010).

4.3 Reduced Forest Regeneration and Productivity

Invasive plants can reduce forest regeneration through direct competition with tree seedlings, resulting in reduced density and slowed growth rate. Reduction in forest regeneration results in the loss of wildlife habitat, and decreases the diversity of a stand, making it more vulnerable to insects and disease.

Invasive plants can also affect forest productivity by impacting beneficial soil organisms and changing soil chemistry. Some invasive plants can form dense mats of vegetation, hindering natural forest regeneration and hindering or preventing access by forestry workers and equipment (e.g. dog-strangling vine (*Cynanchicum rossicum*)).

4.4 Danger to Human Health and Safety

Some invasive plants, like giant hogweed (*Heracleum mantegazzianum*) and wild parsnip (*Pastinaca sativa*), cause human health concerns because their sap is toxic to skin. Other plants can cause physical injuries to the body; common buckthorn (*Rhamnus cathartica*) branches end in a short, sharp thorn which may inflict injury. Human safety may also be impacted by fast growing invasive plants. For example, *Phragmites australis* (hereafter referred to as introduced *Phragmites*) grows large and rapidly, and may reduce visibility at rights of ways, increasing the risk of car accidents. Dead, dry stalks of introduced *Phragmites* are also highly combustible and can become a fire hazard.

It's important to note that many of our native plant species can pose a risk to human health and safety, but a key difference with invasive plants is that they become widespread and prevalent much faster than our native plants, which means their risks may occur at a much higher rate. This makes preventing their spread and controlling them and the risks they pose to humans that much more difficult, but that much more important.

4.5 Socio-economic

Invasive plants can have a large economic impact on individual landowners and municipalities. A recent study shows that property values for shoreline residences in Vermont affected with Eurasian water-milfoil (*Myriophyllum spicatum*) were down as much as 16.4 % (OMNRF, 2012). Due to the explosion of leafy spurge (*Euphorbia esula*), Manitoba has experienced a $30 million reduction in land values (CFIA, 2008). Leafy spurge infests 340,000 acres of land in Manitoba, costing taxpayers an estimated $19 million per year to protect grazing land, public land, and rights-of-way (CFIA, 2008). In Ontario, the MNRF has been involved with introduced *Phragmites* control pilot projects since 2007 and to date control costs range between $865 and $1,112 per hectare (OMNRF, 2012). Invasive species have an impact on approximately 20% of Species at Risk in Ontario (OMNRF, 2012).

Invasive plants directly affect municipalities with reforestation projects and recreational trails. They increase management costs (e.g. project planning and monitoring) and they increase operational costs (e.g. mowing, pruning and hand pulling). They also complicate reforestation projects as they need to first be removed, and then the gaps created through removal must be addressed by using large, potted plant stock, or additional site maintenance to prevent the risk of re-invasion.

The Trinational Commission for Environmental Cooperation reported that economic losses and the costs of environmental impacts caused by invasive species exceed $100 billion annually in the U.S. alone (OMNRF, 2012). In Ontario, over $30 million has been spent by the Canadian Food Inspection Agency (CFIA) to slow the spread of emerald ash borer (EAB) (OMNRF, 2012). On a municipal scale, the City of Toronto has estimated emerald ash borer (*Agrilus planipennis*) management costs for 2013-2020 to be $71.2 million for tree removal, wood disposal, pesticide injection, replacement plantings and staff resources (City of Toronto, 2012).

4.6 Adverse Impacts on Recreation and Aesthetics

Natural areas in municipalities support a wealth of recreational activities including hunting, fishing, swimming, hiking, bird watching, and mountain biking. Invasive plants that invade recreational areas often reduce the area's attractive and enjoyable qualities. For example, invasive plants may reduce native plant biodiversity, affecting the number of songbirds in the area; walking through dense vegetation can prove difficult; and popular swimming areas may become unusable with the presence of invasive aquatic plants. Seeds and other plant parts can hitch rides on hiking boots, clothing, pets, birds and vehicles, resulting in new infestations, potentially over great distances.

5. Framework Overview, Scope and Purpose

This purpose of this framework is to provide a resource for local municipalities in Ontario to begin or become more involved in invasive plant management.

This framework includes information on:

- The importance of local governments' actions
- Roles and responsibilities of those involved
- Ontario legislation and regulations for invasive plants
- Non-regulatory and regulatory management options
- Funding sources
- Additional resources

The framework does not include information on:

- Invasive plant identification and specific control measures (See the "Additional Resources" section at the back of this document for a link to Best Management Practices for Ontario)
- Inventory methodology (See the Additional Resources section at the back of this document for a link to the Landowner's Guide which can assist in starting an inventory)
- How to develop and implement regulations and by-laws – (Ontario Municipal Act: http://www.mah.gov.on.ca/Page184.aspx)

5.1 Creating the Strategy

Effective invasive plant management strategies begin with a vision, followed by scoping, and setting goals and objectives. Starting out with a broad vision (e.g. control invasive plants within the municipality), and determining what is possible and what is not (i.e. scoping), allows you to create tailored goals, and objectives to achieve them (Appendix A provides definitions of these terms).

The resources available for invasive plant management in municipalities differ. This is why setting clear objectives is important. Assessment of financial and staff resources will allow you to make cost-effective decisions of priorities. In the initial stages of a strategy, it may be best to focus on three to five strong and cost effective objectives in priority areas. Follow-up monitoring of these areas will help determine the effectiveness of management decisions.

5.1.1 Create an Implementation Plan

An implementation plan will include all of the actions decided upon in the strategy. The implementation plan identifies the priority, approximate timelines and relative cost of each action. This assists the municipality in staying on track and within budget.

Table 1. Example of part of an implementation plan

Objective 1: Prevent the introduction and spread of invasive plants in the municipality

Strategy 1: Begin to build an Early Detection and Rapid Response (EDRR) Program

Action	Priority	Relative Cost
Establish an internal staff EDRR team with a lead coordinator to develop an EDRR program	Very High	Low

5.2 Optimizing Municipal Resources

Many municipalities struggle to find information, resources and tools to deal with invasive plants. It is important for municipalities to find ways to optimize already existing resources. Examples of ways to do this includes:

- Ensuring that collaboration strategies and actions are completed and continually improved upon. Working in partnership with other organizations, stewardships groups and volunteers will minimize municipal resources needed for invasive plant management
- Conduct a review of, or create, an invasive species management budget to support long-term funding, staffing and resources
- Continue to explore external grants and other funding opportunities
- Regularly update the strategy to include new research and action items, and periodically conduct a review of the overall success of the strategy

5.3 Measuring the Success of the Strategy

It's important to define measures of success for each objective and the specific action you choose to implement under the strategy. Defining measures of success is the first step in helping you evaluate the effectiveness of the strategy.

There are a number of different types of measures of success including efficiency, outcome, quality and project measures of success. The most common measure of success for an invasive plant management strategy is the outcome measure, or end result. This determines whether actions have met proposed objectives and whether they have demonstrated positive impacts and benefits.

An example of an objective and its measures of success include:

- **Objective:** Prevent further introductions and spread of invasive plants in the municipality
- **Strategy:** Contaminated materials management and equipment management
- **Action:** Host a Clean Equipment Protocol Workshop in partnership with the OIPC, for contractors who undertake work in the municipality and for other local contractors

Example Measures of Success:

- Number of contractors at the workshop
- Number of Clean Equipment Protocol guides distributed
- Feedback form created, completed by contractors at the workshop and results summarized to evaluate workshop interest and success
- Future workshops planned or not planned

6. Guiding Principles of A Strategy

Two overall guiding principles of a strategy are the importance of using an Ecosystem Approach for natural areas management, and the necessity of using Integrated Pest Management when determining how to control and/or eradicate invasive plants.

6.1 Ecosystem Approach

Any strategy involved in protecting and restoring the natural environment should focus on using an Ecosystem Approach whenever possible. The Convention on Biological Diversity (2002) defines an ecosystem approach as "A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way". The ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization that encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems."

An ecosystem approach for an invasive plant strategy incorporates the following principles (Invasive Plant Strategy for BC, 2012):

- Maintain genetic and species diversity and functioning ecosystems, since they are more resilient to invasive species
- Base priority-setting and control treatments on susceptibility of ecosystems to certain invasive species and focus on species that will affect ecological, economic and environmental values the most
- Prevent or minimize disturbances during any land-use activities (to minimize suitable habitat for invasive plants)
- Restore disturbed areas and degraded ecosystems as soon as possible to reduce suitable habitat for invasive plants
- Treat ecosystems individually, and determine the appropriate management approach to invasive species and priorities based on knowledge and best management practices that apply integrated plant management
- Consider other values when managing invasive plants such as health and safety, community support, water quality, species at risk, nesting sites and food sources

6.2 Integrated Pest Management (IPM)

Under a strategy, Integrated Pest Management (IPM) principles should be used when implementing invasive plant management programs. IPM refers to the practice of preventing or reducing damage caused by pests by using the best available information, along with a variety of ecologically and economically sustainable approaches and control methods. It is a balanced approach for managing invasive species and should consider the following (Invasive Plant Strategy for BC, 2012):

- Managing the resource to prevent the introduction of invasive plants
- Correctly identifying invasive plant species and applying control strategies based on knowledge of their biology, ecology and response to management
- Conducting inventories and mapping, and monitoring invasive plant populations and damage
- Making control decisions based on knowledge of potential damage, cost of control methods, and the environmental impact of both the invasive plant and the control decision
- Using control strategies that may include a combination of methods such as biological, cultural, mechanical and chemical controls to reduce the invasive plant population to an acceptable level
- Undertaking control during the proper time of year
- Evaluating the effectiveness and impacts of management decisions (this is a very important part of IPM and any management strategy. Without ongoing monitoring, success may be limited and resources wasted)

7. Invasive Plant Inventory

An invasive plant inventory provides the foundation for all management decisions and supplies very important information including:

- What invasive plants are present
- Where invasive plants are located
- The potential pathway of introduction(s) of invasive plants
- Presence of rare species
- Presence of rare community types
- What control (if any) has been completed
- How effective previous controls were
- Status of the infestation

An invasive plant inventory is a key component of a management plan. It provides information on the current status of invasive plants in the municipality, including their distribution, population sizes and relative threats to natural areas. It also serves as a tool to prioritize the control of different invasive plant populations within and among the municipality.

The inventory should capture information of rare species and rare community types. This information helps to determine which areas are a management priority. Local OMNRF district offices and conservation authorities are good sources for information on federal, provincial, and regionally rare species and rare community types that may have been identified in previous historical surveys.

If the municipality has already begun an invasive plant inventory, build on this by mapping new invasive plants, as well as to record changes in existing invasive plant populations.

Before starting an invasive plant inventory, consider the following:

1. Consider using a Standard Protocol

Management activities to reduce the impacts of invasive plants are most successful when based on comprehensive data. Integrated inventory and monitoring are required to measure the extent of invasive plants, but also to measure the extent of the surrounding native flora and fauna. A standard protocol can ensure more cost-effective management and more informed decision-making. The Vegetation Sampling Protocol (VSP) is an inventory and monitoring approach that can be used to consistently inventory vegetation communities and invasive plants in settled landscapes (Puric-Mladenovic et al., 2012). See http://www.forestry.utoronto.ca/settledlandscapes/vsp/documents/VSP_FAQ.pdf for more information.

2. Work with Surrounding Municipalities

Municipalities closest to you may have invasive plant inventories of their own, with the possibility of inventory information for natural areas within your municipality. If there is no inventory information for your municipality, use other municipality's information as a reference for the type of invasive plants near you.

3. EDDMapS Ontario

EDDMapS (Early Detection and Distribution Mapping System) is a web-based mapping system for documenting invasive species distributions. It's fast, easy to use and doesn't require any Geographic Information Systems (GIS) experience. It was launched in 2005 by the Center for Invasive Species and Ecosystem Health at the University of Georgia. EDDMapS Ontario (http://www.eddmaps.org/ontario) was developed by the University of Georgia with support and funding from the Canada/Ontario Invasive Species Centre (ISC), the Ontario Federation of Anglers and Hunters (OFAH) and the OMNRF.

EDDMapS Ontario can assist municipalities in starting an inventory. Municipalities can use EDDMapS Ontario to search for existing invasive plants within their jurisdiction. The "alert" function of the program allows anyone using it to receive a notification when a particular species has been reported in a specific area. Mapping tools also allow staff or the public to query species based on certain areas, such as upper and lower tier municipalities. It is easy to use and it is maintained by the ISAP, therefore there is no additional work that the municipality has to undertake.

In Ontario, there are a number of agencies and monitoring programs in place that collect information on the distribution of invasive species. Many of these monitoring programs generate a large quantity of data, often covering a wide geographic area. Information collected by a municipality through an inventory can be entered into EDDMapS by doing a bulk upload. By having one common reporting tool, this distribution information can be kept in one central database, rather than spread out across the province in a number of different systems. All data entered into EDDMapS is verified by experts, ensuring the data is accurate.

4. Conservation Authorities

Many Conservation Authorities (CAs) map and inventory invasive species within their watersheds and then collaborate with municipalities. Begin to work with your local CAs to obtain important inventory information they may already have, or continue partnering with you CA to save on additional time and resources.

5. Local Community Groups

There are many working groups, cottage associations, field naturalist clubs, and horticultural societies that are involved in invasive plant management. Most of these groups are volunteer-based and have members that are experts in the field. These groups may also have invasive plant inventory information.

6. Hire a Consultant

Depending on the resources available for invasive plant management, it may be feasible for your municipality to hire a private consultant to undertake an invasive plant inventory.

7. A Landowner's Guide to Managing and Controlling Invasive Plants in Ontario

The OIPC, in partnership with the ISAP, OMNRF and Credit Valley Conservation Authority, developed a manual to assist landowners in controlling invasive plants on their property. Although this guide is directed at private landowners, it consists of key pieces of information that can assist anyone with an invasive plant inventory, and options for control and management.

8. Controlling New and Existing Invasive Plants

8.1 Early Detection and Rapid Response (EDRR)

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

An EDRR plan consists of six key steps:

1. Early detection –

Observation, preliminary identification and reporting of invasive plants believed to be new to the area

2. Identification –

Species verification

3. Alert screening –

Confirms whether the species is new to the area and present at an extent deemed eradicable; evaluates risk and determines if the species is designated as prohibited provincially or federally

4. Risk assessment –

Measures probability of entry, establishment and spread, and the associated economic, environmental and social impacts. Assign assessed species a risk rating of high, medium or low – this determines how the EDRR process will proceed

5. Rapid response –

Development and implementation of a response plan, including obtaining land access and treatment permits

6. Monitoring & reassessment –

Evaluation of the success of the response and whether the EDRR objectives were achieved; reassessment of the plan as new monitoring data becomes available

An EDRR program requires an extensive amount of effective and efficient coordination, along with clear accountabilities, communication and information sharing. A complete EDRR plan works best for a large area that crosses multiple jurisdictional boundaries

See **Appendix B** for more information on developing an EDRR program for your municipality

8.2 Developing an Invasive Plant Management Plan

Ontario consists of a number of municipalities that vary in size, shape and landscape features. There is no one correct management plan and any municipality developing one will need to tailor it to suit their needs. It is important to develop and implement an effective management plan to minimize spreads before the cost of management makes it too difficult to undertake.

Management plans start with the invasive plant inventory. Municipalities will need to continue to inventory for as long as active management occurs. Utilizing guidelines in the *Landowner's Guide for Managing and Controlling Invasive Plants in Ontario* (see Additional Resources), will help to prioritize areas for control; emphasizing areas where invasive plants are absent or just starting, and the protection of rare species and rare community types. Use existing Best Management Practices in Ontario documents to guide control efforts and identify necessary research to be conducted. Consider developing best management practices for other target invasive plant species where no document exists. New information regarding best management practices changes often, therefore actively seek guidance on new approaches and adapt your practices accordingly.

Removing invasive plants can result in the loss of all vegetative cover, creating an ideal condition for new invasive plants to move in. In some areas native plants will return naturally after treatment. In these cases there are enough native plants to re-vegetate newly cleared areas through seed germination or plant spread. However, other areas may require restoration through selective planting and/or other methods to reduce the risk of soil erosion and re-invasion by non-native plants. The management plan should include steps for restoring areas where invasive plants have been removed and areas where invasive plants could pose a problem in the future. Examples of restoration methods include:

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

Successful restoration planting is dependent on choosing plant species which are ecologically suited to the site conditions. Typically, primary succession trees and shrubs (those that naturally colonize disturbed sites) will have the highest survival rates.

Continue to monitor success of control and restoration efforts.

9. Governance and Policies for Invasive Plant Management in Ontario

There are a number of steps being taken by the federal and provincial governments, non-profit organizations and private landowners to address the threat of invasive plants in Ontario.

9.1 Roles and Responsibilities

9.1.1 Federal Government

In Canada, the federal government works in cooperation with its provincial and territorial counterparts to combat invasive species. In 2004, the Government of Canada released An *Invasive Alien Species Strategy for Canada*. This National strategy provides a framework for preventing new invasions, detecting and responding to new invasive species, and managing established invasive species through eradication, containment and control. Its goal is to protect Canada's aquatic and terrestrial ecosystems, and native biological diversity from the risks of invasive species (Environment Canada, 2004). Measures being used by the federal government to combat invasive species include outreach and education, monitoring and research, control and management and enforcement of regulations under existing legislation including the *Seeds Act* and *Plant Protection Act*. These pieces of legislation are important for restricting the movement of invasive plants.

9.1.2 Ontario Government

In Canada, the Constitution grants much of the power for management of natural resources to the provincial governments. Provincial governments are responsible for the protection of many of our woodlands, forests, and waters as well as its agricultural lands and rights of way. In Ontario, the OMNRF, the Ministry of Agriculture, Food and Rural Affairs (OMAFRA), the Ministry of the Environment and Climate Change (MOECC), and the Ministry of Transportation (MTO) have taken a major role in combating invasive species by developing the *Ontario Invasive Species Strategic Plan*. The objectives of this strategic plan are to prevent new invaders from arriving and surviving in Ontario, to slow and where possible reverse the spread of existing invasive species, and to reduce the harmful impacts of existing invasive species. Measures being used to fight invasive species include outreach and education, monitoring and research, control and management and assisting with the development of policies and regulations.

Although the Ontario Government plays a large role in combatting invasive species, it's limited within a municipal strategy, with the exception of plant species designated as noxious weeds regulated under the *Weed Control Act*. Municipalities may enact their own by-laws and implement their own strategy to help in preventing the spread of invasive plants.

9.1.3 Municipalities

Municipalities are responsible for managing street trees, municipally designated forests and woodlands, public parks and municipally designated natural areas. They play a key role in protecting these areas from invasive plants. Most municipal staff in Ontario have briefed their councils on the impact of invasive plants and some have provided training to their parks and forestry personnel on detection and management.

Municipalities are responsible for appointing a local weed inspector to undertake the administration and enforcement of the *Weed Control Act* (See page 21). Municipalities also employ by-law enforcement officers to enforce by-laws, rules, laws, codes or regulations enacted by local governments. This may include by-laws associated with invasive plant management.

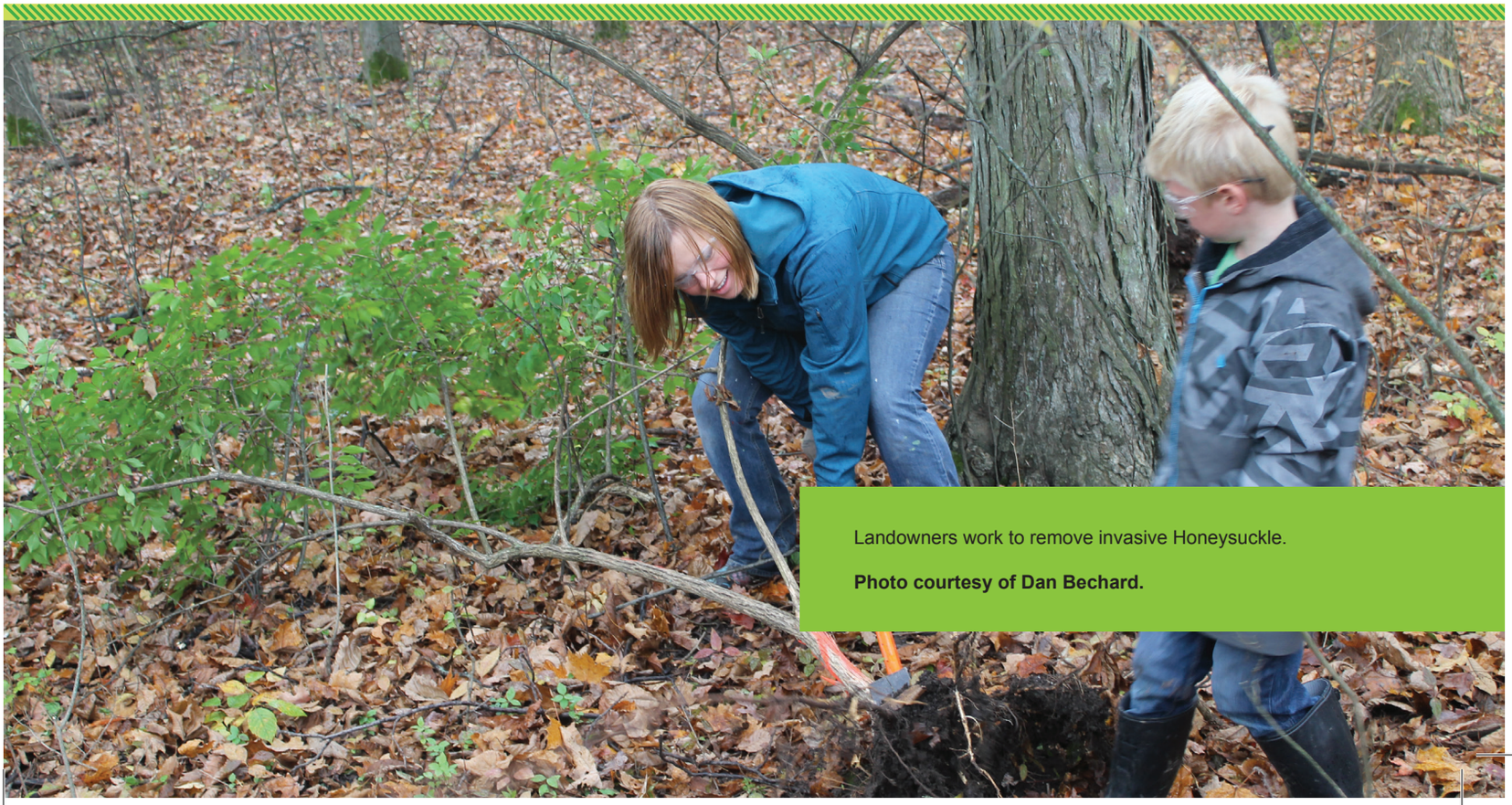
Many municipalities will continue to be severely impacted by invasive species. Private property owners in urban areas will also be heavily impacted by the costs of invasive plant removal. Management, control and mitigation costs municipalities the use of staff time, educational resources, special equipment and herbicides. If work is not coordinated to manage invasive plants early, the future costs will be higher and the work to control will take longer.

9.1.4 Landowners

A private landowner refers to someone who is in physical possession of land or property. A landowner is responsible and has control over the activities conducted on their land, as well as who is allowed to enter or use the property. A landowner can be an individual, corporation or government. Landowners play a role in preventing the spread of and managing invasive plants by controlling noxious weeds under the *Weed Control Act*. They must also follow local regulations and by-laws associated with invasive plant management.

Landowners can assist in preventing the spread of invasive plants by learning how to control them on their own properties, which in turn will reduce their spread into natural areas. Landowners can learn to identify common invasive plants and learn about native alternatives to invasive plants that may be available through the horticulture trade. Private landowners, including private land developers, are a key target audience of outreach and education about identification, prevention and management of invasive plants.

By educating landowners and the public, and by providing them with proper tools and knowledge, they can be empowered to prevent the spread and assist with the control of invasive plants.



Landowners work to remove invasive Honeysuckle.

Photo courtesy of Dan Bechard.

Table 2. Agencies and organizations in Ontario with a role in invasive plant management

Agency/Organization	Jurisdiction	Description
FEDERAL AGENCIES		
Parks Canada	National Parks	Some implement their own invasive plant management strategies
Environment Canada	National wildlife areas (NWA) and migratory bird sanctuaries (MBS)	Some NWA and MBS implement their own invasive plant management strategies Leading an *Invasive Alien Species Strategy for Canada*
Canadian Food Inspection Agency (CFIA)	Canadian Plant Resource Base	Administers the *Plant Protection Act* and the *Seeds Act* (see page 22)
Pest Management Regulatory Agency (PMRA)	Pesticides regulations	Administers the *Pest Control Products Act*
Fisheries and Oceans Canada	All waters in the fishing zones of Canada, in the territorial sea of Canada and all internal waters of Canada	Administers the *Fisheries Act* and has proposed new federal regulations to manage and control aquatic invasive species in Canada
All federal departments and agencies	Federal lands	Conducts vegetation control where needed
PROVINCIAL AGENCIES		
Ministry of Natural Resources and Forestry	Provincial Parks, Crown Land	Leads the *Ontario Invasive Species Strategic Plan* Some parks implement their own invasive plant management strategies Regulates aquatic invasive plant removal under the *Public Lands Act* Issues Letter of Opinion for Natural Resource Exception of the Cosmetic Pesticides Ban (Ontario Regulation 63/09), to enable control of invasive plants using Class 9 pesticides
Ministry of the Environment and Climate Change	Pesticide regulations for lakes, ponds, rivers, streams and wetlands	Regulates the sale, use, licensing, transportation, storage and disposal of pesticides under the *Pesticides Act* and O. Reg. 63/09 Supports the *Ontario Invasive Species Strategic Plan*
Ministry of Transportation	Transportation network of highways and other transportation corridors	Supports the *Ontario Invasive Species Strategic Plan*
Ministry of Agriculture, Food and Rural Affairs	Invasive weeds that impact the industries of agriculture and horticulture	Supports the *Ontario Invasive Species Strategic Plan* Enforces the *Weed Control Act* and maintains the Noxious Weed List

Agency/Organization	Jurisdiction	Description
LOCAL GOVERNMENTS		
Municipalities	Lands within municipal boundaries	Some implement their own invasive plant management strategies, which may include by-laws and regulations Can designate locally noxious weeds impacting the municipality under the *Weed Control Act* Responsible for enforcing the *Weed Control Act* through municipal weed inspector
Regional Municipality	Lands within regional municipality boundary including municipalities	Some implement their own invasive plant management strategies, which may include by-laws and regulations Can designate locally noxious weeds impacting the municipality under the *Weed Control Act* Responsible for enforcing the *Weed Control Act* through municipal weed inspector
ABORIGINAL COMMUNITIES		
Aboriginal communities	Indian reserves and treaty lands	Nations, councils or bands may implement their own invasive plant management strategies
UTILITY AND GAS COMPANIES		
Many in Ontario. Examples include: Hydro One, Ontario Power Generation, Ontario Hydro	Management on rights of way	Management on rights of way of nuisance vegetation including some invasive plants
NON-PROFIT ORGANIZATIONS		
Conservation Authorities	Regulated areas within their jurisdictions	Local watershed management agencies that protect and manage water and natural resources in partnership with others, including invasive plants
Trail councils	Trails within their authority	May be responsible for managing a trail(s) within their authority
Ontario Invasive Plant Council	Ontario	Multi-agency organization to provide leadership expertise and a forum for Ontarians to take action on invasive plant issues
Invading Species Awareness Program (partnership between OMNRF and the OFAH)	Ontario	Addresses invasive plant threats through education and awareness
Community Groups with land management authority	Lands under their management authority	E.g. Ducks Unlimited, The Nature Conservancy Conduct active management of invasive plants to protect lands under their management authority

Agency/Organization	Jurisdiction	Description
Stewardship Groups	Variable	E.g. Field Naturalists, Friends of the Rouge Valley, etc. May be responsible for managing a natural area or park or partaking in invasive plant removal but no actual authority

9.2 Legislation, Regulations and By-laws in Ontario

Ontario currently relies on a number of federal and provincial regulatory tools for dealing with invasive species. Some municipalities have employed their own by-laws to manage invasive species within their own jurisdiction. Table 1 contains a summary of federal and provincial legislation and regulations related to invasive plant management.

Table 3. Summary of existing regulations related to invasive plant management

Jurisdiction	Regulation/By-law	Relevance
Federal	*Plant Protection Act* S.C. 1990, c.22	Regulates invasive plants
	Seeds Act R.S.C. 1985, c. S-8	Regulates seed for the presence of some invasive plants
	Pest Control Products Act (S.C. 2002, c.28)	Regulates pesticides in Canada
	Fisheries Act, R.S.C., 1985, c. F-14	Regulates aquatic invasive species (proposed regulations)
Provincial	*Weed Control Act,* R.S.O. 1990, c. W.5	Addresses listed noxious weeds on all but federal lands
Provincial	*Pesticides Act,* Ontario regulation 63/09	Restricts the use of pesticides in Ontario but some exceptions (e.g. natural resources, forestry, agriculture and human health and safety) allow for the use of certain pesticides for the control of invasive plants
Provincial	*Public Lands Act,* Ontario Regulation 239/13 (section 9)	Allows for the removal of certain aquatic invasive plants without a work permit if certain conditions are followed
Municipal	*Weed Control Act,* R.S.O. 1990, c. W.5	Addresses listed noxious weeds on all but federal lands
Municipal	Other	Potential regulations and by-laws pertaining to invasive plant management

1. *Weed Control Act*

The intent of the *Weed Control Act* is to reduce negative impacts of noxious weeds on agriculture and horticulture; to reduce plant diseases by eliminating plant disease hosts such as common barberry and European buckthorn; and to reduce health hazards to livestock caused by poisonous plants.

A noxious weed includes a plant that has been listed in the schedule of noxious weeds found in regulation 1096 made under the *Weed Control Act*. This list is commonly referred to as the "Noxious Weed List".

In general, a species designated as a noxious weed under the *Weed Control Act* has one or more of the following characteristics:

- Difficult to manage on agricultural land once established and will reduce the yield and quality of the crop being grown
- Negatively affects the health and well-being of livestock
- Poses a risk to the health and well-being of agricultural workers

In Ontario, 25 weeds are designated as noxious under the *Weed Control Act.* Municipalities are responsible for appointing one or more weed inspectors at their discretion. The weed inspector is responsible for responding to calls made to the municipal clerk in regards to a noxious weed that has been reported on someone's property. The weed inspector can order the person in possession of the land to destroy the weed within seven days.

2. Municipal By-Laws

The council of a municipality, subject to the approval of the Minister of the Ministry of Municipal Affairs and Housing, may designate additional plants as noxious through a by-law made in accordance with the *Weed Control Act*. These local weeds are deemed noxious weeds in the area where the by-law applies. For example, Halton Hills included giant hogweed as a "Nuisance Species (noxious)" under their Community Standards By-law before it became a provincial noxious weed.

The City of Toronto also has the Ravine and Natural Feature Protection By-law, which enforces the planting of native plant species and management of invasive plant species where property stewardship plans are required for development applications.

3. Ontario Cosmetic Pesticides Ban

The sale and use of certain pesticides have been banned for cosmetic purposes in Ontario. The provincial ban established one clear set of rules on the sale and use of pesticides for cosmetic purposes, replacing local municipal cosmetic pesticide bylaws. **Class 9 pesticides** are prescribed for the ban and cannot be used for cosmetic purposes on lawns, vegetable and ornamental gardens, patios, driveways, cemeteries, and in parks and school yards.

The Pesticides Act and Ontario Regulation 63/09 provides exceptions and conditions for the exceptions, that allow for the use of prohibited pesticides for invasive species management and protection of the natural environment. The exceptions include:

- **Natural resources:** The Natural Resources exception provides for the use of Class 9 pesticides in a land extermination to protect, establish, maintain, or restore a natural resource when no other exemption applies to the situation. This exception applies to a Conservation Authority, the OMNRF, or a person who has obtained a letter of opinion from the OMNRF stating that the use of a Class 9 pesticide is necessary for either the control an invasive species that may be detrimental to the health of a person, the environment or the economy of Ontario; to benefit a species of plant or animal native to Ontario; or to protect or restore a rare ecosystem or its components. Contact your local MNRF district office for more information: https://www.ontario.ca/government/ministry-natural-resources-and-forestry-regional-and-district-offices
- **Trees:** Since trees are so important to protecting our climate, licensed exterminators can use Class 9 pesticides to maintain a tree's health with the written opinion of a professional tree care specialist that states that the use of the pesticide, as part of an integrated pest management strategy, is necessary to protect the health of the tree. Homeowners and licensed exterminators can also use Class 11 pesticides (biopesticides and lower risk pesticides) to care for trees without requiring an opinion from a professional tree care specialist. For example, Btk (Bacillus thuringiensis subspecies kurstaki) is a biopesticide widely used in Ontario for Gypsy moth control.
- **Agriculture:** Under the agriculture exception, a farmer can use a Class 9 pesticide for the purposes of an "Agricultural Operation". Ontario farmers already have stringent rules on the use, handling, storage and application of pesticides, and these rules will continue. The exception does not apply to a farmer's household vegetable garden and lawn.
- **Forestry:** The forestry exception allows for the use of Class 9 pesticides in a forest (a treed area of land 1 hectare in size or larger that is not part of an agricultural operation) for the purposes of forestry (activities related to the maintenance and establishment of a forest). Ontario's forestry workers must follow stringent rules on the use, handling, storage and application of pesticides.
- **Public works:** Under the health or safety exception, pesticides are allowed to be used to maintain safe conditions, and the security of, and emergency access to, public works. Public works include highways; railways; power works, gas works, water works and other utilities; transit/transportation corridors; and the perimeter of nuclear facilities. The exception does not apply to the use of a pesticide on a portion of a highway to which pedestrians have access on a regular basis or where the public is invited to stop including picnic and rest areas.

It's important to ensure that any management activities follow the new regulations under the ban. It is also important to educate the public and landowners on these regulations to prevent the miss-use of herbicides.

4. *Public Lands Act*

The OMNRF manages Crown land (public lands and forests) under the *Public Lands Act*. The Act applies to the use of Crown land and shore lands, and does not apply to the use of federal lands and waterbodies (e.g. the Trent-Severn and Rideau Canal waterways). Under the Act, a shoreline property owner is not required to obtain a work permit to remove, by mechanical means or by hand, invasive aquatic vegetation from the bed of the waterbody in front of the property. Some rules must be followed and only certain species of invasive aquatic plants can be removed. They are the species of most concern for Ontario's public waters (https://www.ontario.ca/environment-and-energy/remove-invasive-aquatic-plants).

5. *Plant Protection Act*

The *Plant Protection Act* protects plant life, agriculture and forestry. Regulations under the Act prevent the import, export and spread of pests injurious to plants, and provide for their control and eradication. The Plant Protection Act is administered by Canadian Food Inspection Agency.

6. *Seeds Act*

The Seeds Act ensures that seeds sold in, imported into and exported from Canada meet established standards for quality, labelling, and registration prior to sale in Canada. It is administered by the Canadian Food Inspection Agency.

7. *Fisheries Act*

Proposed Aquatic Invasive Species Regulations will address aquatic species (including plants) that may harm fish, fish habitat and the use of fish. The Province of Ontario holds responsibility for fisheries management, including administration and implementation of regulations under this Act.

8. *Pest Control Products Act*

The *Pest Control Products Act* regulates products used for control of pests to protect human health and the environment. Pesticides require approval before they can be imported, manufactured, sold or used in Canada. The *Pest Control Products Act* is administrated by the Pest Management Regulatory Authority.

Protective clothing must be worn when controlling an infestation of Giant hogweed to avoid contact with the toxic sap.

Photo courtesy of Fraser Valley Regional District.

10. Preventing the Introduction and Spread of Invasive Plants using Non-Regulatory and Regulatory Strategies

An invasive plant management strategy is an integrated approach. It uses strategies and actions, which can be non-regulatory and regulatory based. Non-regulatory approaches focus on education and outreach, collaboration with other government and non-government organizations, landowner incentives and staff training. Regulatory approaches focus on the creation of by-laws.

10.1 Non-regulatory Strategies

10.1.1 Develop a 'Watch List' of Invasive Plants

By developing a 'Watch List' for plants most likely to invade or for plants that are at initial stages of invasion when eradication is still possible, you can limit the introduction and spread of highly invasive and high-risk plants.

To begin developing a Watch List for your municipality, it is important to utilize what information already exists. A good starting point would be to work from existing lists including plant lists from local CAs, plant councils, consulting firms, and government organizations. CA's which are located within the surrounding vicinity of your municipality, will have a good indication of what is found in and around you and what has the potential to spread into your jurisdiction. EDDMapS Ontario distribution maps may also provide a good starting point. Research into the biology of plants that are most likely to invade may provide insights into their mechanisms of dispersal and spread.

Develop a comprehensive list of invasive plants which have established themselves or have the potential to establish themselves in the area. Early detection of the plant species which have not yet established will better allow for the implementation of rapid response programs.

Note: *A Watch List can be difficult to maintain due to the amount of plants that may be on the list and the updates required to keep the list relevant. For this reason, it may be easier for smaller municipalities, and larger municipalities may only choose to do this for high priority sites.*

A Watch List of invasive plants can also assist in getting the public more involved. By providing a Watch List to the public, it enables them to become familiar with a small number of priority invasive plants to focus on, and not become overwhelmed by a large list. The list can be posted online and displayed in appropriate areas to increase awareness.

10.1.2 Incorporate Invasive Plant Management into Land Use Planning

Land use planning is an important part of every municipality's activities. Municipalities are responsible for land use planning, which ensures that natural heritage features and resources are considered in community development. It also helps to plan for the incorporation of goals such as an increase in urban forests, a reduction in sprawl and more local jobs, to name a few.

One specific example is the loss of forest cover and the fragmentation of forests, which can contribute to, and promote the spread of invasive plants. Land use planning that considers the impacts of the loss of cover and tries to mitigate the effects, will be more successful in preventing the spread of invasive plants.

There are considerations around development and the spread of invasive plants. During the development stage, native vegetation is often removed, which leaves disturbed areas where invasive plants are highly likely to colonize. The incorporation of invasive plant management strategies into development plans will help to address this issue. It may even be possible to regulate developers to restore disturbed areas after completion of development projects.

One last example is incorporating invasive plant management into municipal landscaping and horticulture programs. The OIPC has created the Grow Me Instead Guide which lists a number of alternative plants to many common garden invaders. This guide is geared towards individual landowners, however it's also important that municipalities begin to incorporate this into their own gardening practices as well. Train seasonal and permanent staff on what to avoid planting and choosing the right plants for the right place.

10.1.3 Promote the use of EDDMapS Ontario

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

Although it is important to track the distribution of all invasive plants within the province, the focus within a municipal strategy should focus on public tracking of species on the Watch List. Tracking Watch List species using EDDMapS increases the likelihood of new invaders being caught quickly.

10.1.4 Contaminated Materials and Equipment

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

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

Control of potentially contaminated materials (e.g. fill, soil, gravel, excavated materials from construction sites, etc.) at the source also helps to prevent the spread of invasive plants. Raising awareness of the problem among target audiences (e.g. construction, demolition and landscape contractors) is a first step towards addressing this issue. Simple measures such as inspecting and cleaning equipment and vehicles after they come in contact with contaminated materials will reduce the likelihood of spread.

10.1.5 Road and Highway Maintenance to Prevent the Introduction and Spread of Invasive Plants

Invasive plants spread to new areas through a number of ways. One unintentional introduction is through contaminated mud, gravel, water, soil and plant material moved by equipment during road construction and highway maintenance activities.

It's recommended that a separate strategy or training program be established to ensure road and highway maintenance staff are following best management practices to prevent the spread of invasive plants when working. Some best management practices include identifying potential invaders, planning maintenance activities, keeping equipment clean by following the Clean Equipment Protocol for Industry and minimizing roadside disturbance as much as possible.

For more information, the Invasive Species Council of B.C. and the Government of B.C. have developed a Best Management Practices Pocket Guide for Managing Invasive Plants on Roadsides for Maintenance Contractors that can assist municipalities in getting started (See the section on Additional Resources).

10.1.6 Staff Training and Education

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

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

10.1.7 Public Education and Awareness

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

Many municipalities have developed communication plans that inform education and awareness strategies not just for invasive plants, but for other municipal programs as well. If one already exists for your municipality, you can update it to include a focus on communication strategies around invasive plants. Some municipalities may consider developing a communication plan solely focused on invasive plants as well.

Some key information that should be communicated to the public includes introduction to invasive plants, how they are introduced and spread, potential impacts, how the public can take action to reduce the spread and what regulations and by-laws are in place. A good way to start is to increase awareness of any large-scale control project taking place in the municipality. Residents may be surprised to see the large landscape change that occurs after invasive plant removal, and this is a good opportunity to teach them of the importance of introducing native vegetation to the site to prevent colonization of invasive plants in this kind of disturbed environment. If herbicides were used to control invasive vegetation, educate on the importance of using chemical control safely, for effective results.

When developing communication strategies it is important to determine the target audience. The type of education and awareness tools chosen will depend on the target audience, as well as on strategy objectives and budget. Example target audiences include:

- The general public, including youth
- Aboriginal groups
- Private landowners
- Contractors
- Municipal staff
- Businesses

Avenues for information distribution include:

- Monthly newsletters, e-newsletters
- Including information in monthly bills (e-bills if possible)
- Utilizing local websites and existing and emerging social media
- Radio public service announcements
- Billboards
- Landowner workshops, preferably when done in partnership with non-profit and community groups

Examples of education and awareness strategies and actions include:

- Updating the municipal website to include a separate webpage about invasive species. It should highlight identification of targeted invasive plants and tips on preventing their spread
- Utilizing existing information (brochures, signs, posters, factsheets etc.) from key invasive species organizations including the OIPC, ISAP, ISC etc.,
- Communicating a clear reporting protocol using EDDMapS Ontario on website
- Creating a citizen science program through which volunteer "citizen scientists" are trained to detect the arrival and spread of invasive plants in their own local areas. Incentives can be given by recognizing volunteers who track a high number of invasive plants. EDDMapS Ontario can assist with this
- Hosting workshops for landowners and the general public that focuses on invasive plant identification, prevention, control, hiring contractors for removal and restoration, EDDMapS Ontario, etc.
- Hosting information workshops for local industries that promote and sell invasive plants such as nurseries, pet stores, horticultural groups, etc.
- Creating demonstration sites and information days to teach landowners about effective invasive plant management techniques
- Developing resources for landowners that teach proper disposal of yard waste and unwanted aquatic plants
- Posting signage about staying on trails, keeping pets on leashes, and removing plant materials from boots, shoes and equipment before entering and exiting parks and recreational areas
- Promoting the use of native and non-invasive horticultural plant species by promoting the OIPC Grow Me Instead Guide and Nursery Recognition Program
- Promoting Best Management Practices and the OIPC Landowner's Guide's Managing and Controlling Invasive Plants in Ontario
- Creating an Invasive Plant Awareness day/week/month with activities such as events, contests, awards, etc.

10.1.8 Community Based Social Marketing (CBSM)

Many municipalities and non-governmental organizations have adopted the principles of Community Based Social Marketing (CBSM) in their communication and public education plans. CBSM emphasizes direct contact with community members and removal of barriers that are preventing behavioural change. It is one method of fostering behavioural change that is sustainable. The tools of a CBSM strategy are designed based on the understanding of what influences people to change, such as verbal or written commitments, social norms, the use of prompts and vivid communication and the use of incentives.

There are five key steps involved in a CBSM strategy

1. Selecting desired behaviours
2. Identifying the barriers and benefits to an activity
3. Developing a strategy that utilizes "tools" that have been shown to be effective in changing behaviour
4. Piloting the strategy
5. Evaluating the strategy

To deliver effective education, it is important to collect accurate information and data that identifies barriers that inhibit individuals from engaging in the activity, as well as what would motivate them to act. In step one and two of a CBSM strategy, the organization conducts research, hosts focus groups, and conducts surveys to identify other programs and initiatives with similar themes; selects the desired behaviours needed to prevent the spread of invasive plants; and identifies the barriers and benefits to an activity, which will assist in deciding on the proper tools and strategies to carry out the rest of the plan. See www.cbsm.com for more information.

10.1.9 Engaging Stewardship Groups and Community Volunteers

Assistance from stewardship groups and other community volunteers can be invaluable for an invasive plant management program as it can help further the reach of education and awareness efforts. These groups will have specialized expertise and local knowledge that can assist in invasive plant management. School groups and youth organizations are often especially eager to assist in the control activities.

Note: *Involving school groups and youth organizations is a great way to spread awareness of this issue, but it is recommend to select sites suitable for education purposes versus sites that need extensive remediation.*

1. Hold a Public Meeting

A structured and well-advertised public meeting that consists of a formal presentation followed by a question and answer period can help engage both stewardship groups and the public of whom may be interested in partnering and volunteering. A public meeting introduces the invasive plant strategy as well. Participants are presented with relevant information to allow for transparency and it shows that you are interested in working with them.

2. Host a Community Workshop

A workshop is along the lines of an informal public meeting. The workshop generally begins with a presentation, but could end with small group discussions guided by a facilitator to discuss partnership and volunteer ideas and opportunities.

3. Make Direct Contact

Make a list of all local stewardship groups (and any other relevant groups) in the municipality and contact them directly. Be prepared to explain how you can partner on invasive plant management activities. Direct contact shows stewardship groups that you are determined to establish a positive relationship to try and effectively manage invasive plants.

Make direct contact to also support local stewardship groups in coordinating and facilitating invasive plant removal activities by providing technical advice, in-kind support, and in-kind promotion (website and social media advertising). Share best management practices with groups to ensure consistent management standards.

4. Create a Municipal Volunteer Program

A municipal volunteer program establishes a group of dedicated volunteers who can assist in invasive plant management activities. The volunteer program consists of someone who recruits and manages volunteers and plans and promotes invasive plant management activities. Through the volunteer program, partner with local stewardship groups to coordinate and host “Community Weed Pulls”.

5. Show your Support

Support and provide any in-kind support possible to other organizations and educational institutions involved in invasive plant research. New invasive plant research can assist your municipality in making correct management decisions and will save you valuable time and resources by not having to undertake the research yourself. When appropriate, partner with municipalities to obtain funding for invasive plant projects.

10.1.10 Enhance Collaboration and Communication with Government and Non-profit Organizations

Invasive plants have the ability to spread far and fast, and they do not follow jurisdictional boundaries. Effective management of invasive plants requires a strong regional approach and coordination and collaboration among various stakeholders. Successful management of invasive plants requires a shared effort with mutual cooperation across jurisdictions.

Communicate the strategy and implementation actions through forums and working groups with other local municipalities. Establish a lead contact within each local municipality to distribute information to municipal staff and residents. Encourage other municipalities to develop their own invasive plant management strategy. You may also want to consider replicating this with contacts from the provincial and federal government, for work that is being done to manage invasive plants on provincial and federal lands in or adjacent to your municipality.

There are many non-profit organizations specializing in invasive species prevention and management including the OIPC, the ISAP, the ISC, local CAs and Master Gardener groups. Partner with these organizations on specific projects and workshops to reach a larger audience, ensure consistent messaging, and to save municipal resources.

10.1.11 Landowner Incentives

As well as public education and outreach, incentives encourage and motivate the general public and landowners to prevent the spread of and control invasive plants. When creating incentives keep in mind the following:

- Be clear about what it is you want the public and landowners to do
- Focus on the goal of the invasive plant management strategy – the target goal must be meaningful and motivational for anyone involved
- Consider making a fun competition apart of an incentive program – some “positive” peer pressure from the public can influence others to follow in their footsteps

Some examples of incentives are:

1. Free Tipping Fees

If landowners or organizations are removing invasive plants by hand or mechanically, they will need to properly dispose of the plant material. Composting is not recommended for most invasive plants because it is generally a mechanism for spread, as not all invasive plant parts and seeds are destroyed through the composting process. Therefore, the simplest method for disposing of invasive plant material is through the landfill. Most municipalities have various invasive plant disposal policies and gate fees. One method to encourage landowners to remove invasive plants and encourage proper disposal is to waive or lower tipping fees.

2. Invasive Plant Green-Waste Pick-up

Many municipalities already have a green-waste program where landowners can put green-waste such as tree branches and leaves in compostable bags alongside their regular garbage and recycling to be picked up by the municipality. More recently, invasive plants have become another component of green-waste pick-up. However, many landowners are unsure if they can place invasive plants that they have removed from their property with their regular green-waste. Make it easy for landowners to dispose of invasive plants by making invasive plant pick-up apart of your regular green-waste pick-up program (if you have the ability/equipment to properly treat them). Invasive plants can spread easily through plant parts and seeds so they should not be composted unless your compost facility reaches an adequate temperature to kill the plants parts and seeds.

3. Equipment Loan Program (for Manual and Mechanical Control)

Manual and mechanical control of invasive plants requires a number of different tools to undertake effective control. Tools can include weed wrenches, pruners, shovels and chainsaws. Create an equipment loan program where residents can borrow certain equipment free of charge (for equipment that does not require a special permit or license). Landowners can be encouraged to remove invasive plants without the financial burden.

4. Invasive Plant Control Assistance

In many cases, landowners do not have the knowledge and/or experience to removing invasive plants. In some cases when an invasive plant is required to be removed, such as under the *Weed Act*, this can cause even more of a burden for a landowner because removal must be done in a certain time period. Establish a program whereby staff assist individual landowners in removing invasive plants through one-on-one site visits. If resources cannot allow for individual site visits, offer landowners free invasive plant control training workshops. Ensure that the *Landowner's Guide to Managing and Controlling Invasive Plants in Ontario* is made accessible to the public. You may even consider developing a landowner's guide tailored to your municipality, with easy step-by-step instructions for removing invasive plants. This should include clear information on herbicide regulations and what landowners must follow to use herbicides as a management tool. Provide flexibility to those landowners who must remove a noxious weed from their property.

5. List of Licenced Herbicide Applicators

Herbicides can be very effective when used in combination with other control efforts, and in some cases, are the most effective form of control. However, most landowners are unsure of who to contact to provide herbicide treatments, and who has experience providing herbicide treatment to control invasive plants. Create a list of licensed and experienced herbicide applicators with contact information that is easily accessible to landowners.

Introduced Phragmites is becoming an increasing problem for municipalities due to its ability to invade and disrupt the flow of municipal drains.

Photo courtesy of Lambton Shores Phragmites Community Group.

10.2 Regulatory Strategies

10.2.12 Municipal By-laws

Education is the preferred action to encourage residents to manage and control invasive plants. However, regulations and by-laws can be used to support a municipality's efforts to control invasive plants when faced with residents who are unwilling to remove invasive plants of concern, or who are directly contributing to the spread of invasive plants (i.e. dumping yard waste into natural areas). By-laws can be made to regulate other activities related to invasive plants such as the movement of contaminated soil and the sale of invasive plants.

Any recommendations for new by-laws or changes to existing by-laws should consider these general principles:

- Education and communication should precede the use of regulations
- Regulations should be used sparingly and only as a last resort
- Consultation with community members, staff and experts should take place before a by-law is enacted
- Consideration should be given to using existing by-laws

Creating Regulations and By-laws under the *Municipal Act*

All local governments have the ability to manage listed noxious weeds (which include some invasive plants) under the *Weed Control Act* and enforce removal of them under the Act. All local governments have the ability to designate local noxious weeds not listed on the provincial list within their jurisdiction (**See *Weed Control Act* on page 21**).

Alternatively, municipalities can create new by-laws through the *Municipal Act*. The *Municipal Act* allows lower and upper-tier municipalities to pass by-laws subject to the rules set out in subsection 4 of the Act. Visit http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_01m25_e.htm to view the *Municipal Act*.

In 2007, the Act was amended significantly to broaden the powers of a municipality. This allows municipalities to govern affairs as appropriate, enhancing the ability to respond to respond to municipal issues. This facilitates the creation of new and progressive invasive plant management by-laws.

Example By-laws

There is no set template for creating effective invasive plant by-laws. The following are a variety of existing by-laws and ideas for by-laws that municipalities can use as to assist in creating their own. Expert advice should be sought to ensure the design of any by-law is appropriate for the municipality and targeted invasive plants.

There are few municipal by-laws in Ontario which deal with invasive plants directly. This may be because municipalities have the ability to add an invasive plant which is deemed noxious to their local noxious weed list under the *Weed Act*, without the need to create a new by-law. However, there are other examples of by-laws from other provinces in Canada which may be useful for municipalities to follow.

1. Peace River (Alberta) Regional District By-Law No. 2121 and 2120

Peace River has created two by-laws; one grants authority to the municipality to provide a service to landowners to assist in controlling listed noxious weeds and invasive plants; and another requires landowners to clean their property of listed noxious weeds and invasive plants. The regional district maintains a list of invasive plants for landowners to refer to.

By-law No. 2121

Whereas the Local Government Act authorizes the Regional Board to require the owners or occupiers of real property, or their agents, to clear their property of invasive plants.

By-law No. 2120

Whereas pursuant to supplementary letters patent the Peace River Regional District has been granted authority to provide the service of controlling noxious weeds and other growths, with all member municipalities and electoral areas participating.

2. Resort Municipality of Whistler (British Columbia) Environmental Protection By-law No. 2000

The Environmental Protection By-law was created to assist the municipality in meeting community goals for protecting the environment. The by-law was amended in June 2014 to include invasive plants. The by-law requires the removal of noxious weeds similar to Ontario's Weed Act, but it also restricts landowners from planting other invasive plants.

By-law No.2000

No person shall, having received written notice from the Resort Municipality to remove any specimen of an applicable plant from that person's land or from land occupied by that person, fail to comply with such notice within the time specified in the notice shall be no less than 30 days.

No person shall plant any specimen of an applicable plant on any land owned or occupied by that person, or on any other land within the Resort Municipality.

Some example by-laws to consider include:

Prohibiting the dumping of yard waste into parks and natural areas

- Yard waste is a vector in which invasive plants spread. Many municipalities and government bodies already restrict the dumping of yard waste into natural areas. However, if your municipality does not have a by-law regarding this, it is an important one to consider. This by-law can be supported if the municipality already has green-waste pickup and proper green-waste disposal areas at the local landfill.

Prohibiting the removal of plants from parks and city-owned natural areas

- By prohibiting the removal of plants from parks and other natural areas, you are protecting important native vegetation that is important food and habitat for local wildlife. You are also preventing the potential spread of invasive plants by limiting disturbance in natural areas

Soil transfer and disposal regulations

- Invasive plant seeds can be dispersed through many vectors including through soil. Control of potentially contaminated materials such as fill and soil at the source could prevent the spread of invasive plants.

11. Funding Opportunities

There are many ways in which you can obtain financial assistance with invasive plant management. Partnering with other agencies (e.g. Conservation Authorities, MNRF, etc.) can assist in finding funding opportunities that fit proposed management projects. Depending on the type of area where the management is to take place, the following could be applicable:

Land Stewardship and Habitat Restoration Fund (LSHRP)

This program offers eligible organizations support to undertake land stewardship and habitat restoration for biodiversity conservation, including removal of invasive species.
http://www.ontario.ca/environment-and-energy/land-stewardship-and-habitat-restoration-program

Species at Risk Stewardship Fund (SARSF)

This program was created under the provincial *Endangered Species Act* to encourage people to become involved in protecting and recovering species at risk through stewardship activities.
https://www.ontario.ca/environment-and-energy/species-risk-stewardship-fund

Habitat Stewardship Program for Species at Risk (HSP)

This program allocates funds to projects that conserve and protect species at risk and their habitats to increase biodiversity as a whole. These funds promote the participation of local communities to help with the recovery of species at risk and prevent other sensitive species from becoming a conservation concern.
http://www.ec.gc.ca/hsp-pih/default.asp?lang=En&n=59BF488F-1

Environmental Damages Fund (EDF)

This fund is a specified-purpose account administered by Environment Canada to manage funds received as compensation for environmental damage. They primarily support the restoration of natural resources and the environment, and wildlife conservation projects in the same geographic area where the damage originally occurred. The EDF also supports research and development on environmental damage assessment and restoration, and education on pollution prevention and the restoration of natural resources.
https://www.ec.gc.ca/edf-fde/default.asp?lang=En&n=BD1220D8-1

Great Lakes Sustainability Fund

This fund provides technical and financial support to action projects aimed at cleaning up, restoring and protecting the environmental quality and beneficial uses of Canada's Great Lakes in Areas of Concern (AOC). The fund is targeted at three key priority areas: fish and wildlife habitat rehabilitation and stewardship; contaminated sediment assessment and remediation; and innovative approaches to improving municipal wastewater effluent quality.
https://www.ec.gc.ca/raps-pas/default.asp?lang=En&n=F328E319-1

National Conservation Plan – National Wetland Conservation Fund (NWCF)

The National Wetland Conservation Fund (NWCF) supports projects that restore degraded or lost wetlands; enhance degraded wetlands; scientifically assess and monitor the health and functionality of wetlands and the species that use them; and encourage stewardship and wetland appreciation by a wide variety of partners to build support for future wetland conservation and restoration activities.
https://www.ec.gc.ca/financement-funding/default.asp?lang=En&n=923047A0-1#_09

Walmart-Evergreen Green Grants

Walmart Canada and Evergreen have partnered to offer a national program that funds community-based initiatives across Canada. Many projects are supported including invasive species removal and native planting initiatives. Those eligible include community groups and non-profit organizations. Although a municipality is not directly eligible, the eligible group must be working collaboratively with a municipality.
http://www.evergreen.ca/get-involved/funding-opportunities/green-grants/

TD Friends of the Environment

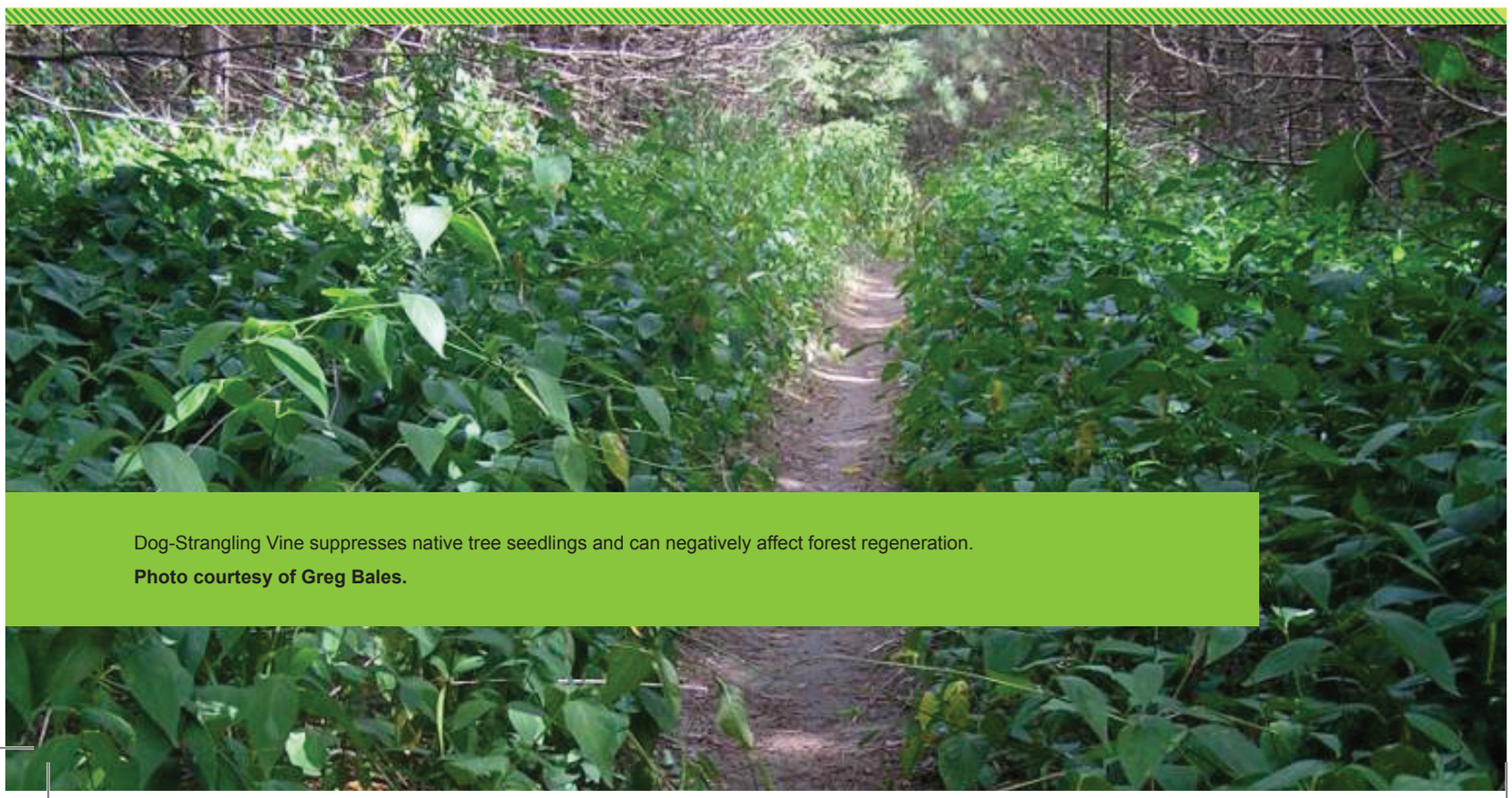
Founded by TD Bank Group in 1990, TD Friends of the Environment Foundation (TD FEF) is a national charity that funds environmental projects across Canada. The Foundation supports a wide range of environmental initiatives, with a primary funding focus on environmental education, urban greening and enhancing biodiversity, and energy conservation.
https://fef.td.com/funding/

EcoAction Community Funding Program

Since 1995, Environment Canada's EcoAction Community Funding Program has provided financial support to community-based, non-profit organizations for projects that have measurable, positive impacts on the environment. The Program encourages action focused projects that will protect, rehabilitate or enhance the natural environment, and build the capacity of communities to sustain these activities into the future. Although a municipality is not directly eligible, the eligible group must be obtain 50% funding from an alternative source, such as a municipality.
http://www.ec.gc.ca/ecoaction/

Lake Simcoe South-eastern Georgian Bay Clean-Up Fund

This fund helps to restore the ecological health of Lake Simcoe and South-eastern Georgian Bay and improve water quality for the residents and wildlife of the region. It will support community-based projects that are focused on priorities such as reducing phosphorous inputs from urban and rural sources, restoring fish and aquatic wildlife habitat, and addressing near shore toxic and nuisance algae growth. Municipalities and a number of other groups are eligible.
http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=EBF944F0-1



Dog-Strangling Vine suppresses native tree seedlings and can negatively affect forest regeneration.
Photo courtesy of Greg Bales.

12. Additional Resources

Community-Based Social Marketing:
http://www.cbsm.com

Ontario's Best Management Practices:
http://www.ontarioinvasiveplants.ca/index.php/bmp_library

Landowner's Guide to Managing and Controlling Invasive Plants in Ontario:
http://www.ontarioinvasiveplants.ca/files/LandOwnerGuide_June262013.pdf

Clean Equipment Protocol for Industry:
http://www.ontarioinvasiveplants.ca/files/CleanEquipmentProtocol_Mar152013_D3.pdf

Grow Me Instead:
http://www.ontarioinvasiveplants.ca/index.php/gardenersandhorticulturalists

EDDMapS Ontario:
http://www.eddmaps.org/ontario/

Compendium of Invasive Plant Management in Ontario:
http://www.ontarioinvasiveplants.ca/files/Management_Compendium_Final_web.pdf

B.C.'s Best Practices for Managing Invasive Plants on Roadsides:
http://bcinvasives.ca/resources/publications/best-practices-for-managing-invasive-plants-on-roadsides/

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APPENDIX A - Definitions

Scope

The scope statement details the projects deliverables and describes major objectives. It should capture, in very broad terms, the intended product or outcome of the strategy.

Vision

A vision statement is a declaration of an organization's goals for the mid-term or long-term future. Ranging from one line to several paragraphs, a vision statement identifies what the organizations would like to achieve or accomplish.

Goal

A goal is much broader than objectives and activities, and should be the big picture of what you want the final outcome to be; related to the scope and simply stated.

Objectives

An objective is a performance measure that would lead to achieving the goal. An objective should be specific, concrete, measurable and time framed (if possible). It is a target that a municipality aims to achieve with allocated resources.

You can choose any number of objectives, but ensure that they are clear and concise. Your objectives should then be followed by strategies and actions on how to meet the objective.

- **Example Objective:** Prevent the introduction and spread of invasive plants
- **Example Strategy:** Begin building an Early Detection and Rapid Response Program
- **Example Action:** Establish an internal staff EDRR team with a lead coordinator to develop EDRR program

APPENDIX B - Developing an Early Detection and Rapid Response (EDRR) Program

The very first step to the development of an EDRR is to create a working group/network. Collaborate with the groups that are going to be able to implement the plan you will begin to develop.

1. Early Detection

Early detection includes observing and reporting invasive plants that may be new to the region and are found on the Target Plant List. Early detection of a plant new to the area could come from a member of the public, a landowner, a staff member or an expert. Reporting methods could include EDDMapS Ontario, direct contact and/or email, or a phone call (accompanied by pictures of plant). Once a species has been reported, it will need to be verified.

2. Identification

The identification step of an EDRR process is important to verify exactly what invasive species has been reported. If an invasive plant has been reported through EDDMapS Ontario, it has already been verified. If a staff person has a species reported to them directly and they are unsure of the species, it is important to establish personnel who can reliably identify the plant. This may include a botany expert within your region, or an outside professional from the MNRF Natural Heritage Information Centre, or the Royal Botanical Gardens. Establish a directory of contacts so that if one person is not available, the next person on the list can be contacted.

3. Alert Screening

This step confirms whether the species is new to the area and present at an extent deemed eradicable. It also determines if it has been included in any provincial or federal lists of invasive species. If it is on a provincial or federal list, staff would notify the pre-determined contacts for the provincial and federal agencies and the responsibility of eradicating the species would be given to the appropriate agency.

Considerations for Alert Screening are:

- Coordination and completion of site containment
- Updating the species EDRR status
- Determining agency responsibility for the EDRR process for the species

4. Risk Assessment

Risk assessment evaluates the relative impact of an invasive plant species and the current predicted stage of infestation within the municipality.

There are a variety of different methods and protocols for determining the risk rating and management category for invasive plants. You can use a combination of a number of different methods, one that you have used before, or one developed by other local organizations involved in invasive plant management. Some initial research about the biology of the plant will be necessary to categorize it.

Risk Rating

(The following has been adapted from the District of West Vancouver Invasive Plant Strategy, 2014.) The risk rating assists you in prioritizing species for control. Each category is described below and either a 0, 1 or 2 is assigned to the species for each category based upon its impacts and biology.

Table 1. Risk Rating

RISK RATING					
Score	**Human Health & Safety**	**Ecosystem**	**Infrastructure**	**Recreation & Aesthetics**	**Persistence**
2	Immediate and detrimental effect on human health	Impacts sensitive/ rare ecosystems (e.g. creeks and riparian areas, wetlands, etc.)	Direct impact on infrastructure (e.g. roads, buildings, underground utilities, etc.)	Direct impact on recreation and aesthetics	Removal requires a trained professional
1	Potential impact on human health	Impacts forested ecosystems (e.g. shade tolerant)	Indirect impact on infrastructure (e.g. creates hazard trees)	Impedes recreation access and/or impacts viewscapes	Requires 3 or more repeat manual treatments
0	No direct impact	Primarily impacts disturbed sites	No significant impacts	No significant impacts	Removal typically requires only 1 to 2 repeat manual treatments

For each species, add the total scores for each category and match the score matrix found in Table 2 below. This will determine its risk rating of very high, high, or moderate.

Score Matrix

The score matrix table is used to categorize the risk rating for each species. This table is used to create a graph that is commonly seen in other invasive species management strategies. Use the score from the risk rating and match it to one of the categories below to get your associated risk.

Table 2. Score Matrix

RISK	
Score	**Rating**
4-8	Very high
3	High
2	Moderate
1	Low

Management Categories

The four management categories (prevent, eradicate, contain and control) are based on best estimates of the plants distribution in the municipality. Give the plant a score based on its stage of infestation, and this will assist in determining what management actions should be undertaken.

Eradicate: aims to target invasive plants with small numbers of localised populations. With quick action and early detection it may be possible to get rid of these species.

Contain: aims to restrict plants that are widespread in the municipality to isolate sites with some possibility of eventual eradication. The goal is to restrict these plants to slow or stop their spread.

Control: aims to manage plants that are widespread with little chance of eradication. These plants are only controlled in specific sites where they can be constrained.

Prevent: aims to keep invasive plants out. They may be present in surrounding municipalities or able to grow in similar environments.

Table 3. Stage of Infestation

STAGE OF INFESTATION		
Score	**Rating**	**Management Category**
0	Pre-introduction	Prevent
1	Early introduction	Eradicate
2	Introduction	Eradicate
3	Introduction-colonization	Contain
4	Colonization	Contain
5	Colonization-naturalization	Control
6-8	Naturalization	Control

Table 4. Risk Assessment Table Example

COMMON NAME	RISK RATING						STAGE OF INFESTATION		
	HumanHealth and Safety	**Ecosystem**	**Infrastructure**	**Recreation and Aesthetic Value**	**Persistence**	**Total Score**	**Scope (Stage of Infestation)**	**Stage of Infestation**	**Management Category**
Kudzu	0	2	2	2	2	8	0	Pre-introduction	Prevent

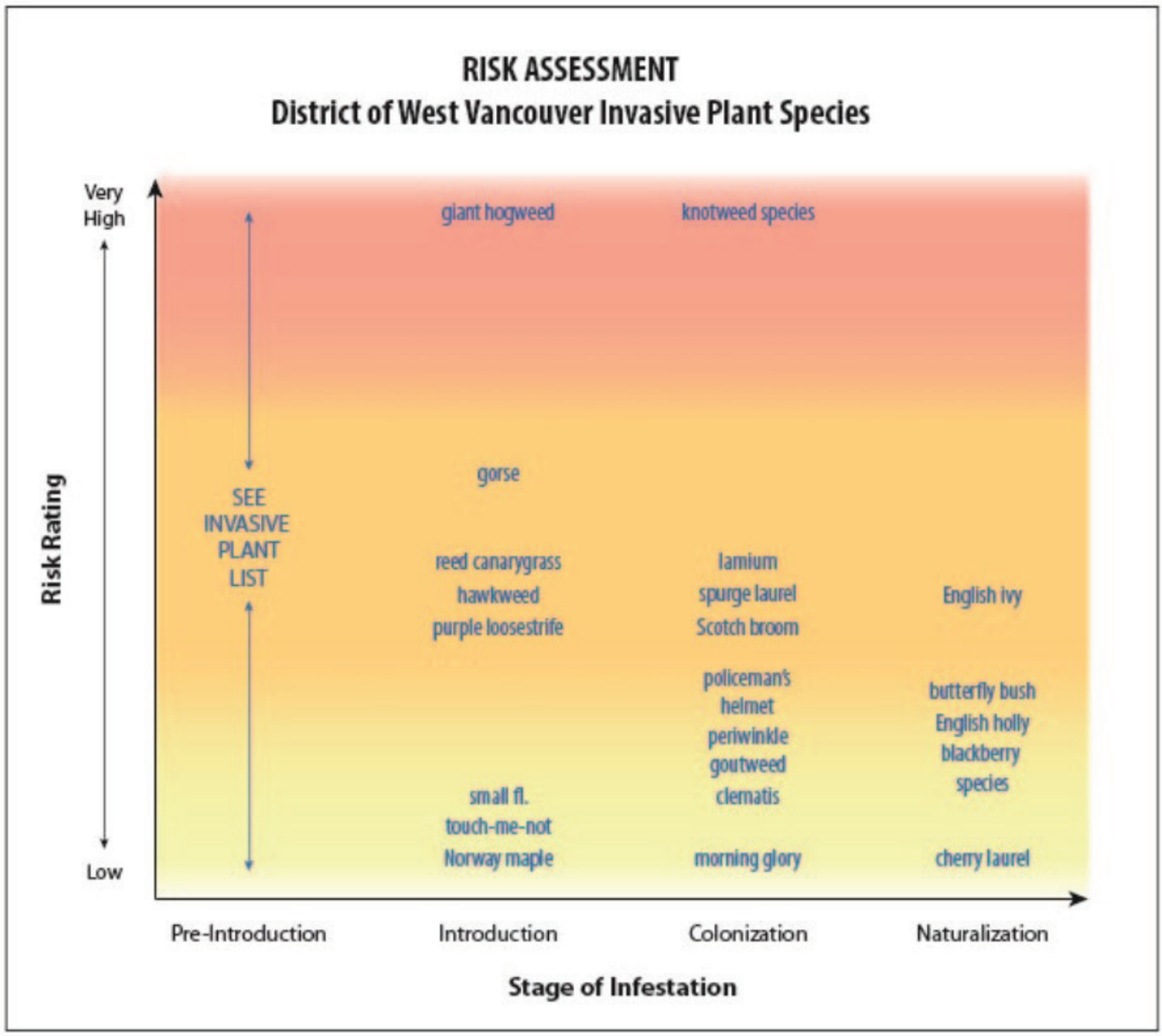

Figure 1. Risk Assessment Example (image courtesy of the District of West Vancouver)

The graph above provides a visual example of what the end result of your risk assessment should like. The risk rating and management category can direct your actions through the rest of the EDRR process.

If a detected species is high-risk, the finding should be shared with other organizations and all known sites should be contained.

5. Rapid Response

This is an important step, as it determines the response plan for a high-risk species. The EDRR lead or coordinator will need to develop a rapid response plan in liaison with a rapid response management team composed of species and subject experts and impacted land managers. Generally, a template/form is created to guide the response plan actions and decisions. The plan needs to include information on obtaining permits required to allow for rapid response on impacted lands and any permits required from regulatory agencies and public/private land occupiers. Establish who will complete the rapid response activities.

Permits may include:

- Emergency Pesticide Registrations
- Emergency Product Registrations
- PMRA Label Expansions
- Provincial Letters of Opinions
- Special Work Permits
- Memorandum of Understanding (MOU) and other written agreements

6. Monitor and Reassess

It is critical to evaluate the EDRR process once it has been completed to determine its level of success and effectiveness and whether changes need to be made.

The EDRR lead or coordinator would take on the responsibility of monitoring the area for treatment efficacy and evaluating the treatment results. If the objectives were met, the species status would be updated and a final report and long-term monitoring plan would be completed.

If the objectives were not met, the lead/coordinator would begin a process of re-evaluating the species status and adjusting the rapid response plan in liaison with the rapid response team of species and subject experts and impacted land managers. In this case, if continued response is to take place, the process for obtaining the proper permits may need to be repeated.

Once rapid response has been conducted and is successful, a long term monitoring plan needs to be put in place and reported on annually.