

Hamilton Conservation Authority Invasive Species Strategy



2024



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1. Introduction

Invasive species have been a growing concern for ecologists, biologists, and land managers over the last 25 years. Invasive species are, “plants, animals, aquatic life, and micro-organisms that outcompete native species when introduced outside of their natural environment and threaten Canada's ecosystems, economy, and society. They can come from across the country or across the globe.” (Government of Canada, 2014).

The International Union for Conservation of Nature (IUCN, 2014) considers invasive species to be the second highest threat to biodiversity conservation after habitat destruction. This organization has an invasive species specialist group that tracks invasive species and their impacts across the globe. According to the Government of Canada, there are hundreds of invasive species in our country (Government of Canada, 2014). These include, birds, mammals, reptiles, amphibians, crustaceans, aquatic and terrestrial plants, marine and freshwater fish, molluscs, algae, fungi, and other pathogens. The impacts of these species are large and cross all sectors including the economy, environment, and human health.

In Ontario, one of the first documents developed to shed light on invasive species as a growing issue for biodiversity was “Sustaining Biodiversity: A Strategic Plan for Managing Invasive Plant Species in Southern Ontario” (Havinga, Invasive Plant Working Group, 2000). The document outlines eight strategies and related specific actions for addressing invasive species, which were intended to support the efforts of the various organizations and agencies involved in land management and conservation in Ontario and serve as a catalyst for further action and partnerships.

The Government of Canada later developed “An Invasive Alien Species Strategy for Canada” in 2004 (Environment Canada, 2004). The strategy is broad in scope and includes direction on prevention, early detection, rapid response to new invaders, and management of established and spreading invaders. The finalization of a strategy and dedication of federal dollars resulted in the development of the Invasive Alien Species Partnership Program and creation of the Invasive Species Centre. The Partnership Program was terminated in 2012, however the Invasive Species Centre continues to operate and is focused on research, prevention, education and outreach, as well as engaging provincial governments, municipalities, conservation organizations and the general public in dialogue about invasive species.

Ontario has a recently updated biodiversity strategy (Ontario Biodiversity Council, 2023), which identifies invasive species as one of the six major threats to biodiversity in Ontario. It discusses the economic and environmental threat of invasive species and the cumulative impacts they can pose. These include climate change, habitat loss, and

other factors allowing invasive species to become established in an ecosystem faster and easier than before.

The impacts of invasive species are widespread and include the disruption of native ecosystems, loss of biodiversity, and economic impacts to humans. Invasive species have the ability to outcompete native plants and animals. This can cause a cascade effect within the food chain. For example, invasive Zebra mussels filter plankton from the water column, thus reducing this food source for fish and clam species native to the Great Lakes. This may have caused a drop in fish populations since the introduction of Zebra mussels (Government of Ontario, 2006).

The inherent characteristics of invasive species can also result in widespread and rapid ecological changes which have permanent consequences for the local ecosystem. For example, forest pathogens typically target a preferred host species which can result in a precipitous decline of that species' population within an area (Invasive Species Centre, 2022). The imminent threat Oak wilt, a disease caused by the fungus *Bretziella fagacearum*, specifically propagates in oak trees. Oak wilt can result in complete mortality of red oak trees within a single season (Canadian Food Inspection Agency, 2024), which may cause profound changes to infected oak dominant forests in a short time span.

Effects such as this impact not only biodiversity but also the economy. The Government of Ontario has quantified some of the economic impacts of invasive species. Invasive species threaten many sectors of the Ontario economy, including fishing, hunting, agriculture, and tourism. Impacts have included reduced value of commercial and recreational fisheries, effects on crop production, and decreased property values. The Ministry of Natural Resources and Forestry has determined that invasive plants have cost the agricultural and forestry industries approximately \$7.3 billion annually. The impacts from Zebra mussels alone in Ontario have cost \$75-91 million annually (Ontario Ministry of Natural Resources (OMNR), 2012). It is likely that most species established in Ontario are now here to stay. Many of these species are hard to control once established. The issues related to invasive species are complex as is their management.

The Hamilton Conservation Authority (HCA) in cooperation with its partners has completed three Natural Areas Inventories (NAI), over the past thirty years, with the most recent NAI ('Nature Counts 2') completed in 2014. The fourth NAI project was initiated in 2023 and will build on the work of earlier NAIs.

The NAI is a comprehensive study of the natural areas within the watershed, both public and private, although not all parcels are studied in each round of the NAI. This study

provides information on the distribution and types of terrestrial invasive species in the watershed. Although the NAI study boundary encompasses a larger jurisdiction than the HCA watershed, it represents the best summary of invasive plant species available locally. The last NAI identified 63 invasive plant species within the City of Hamilton (NAI, 2014) which represents 4% of total plant species records. There were also an additional 444 non-native plant species, not considered invasive, identified during the NAI. Considering these additional species, 34.6% of all the plants recorded in the City of Hamilton are non-native. The NAI only speaks to terrestrial invasive species in our watershed. Few studies have been completed to catalogue our aquatic invasive species or invasive pathogens.

The percentage of non-native plant species identified (approximately 35%) is not unexpected given some of the watershed's characteristics. Favorable climate, proximity to the Great Lakes port system, and degraded ecosystems have contributed to this percentage. These conditions make Hamilton vulnerable to the introduction of invasive species more so than other areas that are less urbanized and not adjacent to a large port system. Ports contribute to the introduction of invasive species and are often the first point of entry as different species are transported from other countries in shipping containers or in the ballast water of the ships. Urbanization can also escalate the distribution of invasive species through habitat loss and fragmentation. Given these conditions, HCA considers the control and management of invasive species to be the key priority for addressing loss of biodiversity. However, given the highly urbanized nature of Hamilton's watersheds, decisions to manage invasive species can become increasingly complex. Plants living in urban environments must contend with high levels of disturbance, habitat fragmentation, a constant stream of new ecosystem interactions with introduced species, and more. These factors stress native species that are poorly adapted to these conditions and create a more suitable habitat for invasive species which are either able to rapidly adapt or are pre-adapted to this type of environment (Elmqvist et al. 2008).

Within the scientific community there are ongoing discussions about the ecosystem services invasive species can provide in highly urban environments and whether management is appropriate in all situations (Gaertner et al. 2017). These urban invasive species may provide ecosystem services in a novel way which native species cannot. Specifically, regarding plants, desirable ecosystem services include but are not limited to food production, carbon sequestration, cooling amidst urban heat islands, and air quality improvements (Potgieter et al. 2017). Due to the conditions of urban environments stated previously, hardy non-native plants might be able to provide those services where native plants may struggle to survive. This approach in urban areas needs to be balanced with the knowledge that invasives provide many undesirable

ecosystem disservices, which include widespread biodiversity reduction, threats to human health, propagation beyond original planting, and more (Gaertner et al. 2017). These factors are considered in HCA's prioritization of sites for treatment.

HCA will continue to monitor the scientific discourse around this topic and adjust management strategies as supported by accepted best practices. Currently, invasive species management remains a key component of fulfilling HCA's strategic goals and maintaining the watershed's health.

2. Legislation and Policy Framework

There are a variety of laws, regulations, policies and guidelines in place at all levels of government that can assist in preventing the introduction of invasive species and provide direction regarding the management of those species. At the federal level these include *Ballast Water Control and Management Regulations* under the *Canada Shipping Act*, which require ocean-going vessels to flush their tanks with salt water before entering the St. Lawrence Seaway and the Great Lakes (Government of Ontario, 2015). Fisheries and Oceans Canada maintains *Aquatic Invasive Species Regulations* under the *Fisheries Act* with the objective of preventing the introduction of aquatic invasive species into Canadian waters and to provide for the control and management of their establishment and spread, once introduced.

At the provincial level, some of the key relevant legislation includes the *Weed Control Act*, *Public Lands Act* and *Invasive Species Act*. In the recent past, several plant species have been added and removed from the noxious weed list under the *Weed Control Act* (Government of Ontario, 2015). This list is used by weed inspectors to control target plants and minimize their impact on agriculture. In 2014 the *Public Lands Act* was changed to allow the removal of invasive aquatic plants. This change was necessary as the beds of most water bodies in Ontario are crown land and the MNRF manages these lands under the *Public Lands Act* (Government of Ontario, 2015). There are in-water works timing windows and other rules that need to be followed with this legislation. Ontario introduced regulations in 2005 that prohibits the possession, purchase and sale of several live invasive fish, including Round and Tubenose Goby, Rudd, Ruffe, and the Snakehead family, and four Asian carp species (bighead, black, grass, and silver) (Government of Ontario, 2021).

The Government of Ontario has continued to update invasive species legislation and recommendations as new threats have become apparent in the province. The Ontario Invasive Species Strategic Plan was originally released in 2012 and resulted in the creation of the *Invasive Species Act*. This Act came into force on November 3, 2016. It

allows the province to classify the threat level of invasive species, prohibit the import and possession of significant threat species and give the Minister the power to implement restrictions prescribed by the regulation or designated by the Minister. The *Invasive Species Act* has been amended several times to increase the scope of regulatory controls. As of 2022, watercraft operators are now required to take preventative actions to avoid accidental transportation of aquatic invasive species between water bodies. This includes removing drain plugs to release any captured water and ensuring no aquatic life is attached to the watercraft or related equipment before transport. Also, the list of prohibited and restricted species has been expanded to include 45 species as of January 1, 2024 (Government of Ontario, 2023).

Ontario has also recently completed a review of the Ontario Invasive Species Strategic Plan from 2012-2022. The review examines Ontario's progress in achieving the goals set out in the strategic plan and identifies future areas of focus related to those same goals. The report highlights the economic toll of invasive species and discusses their continued threat which is driven by the risk-factors of economic activity and climate change.

In October of 2021, the Government of Ontario released an update to Regulation 686/21 under the Conservation Authorities Act, which now requires mandatory delivery of certain activities. These include, "programs and services to conserve, protect, rehabilitate, establish, and manage natural heritage located within the lands owned or controlled by the authority" (Government of Ontario, 2021, Sec 9.1.2.iv). HCA has interpreted this to mean the invasive species management activities undertaken on HCA lands are included within the description of the mandatory programs and services under this regulation.

HCA supports the adoption of policies and legislation that will prevent the introduction of invasive species and provide tools to manage the threats posed by invasive species already present. HCA will continue to monitor and review changes to relevant legislation and policy pertaining to invasive species to ensure the strategies and actions employed by HCA in addressing invasive species remain current and effective.

3. Goals and Objectives

The "*Hamilton Conservation Authority Invasive Species Strategy*" (the 'Strategy') outlines HCA's goals and objectives in relation to invasive species and the strategies to be employed on HCA owned lands and promoted throughout the watershed to address the threats they pose. It addresses issues related to both terrestrial and aquatic invasive species.

3.1. Goals

In developing and implementing the Strategy, HCA's main goals are to ensure a healthy watershed at the ecosystem level, reduce the ecological and economic impacts of invasive species, and provide support to HCA land managers and private landowners.

3.2. Objectives

In support of the Strategy's goals, the following objectives have been defined and are focused on invasive species detection, prevention, and management:

- To maintain current information on invasive species and their distribution on HCA properties and throughout the watershed through regular monitoring and survey. This will include both surveys by staff as well as regular review of participatory science platforms;
- To identify priority invasive species and geographic areas to be managed within the watershed;
- To prevent the establishment of new populations of known or new invasive species to the extent possible;
- To provide information regarding invasive species and their impacts in support of education and outreach activities; and
- To use ecological restoration within priority sites to increase resilience to re-invasion.

To achieve the above noted goals and objectives HCA has identified six strategies, which are focused on prevention, communication, prioritization, monitoring and restoration, collaboration, and research. Further information regarding each of these strategies and proposed related priority actions under each is provided in more detail below. Strategies and associated actions will be implemented on a priority basis and as resources allow.

4. Strategic Plan Linkage

This invasive species strategy aligns with the following goals in HCA's 2019-2023 Strategic Plan:

- Strategic goal #2 - Natural Heritage Conservation – HCA conserves, restores and enhances watershed natural areas and ecological systems.
- Strategic Goal # 3 – Conservation Area Experience - HCA provides customers high quality, diverse conservation areas to promote outdoor recreation, health

and well-being, strengthening public awareness of the benefits of being in or near our conservation areas.

- Strategic Goal # 4 – Education and Environmental Awareness – HCA provides active outdoor learning experiences for students, teachers and the community, increasing knowledge and awareness of the value of our environment and heritage.

5. Invasive Species Program: 2016-2023

Since the implementation of the 2016 Invasive Species Strategy, HCA has completed many of the action items listed under the seven key strategies in that plan. A clean equipment protocol was developed to educate HCA staff about measures for preventing the spread of invasive species on equipment. Signs were also installed in various Conservation Areas (CAs), informing the public about local invasive species and how to prevent their introduction into new locations.

HCA took action to communicate the importance of invasive species management to the public through the Hamilton Watershed Stewardship Program (HWSP), and supported removal projects through the Water Quality and Habitat Improvement Program (WQHIP). HCA also promoted the use of public reporting tools such as EDDMapS and iNaturalist to utilize participatory science for early detection. Internally, invasive species distribution data was incorporated into Conservation Area Master Plans.

Under the direction of the 2016 Strategy, HCA conducted yearly invasive species research and monitoring activities. The aquatic and terrestrial ecological monitoring programs have integrated invasive species identification into regular field work. This information is used as a primary detection method and followed up by more comprehensive surveys. Additionally, widespread monitoring was conducted throughout HCA lands supporting a variety of activities which include: Conservation Area master planning, prioritization planning, early detection of newly introduced species, and mapping for prompt removal.

Due to the high volume of invasive species within the HCA watershed, prioritization has been a crucial activity to ensure control efforts are impactful. HCA staff have maintained an understanding of the top priority invasive species by attending educational webinars and conferences. Staff have also used existing inventory data to prioritize invasive species control based on the ecological importance of natural areas. More recently, an Invasive Species Prioritization Plan was developed for Valens Lake Conservation Area. These plans outline criteria for prioritizing invasive species management within Conservation Areas, with the goal of effectively coordinating management efforts between WMS and CAS staff.

Using these prioritization techniques, HCA has taken action to manage invasive species populations throughout the watershed. To summarize, staff have manually and chemically controlled a variety of invasive plants, forest pests, and forest pathogens on HCA lands. Through the HWSP, staff have also assisted with manual control of invasive plant species on private lands. This has been accomplished in part by the creation of two Invasive Species Technician positions, which were made permanent full-time positions in January of 2024. Additionally, WMS staff have undergone certification to become licensed pesticide applicators, reducing cost of treatment implementation.

While conducting invasive species management activities, HCA staff have followed best management practices outlined by organizations such as the Ontario Invasive Plant Council. These documents contain information regarding the most current management practices that balance efficacy and environmental safety.

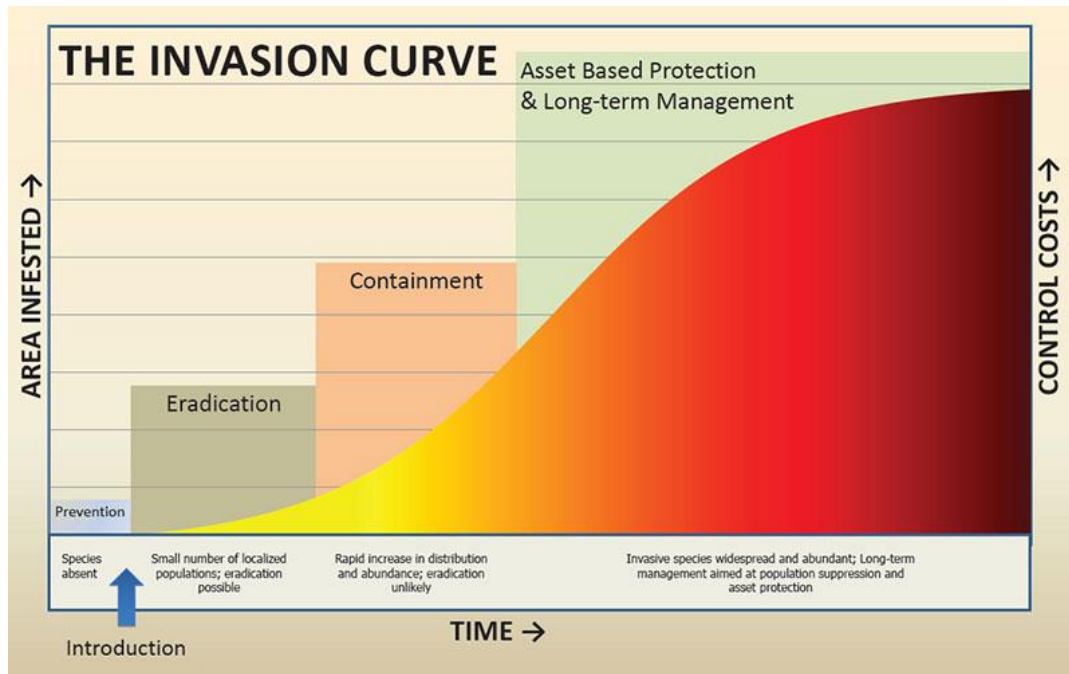
Further, HCA has partnered with organizations like Royal Botanical Gardens and City of Hamilton to combine resources for invasive species removal initiatives. Collaboration has also involved coordinating management efforts and sharing knowledge about best management practices with organizations including McMaster University, City of Hamilton, and Hamilton Naturalist Club.

6. Strategies

6.1. Prevention

Prevention is key with all invasive species, from those that live in the water to the pests which impact forests. Both the federal and provincial governments have developed prevention strategies regarding invasive species (Government of Canada, 2014 and OMNR, 2012). Many of the introduced species (invasive) are hardy species in their native home ranges and thrive in degraded ecosystems. When invasive species are introduced into other landscapes outside of their native range, it is their hardiness and void of natural predators to keep them in check that makes it relatively easy for them to become established. Once established they are difficult to eradicate. This is especially true for aquatic organisms. They can become widespread quickly, can be prolific breeders (i.e. goldfish), and tend to colonize quickly. Eradication efforts can be expensive, time consuming, and in some instances impossible (Asian Carp Regional Coordinating Committee, 2015). This is illustrated by the invasion curve, as seen in Figure 1, which represents the relationship between the level of infestation and the cost of management (United States Department of Agriculture, 2005).

Figure 1. Invasive Species Invasion Curve.



Invasive species can be introduced through several pathways. Within the HCA watershed, some of the main pathways for introduction are garden plants and the nurseries that sell invasive plant species, ballast water from ships, and recreational activities (hiking, fishing, biking and boating). The natural environment within HCA's watershed is also at risk due to the active port and shipping industries. For example, the invasive Spotted Lanternfly has been intercepted in shipments immediately adjacent to Ontario in New York State (Invasive Species Centre, 2024).

HCA proposes to do the following:

- Install boat washing stations at Valens and Christie Lake Conservation Areas and Fifty Point marina to assist in the removal of aquatic plants, animals, and algae from watercraft before overland transport. This removal is a requirement of the Ontario Regulation 546/16 (2023) under the *Ontario Invasive Species Act* (2015). By providing a boat washing station, HCA will make it easier for patrons to comply with the regulation.
- Monitor the implementation of clean equipment protocols to prevent the movement of invasive species from CA to CA.
- Install boot brushes at high-traffic hiking locations with Conservation Areas to mitigate invasive species spread during trail use. Working with area superintendents, this will be piloted at Valens Lake CA between 2024 and 2027.

- Review operational procedures in Watershed Management Services (WMS) to prevent the movement of aquatic invasive species on sampling equipment.
- Monitor Canadian Food Inspection Agency (CFIA) and Ontario Invasive Plant Council (OIPC) websites for information on new invasive species to ensure prevention strategies remain current.
- Attend industry directed workshops on invasive species to stay current on federal and provincial prevention strategies and management techniques.
- Keep investing in educational signage at HCA's active Conservation Areas which describes invasive species, their impact on the natural environment and how to prevent their introduction. At minimum, five educational signs will be installed over the next five years.

6.2. Communication

Communication is very important to the achievement of HCA's goals and objectives for this Strategy. This includes both internal and external communication. Through education on the introduction, spread, and threat of invasive species, Conservation Area users and staff will be better able to prevent new introductions and be better prepared for managing invasions. Part of the communication strategy will be maintaining the list of the top terrestrial and aquatic invasive species and forest pests and pathogens within the watershed (Appendix A). HCA proposes to do the following:

- Develop a communications strategy to bring all these aspects of communication into an organized plan. WMS and Marketing staff will collaborate to achieve this.
- Develop a webpage dedicated to invasive species found in the HCA watershed, including the following activities:
 - Place links on HCA's website to relevant NGO and Government websites that discuss invasive species, their habitats and introduction pathways.
 - Focus this webpage on top invaders, linking the public to best management practices and other resources.
 - This will be completed in conjunction with HCA communications staff by 2030.
- Provide links to web-based applications for the public to report invasive species in our Conservation Areas such as EDD MapS.

- Continue to share information about invasive species best practices with the public through social media channels.
- Conservation Area Master Plans will include a section on invasive species and what occurs in each CA.
- Promote through private landowner stewardship initiatives the importance of the control of invasive species and their impact on biodiversity.
- Coordinate invasive species management between WMS and Conservation Area Services (CAS) staff on HCA property using Invasive Species Prioritization Plans as discussed in section 6.3.

6.3. Prioritization

As noted throughout this plan there are many different invasive species within the watershed that impact terrestrial and aquatic environments. The degree to which these different species affect their surroundings varies based on their method of spread, invasiveness, and the way they interact with other species and the environment. As a result, prioritization must occur for both species and Conservation Authority lands since preserving the biodiversity contained within certain Conservation Areas requires more immediate action than other areas. HCA will continue to research appropriate BMPs for the invasive species in the watershed. This along with site specific work planning will help guide the implementation of this invasive species strategy.

HCA will continue, through the Master Plan and Management Plan process to inventory invasive species on HCA owned properties. This will guide the development of site-specific prioritization plans which will help prioritize actions based on species (threat level) and/or ecosystem type (sensitivity). With prioritization plans in place, HCA can more effectively engage volunteers and staff in the removal of invasive species. These removals will involve Ecology and CAS staff, along with volunteers when appropriate. Species requiring chemical control will be assessed and controlled by HCA staff with pesticide applicator licenses or by certified contractors. The use of chemicals will be evaluated on a case by case, and species by species basis, balancing the need for chemicals, the appropriateness of their use for certain species, and the manual labour required for mechanical removal. This is a long-term commitment and funding will actively be sought to continue with implementation. HCA proposes to complete the following:

- Develop and maintain a priority list of terrestrial and aquatic invasive species and forest pests/pathogens (Appendix A).

- Develop invasive species prioritization plans following the Master Plan or Management Plan for each Conservation Area. These will be used to direct all staff to the priority invasive species on each property for management. These plans will be completed for the majority of Conservation Areas by 2030.
- Develop and maintain a priority list of locations with high ecological value and/or importance for invasive species prevention and management via the property-specific prioritization plans.
- Conduct surveys for aquatic invasive species to develop a better understanding of the range and diversity of species present. Management of aquatic invasive species is a difficult and resource intensive task. Therefore, implementation activities will focus on mapping, monitoring, and small-scale management initiatives in master plans and prioritization plans within HCA's various landholdings.
- Maintain at least 2 HCA staff as Ontario certified pesticide applicators making implementation more cost effective and faster.
- Work collaboratively with partners and organizations, including the City of Hamilton and Royal Botanical Gardens on invasive species removal initiatives. This is an ongoing action.

6.4. Monitoring and Restoration

In order to combat invasive species, monitoring at two stages is necessary: pre-emptive surveys to detect new occurrences, and post-management surveys to track the success of restoration activities.

HCA has both aquatic and terrestrial monitoring programs that are watershed wide. These may be able to detect invasive species as they establish in the watershed. Master/Management plans are also completed on a 10-year cycle within all lands owned by HCA. These can highlight invasion areas that change between creation of the plans. However, some species can establish and begin to have detrimental impacts very quickly. *Bretziella fagacearum*, the fungus which causes oak wilt, has been highlighted in this strategy as an example of such a species. An invasion of this disease could result in a precipitous decrease in the oak population across the watershed. Regular and thorough monitoring is essential to ensure a rapid response to this type of invasion. Therefore, Conservation Area Staff who are also knowledgeable in regard to invasive species are instrumental in on the ground monitoring of emerging invasive

species. It is also important for HCA to regularly check the CFIA website and consult with other organizations like the Ontario Plant Council that are aware of new and incoming invasive species.

Post-management monitoring is required to measure the efficacy of control methods, to detect re-invasion at managed sites, and to observe the success of post-control restoration efforts. Several invasive species strategies from upper tier municipalities and conservation authorities highlight active restoration as a key activity for ensuring the long-term success of invasive species control efforts (City of Mississauga, 2021; Credit Valley Conservation, 2020). HCA engages in active restoration at invasive species management sites on a case-by-case, but staff have encountered challenges that have mitigated the success of some restoration plantings. Predation of newly planted native species, lack of funds for quick replanting, and secondary invasion by other invasive species have been consistent issues at management sites. HCA proposes to complete the following:

- Develop a restoration protocol to determine if a site can be left to passively restore after invasive plant species removal or whether native plant-reintroduction is necessary. To be completed via collaboration between Ecology staff and Invasive Species staff by 2030.
- Work with Forestry staff and develop a yearly review process to determine areas of significant tree removal to facilitate restoration/management before invasive species can establish. To be completed by 2026.
- Create and implement a monitoring schedule for completed invasive species management sites to track efficacy of control efforts. To be completed by 2026.
- Plantation management will be carefully reviewed for the occurrence of invasive species, and the cost benefit of harvest vs possible invasion will be weighed. This will occur when plantation management is scheduled again.

6.5. Collaboration

Collaboration and partnership will play an important role towards the advancement of the actions and efforts proposed within the Strategy to address invasive species. There are many partners in the Hamilton area with which HCA could coordinate efforts on both private and public land. Some of these partners include Royal Botanical Gardens, Hamilton Naturalist Club, Bruce Trail Conservancy, City of Hamilton, and Cootes to Escarpment (C2E). Collaboration can take place in a variety of ways and may include the following:

- Work with the Hamilton Watershed Stewardship Program to support local landowner initiatives in invasive species removal. This is an ongoing initiative.
- Support invasive species removal initiatives through the Cootes to Escarpment Eco-park (within the HCA watershed).
- Continue to support federal and provincial initiatives (e.g. EDD MapS).
- Work with partners to share information in regard to invasive species management, removals, mapping etc., for example the multi-agency Greater Toronto and Hamilton Area Invasive Species Working Group.
- Engage non-government organizations to partner with and work on changing traditional landscape planting programs and lists with our municipal partners to exclude non-native invasive species.
- Partner with Indigenous-led organizations and communities to better understand Indigenous Ecological Knowledge perspectives on invasive species management.

6.6. Research

Invasive species management practices are continually changing as new knowledge and technologies become available. Additionally, new invasive species continue to spread into the watershed despite prevention measures and may each require a different management approach. To ensure HCA's invasive species management efforts are following current best practices and are as effective as possible, it is important for HCA to engage in research and education. The following are proposed actions:

- Attend annual conferences and webinars to stay up to date on current management strategies and BMPs.
- Conduct field tests to assess efficacy of recommended management techniques to optimize HCA's invasive species control methods.
- Compete as appropriate funding applications to allow the use of a wider range of management tools.

7. Conclusion

Invasive species are a persistent and continually evolving threat to biodiversity in the HCA watershed, and throughout Ontario more generally, second only to habitat destruction. Invasive species have many impacts, from large scale biodiversity loss to costly impacts on industry and infrastructure. The Ontario and Canadian governments

both have strategies in place to address the impacts of invasive species, and regulations such as the *Invasive Species Act* provide legislative support by restricting the movement of some key species. However, it is apparent that already-established invasive species will persist in the local ecosystem and that new species will continue to be introduced through a variety of pathways.

This Strategy and the actions outlined within support HCA's Strategic Plan goals of natural heritage conservation, conservation area experience, and education and environmental awareness. HCA has already taken important steps to improve the health of ecosystems within the watershed by completing many of the actions recommended in the 2016 Invasive Species Strategy. By updating and implementing this 2024 Strategy, HCA will continue to support biodiversity and conservation principles, while also addressing the unique management challenges posed by invasive species in the watershed.

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Appendix A

Top Terrestrial Invasive Species

Common name	Scientific name	Current Distribution
Dog strangling vine	<i>Vincetoxicum rossicum</i>	Widespread
European buckthorn	<i>Rhamnus cathartica</i>	Widespread
Garlic mustard	<i>Alliaria petiolata</i>	Widespread
Giant Hogweed	<i>Heracleum mantegazzianum</i>	Limited: Lower Spencer Creek
Invasive Honeysuckles	<i>Lonicera sp.</i>	Widespread
Japanese knotweed	<i>Fallopia japonica</i>	Widespread
Oriental bittersweet	<i>Celastrus orbiculatus</i>	Widespread
Phragmites	<i>Phragmites australis</i>	Widespread
Tree of heaven	<i>Ailanthus altissima</i>	Widespread
Wild Parsnip	<i>Pastinaca sativa</i>	Limited: Dundas Valley Conservation Area, Fifty Point Conservation Area

Top Aquatic Invasive Species

Common name	Scientific name	Current Distribution
Asian carp (bighead, black, grass, and silver)	<i>Hypophthalmichthys nobilis</i> and others	Not yet detected in HCA watershed
Common carp	<i>Cyprinus carpio</i>	Widespread
Flowering Rush	<i>Butomus umbellatus</i>	Limited: Lower Spencer creek watershed
Goldfish	<i>Carassius auratus auratus</i>	Widespread
Manna grass	<i>Glyceria maxima</i>	Widespread
Marbled crayfish	<i>Procambarus virginalis</i>	Not yet detected in HCA watershed
Chinese mystery snails	<i>Cipangopaludina chinensis</i>	Limited: Lower Spencer creek watershed and Stoney Creek numbered watercourses
Round goby	<i>Neogobius melanostomus</i>	Limited: Lower Spencer creek and Redhill creek watersheds
Rudd	<i>Scardinius erythrophthalmus</i>	Limited: Lower Spencer creek watershed
Rusty crayfish	<i>Orconectes rusticus</i>	Limited: Lower Spencer creek watershed
VHS and Rana virus	N/A	Widespread
Water Chestnut	<i>Trapa natans</i>	Not yet in HCA watershed
Water Soldier	<i>Stratiotes aloides</i>	Not yet in HCA watershed
White river crayfish	<i>Procambarus acutus</i>	Not yet in HCA Watershed
Zebra mussel	<i>Dreissena polymorpha</i>	Widespread

Top Forest Pests and Pathogens

Common name	Scientific name	Current Distribution
Asian Longhorned Beetle	<i>Anoplophora glabripennis</i>	Formerly present in GTA; has been declared eradicated by CFIA
Beech Bark Disease	Associated with <i>Cryptococcus fagisuga</i> / <i>Neonectria</i> spp. complex	Widespread
Beech Leaf Disease	Associated with <i>Litylenchus crenatae mccannii</i>	Limited: Dundas Valley
Elm Zigzag Sawfly	<i>Aproceros leucopoda</i>	Widespread in Eastern Ontario; invasion possible
Hemlock Woolly Adelgid	<i>Adelges tsugae</i>	Present in Hamilton; invasion imminent
Jumping Worm	<i>Amyntas</i> spp., <i>Metaphire</i> spp., <i>Pheretima</i> spp.	Limited: Dundas Valley
LDD (Spongy) Moth	<i>Lymantria dispar</i>	Widespread
Oak Wilt	Associated with <i>Bretziella fagacearum</i>	Present in Ontario; invasion possible
Spotted Lanternfly	<i>Lycorma delicatula</i>	Not yet detected in Ontario

