Central Lake Ontario Conservation

2013

Terrestrial Watershed Monitoring Report

White Trillium
Trillium grandiflorum

Hericium coralloides

Bladder Sedge
Carex intumescens

What we do on the land is mirrored in the water

Working In Partnership:

DURHAM REGION

Conservation ONTARIO
Natural Champions

Report No.: 2014-02MR

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EXECUTIVE SUMMARY

The Terrestrial Watershed Monitoring program was established in 2009, and is now in its fifth year of implementation. The program focuses on Forests, Wetlands and Non-forested communities, including meadows and thickets. Three plots were established within the Black Harmony Farewell Creek watershed in 2013, and an additional 70ha of private land was inventoried.

Through the Natural Heritage System Inventory pilot project there was an overall total native species richness of 76%. To break it down, there was 84%, 88% and 70% within Forested sites, Wetland sites and non-forested sites respectively.

Ground water levels at Heber Down CA continue to be monitored in conjunction with vegetation composition. In addition, CLOCA's internal invasive species working group continues to implement the Invasive Species Management Strategy. Some of the working groups' accomplishments for 2013 include:

- Workshops dedicated to municipal works and operations staff
- Restoration initiatives
- Outreach initiatives at CLOCA's CA's and local events
- Survey of goldfish at 12 of Black Harmony Farewell Creek watersheds stormwater management ponds
- Implementation of invasive species management pilot programs
- Emerald Ash Borer Surveys

Slender Gerardia
Agalinis tenuifolia

1.0 INTRODUCTION

The Terrestrial Watershed Monitoring Program (TWMP) was developed to help determine and monitor the changes of the ecological integrity of terrestrial natural areas within the Central Lake Ontario Conservation Authority's jurisdiction. CLOCA has used the Parks Canada Agency's Panel (1998) definition of Ecological Integrity, "an ecosystem has integrity when it is deemed characteristic for its natural region, including the composition and abundance of native species and biological communities, rates of changes and supporting processes. In plain language, ecosystems have integrity when they have their native components (plants, animals and other organisms) and processes (such as growth and reproductions) intact."

CLOCA monitors specific ecological indicators within a select group of systems that cover the landscape of CLOCA's jurisdiction. The systems monitored and indicators measured are grouped according to Ecological Land Classification (ELC) categories and are described in Table 1**.**

Table 1: ELC classification with corresponding system type and ecological indicator

Ecosystem Type	ELC Community Series Included	Ecological Indicator
Forested Systems	Cultural Woodlots (CUW), Cultural Plantations (CUP), Deciduous Forests (FOD), Mixed Forests	Tree Health; Regeneration; Ground Vegetation; Species Richness
Non-Coastal Wetland Systems	Deciduous Swamp (SWD), Mixed Swamp (SWM), Coniferous Swamp (SWC)	Tree Health; Regeneration; Ground Vegetation; Species Richness
Non-Forested Systems	Cultural Thicket (CUT), Cultural Meadow (CUM)	Ground Vegetation; Species Richness

In addition to the regular Terrestrial Watershed Monitoring Program, special projects are taken on when deemed necessary, and are more refined in scope. 2013 saw the continuation of two projects, surficial groundwater monitoring at Heber Down Provincially Significant Wetland, and the Natural Heritage System Inventory Pilot Project was implemented to gain more detailed information on the natural features present within CLOCA's Black Harmony Farewell Creek Watershed functional Natural Heritage System.

2.0 TERRESTRIAL WATERSHED MONITORING

In 2013 the Terrestrial Watershed Monitoring program was implemented within the Black Harmony Farewell Creek Watershed (Figure 1). This watershed lies within the eastern portion of the City of Oshawa and western extent of the Municipality of Clarington, and covers approximately 108km^2. The headwaters begin along the south slope till plain of the Oak Ridges Moraine, traveling south through the Lake Iroquois Beach, and empties into Lake Ontario through a diversion channel adjacent to Oshawa Second Marsh Provincially Significant Wetland.

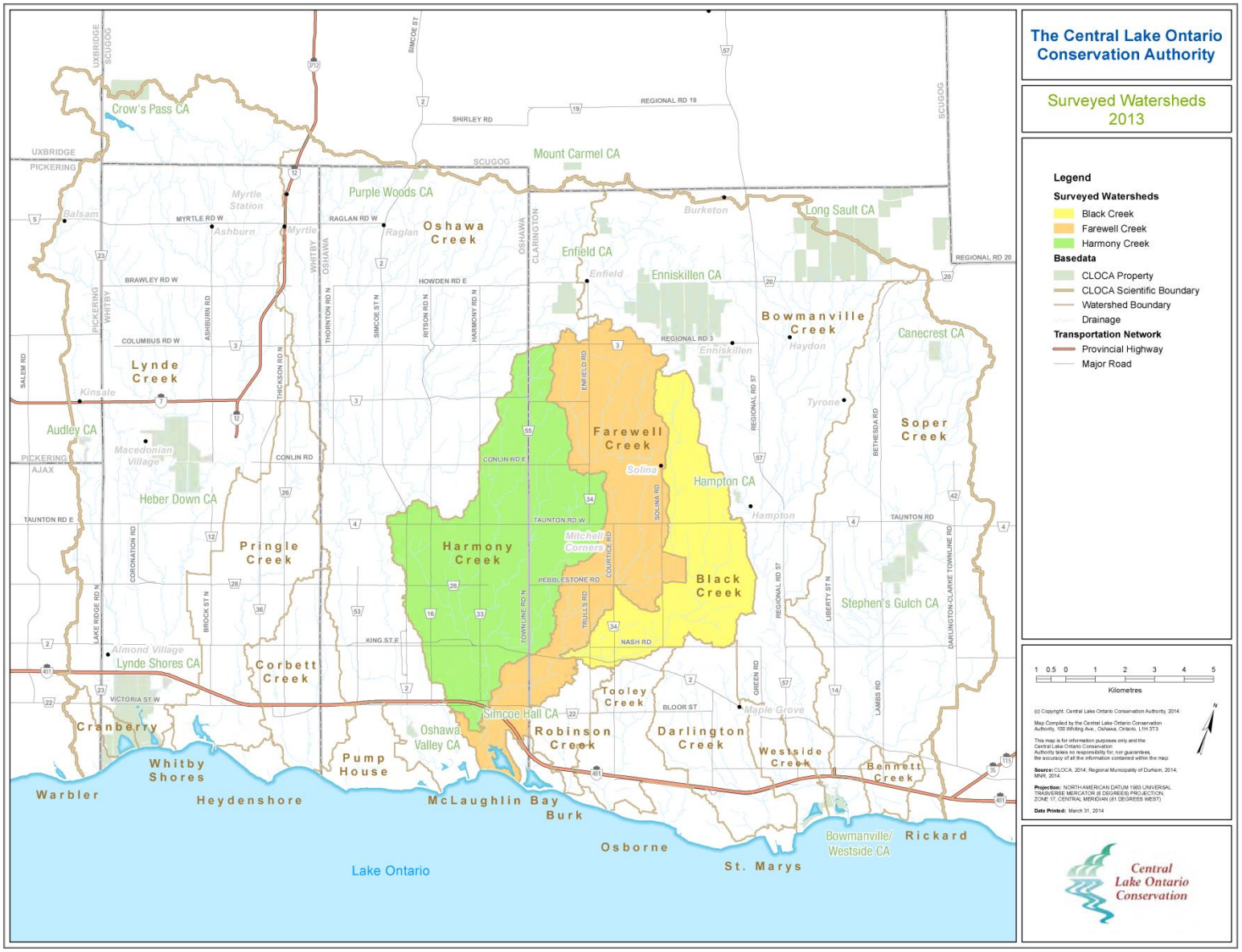


Figure 1: Map of Black/Harmony/Farwell Creek Watersheds within CLOCA's jurisdiction

Approximately 24% of the entire Black/Harmony/Farwell watershed is naturally vegetated, which equates to just over 25km^2. The natural cover is heavily distributed within the central portion of the watershed along the Lake Iroquois Beach physiographic region, while in the northern and southern sections the natural cover is more fragmented as a result of prime agricultural land in the north and urban pressures in the south. Table 2 shows the overall representation of vegetative communities across the watershed. Forests account for 27% of the natural cover, while wetlands account for 35% and non-forested lands cover 28% of the watershed; the remaining 11% is composed of open water, shallow and meadow marshes, beach bluffs and one treed bog. The latter is not included within the terrestrial monitoring program as many of these natural features are monitored through the Durham Region Coastal Wetland Monitoring Program, and overall they comprise a small part of the entire Black/Harmony/Farewell creek watershed, making up only 2%. Table 3 displays the breakdown of system type by individual watershed, Black, Harmony and Farewell creeks.

Table 2: Natural Cover by ELC Community Class

Monitoring System	ELC Classification	Cover (ha)	Cover as % of total natural area in watershed	% Cover as total land area in watershed
Forested System	FOD, FOC, FOM, CUP, CUW	688.64	27%	6%
Non-Forested System	CUT, CUM	701.57	28%	6%
Non-Coastal Wetlands	SWM, SWD, SWC	885.46	35%	8%
Not included in monitoring program	MAM, MAS, SAS, SAM, SAF, CUS, BBO, BBT, FEO, FET, FES, OAO	269.87	11%	2%
Total			**100%**	**24%**

Table 3: Natural Cover by Watershed

Monitoring System	% Natural Cover Black Creek watershed	% Natural Cover Harmony Creek watershed	% Natural Cover Farewell Creek watershed
Forested System	5%	6%	7%
Non-Forested System	8%	4%	8%
Non-Coastal Wetlands	17%	4%	8%
Not included in monitoring program	3%	1%	4%
Total	**32%**	**16%**	**28%**

Terrestrial Monitoring plots are often installed on CLOCA landholdings, municipally owned public lands, and private landholdings with permission from the landowner. CLOCA does not own any lands within the Black/Harmony/Farwell Creek watershed and there are limited public

lands available, as a result very few plots were installed within this watershed. A total of 3 plots were installed; 2 forest plots and 1 wetland plot.

All three plots are located within the south central part of the watershed and are confined within urban valley lands. BHFF01 is at the bottom of a steep valley within a mixed forest. The forest is comprised of ash, poplars, and Manitoba maple in the canopy and eastern white cedar and alternate leaved dogwood in the understory. BHFF02 is a coniferous forest dominated by eastern white cedar. While most of this forest has very little ground cover, there are some pockets of areas that have upwards to 60% ground vegetation cover. BHFW01 is within a mixed swamp, characterized by eastern white cedar and poplars. All of these sites experience pressures as a result of human disturbance, including, but not limited to, dumping of yard waste, garbage, foot and bike paths, garden escapees and encroachment of the adjacent landowner into the natural feature.

To supplement the Terrestrial Monitoring data collected CLOCA staff conducted flora inventories. These flora inventories were conducted on private lands where permission was granted and followed the Ecological Land Classification System for Southern Ontario (Lee, *et. al.* 1998). An additional 70ha of natural areas were inventoried. The area targeted for additional inventories is highlighted on Figure 2 as well as the location of the three terrestrial monitoring plots.

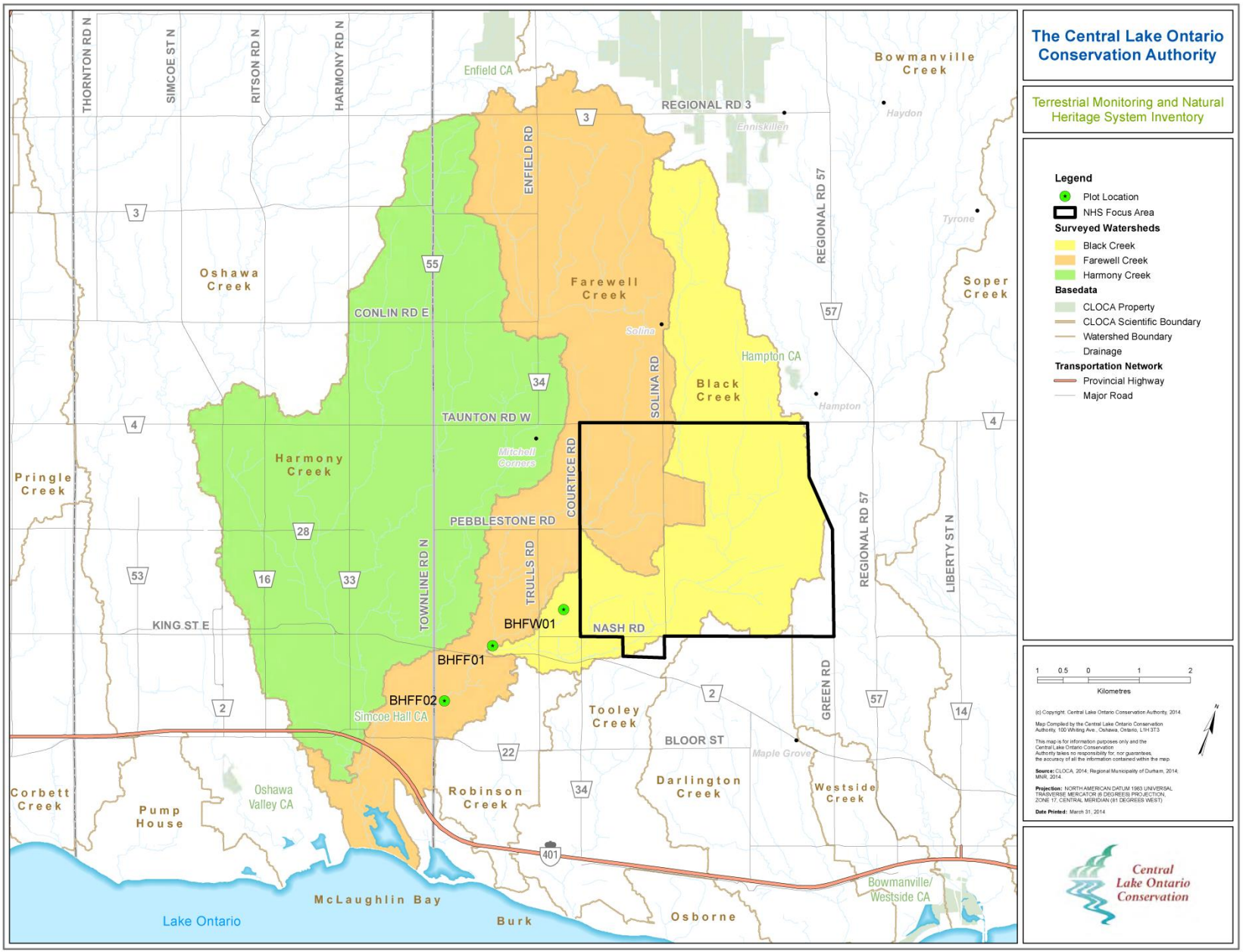


Figure 2: Terrestrial Monitoring Plots and NHS Inventory Target Area

2.1 Forested & Wetland Systems

In 2013, Environment Canada published the "*How Much Habitat is Enough? Third Edition*", and forest cover was updated and has now been divided into 3 risk groups: high risk – minimum 30% forest cover; medium risk – minimum 40% cover; and low risk – minimum 50% forest cover; forested wetlands are included in these percentages. Through CLOCA's Natural Heritage System and watershed plans, CLOCA strives to achieve a minimum of 30% natural cover within each watershed throughout its jurisdiction. Together, wetlands and forests account for 14% of the natural cover within the Black Harmony Farewell Creek watershed.

Forests account for 27% of the watersheds total natural land cover, only 3% of that is coniferous forests, while deciduous and mixed forests are evenly distributed at 10% and 8% respectively; the remaining 6% cover includes cultural plantations and cultural woodlots. Wetlands account for 35% of the watersheds natural cover, with coniferous and deciduous swamps making up only 3.5% and 8% respectively, while the remaining 23% is comprised of mixed swamps, containing both deciduous and coniferous tree species. Both wetlands and forests provide significant habitat to a variety of animal species, and it is vital to ensure the integrity of their habitat is maintained. For this reason, tree health, regeneration, ground vegetation and invasive species were observed.

2.1.1 Tree Health

Tree size and disturbance history can help in understanding how the forest structure is changing, and when regularly monitored, can often help identify both short-term and long-term stresses on the system. These short-term stresses may include extreme weather, insect defoliation and many other factors. While long-term stresses may be more difficult to isolate and can result from surrounding land use changes, recreational uses, climate change, and an array of other factors.

The now retired Canadian Forest Service (Sajan, 2006) states that the average annual mortality rates of 1% to 3% are considered normal, but a red flag should be raised at 5% mortality rates. This threshold will be used when monitoring and analyzing data. If mortality rates exceed this rate, recommendations for management will be made. To utilize this threshold, a baseline must be established to measure from and be compared against. At all forest and wetland plots, tree health is assessed by observing the species, dbh (diameter at breast height), tree status (dead/alive), stem defects, and crown vigor (amount of defoliation).

While high mortality rates can raise alarm, dying, decaying and dead trees play an integral role in forest and wetland ecosystems. Decomposing material can provide habitat and food sources for a variety of animals, including cavity nesters and salamanders, the latter of which are sensitive indicator species; decomposing material is also an important component in nutrient cycling.

Table 4 below shows the percent mortality rate for each site, bearing in mind that the data represents the first year of monitoring, and the recommended threshold will not be applied to this baseline data.

Table 4: Tree Health Summary

Site Name	Mortality of Trees (%)
BHFF01	0%
BHFF02	0%
BHFW01	1%
Overall	**1%**

Table 5 below shows the composition of species, and percent non-native tree species by site. There are eleven trees species overall, 4 of them non-native, these are Manitoba maple (*Acer negundo*), common buckthorn (*Rhamnus cathartica*), scot's pine (*Pinus sylvestris*), and Norway maple (*Acer platanoides*). The first two are ranked in category 1 of Urban Forest Associates Inc. List of Invasive Exotic Species Rankings for Southern Ontario (2004) and the latter two species are ranked in category 2. Table 6 shows the category ranking and criteria associated with each rank. Category 1 species are aggressive invasive species that can alter and dominate sites, and should be considered top priority for control and eradication. Common buckthorn is native to Europe and was introduced to Ontario as an agricultural hedgerow, female plants produce prolific amounts of berries which birds enjoy and rapidly spread. Manitoba maple is considered native to Canada, however it has been planted as an ornamental tree and has naturalized beyond its natural range (Farrar, 2006). Unfortunately, both of these plants are widespread throughout much of southern Ontario, including CLOCA's jurisdiction. Control and eradication is an unlikely option for these species, as they are spread through human and natural means including wind and animals.

Table 5: Tree Species Composition by Site

Site Name	Species Richness	Native	Non-Native	% Non-Native
BHFF01	6	4	2	33%
BHFF02	3	2	1	33%
BHFW01	3	2	1	33%
Overall	**11**	**7**	**4**	**36%**

Scot's pine and Norway maple rank in category 2, and while they are considered highly invasive, they tend to dominate specific niches and reproduce primarily through seed dispersal. One of Norway maple's major ecological threats is its ability to produce a dense canopy of shade which prohibits other native seedlings from regenerating. This can impact and reduce understory and ground cover layers, as well as change the future composition of the forest canopy (U.S. National Parks Service, 2010). Management for these two species is more manageable than the former species; however pathways and vectors need to be addressed to prevent further introduction into natural areas.

Table 6: List of Invasive Exotic Species Ranking for Southern Ontario

Category Rank	Category Criteria
1	This category contains aggressive invasive exotic species that can alter or dominate sites and exclude native species. These organisms are a threat to natural areas, as they disperse widely, through transport by animals and/or natural means (water, wind, etc). These species are top priority, however control may be difficult.
2	Species that are highly invasive but tend to only dominate certain niches or do not spread rapidly from major concentrations. They spread by vegetative means or by seeds that drop close to the parent. They may persist in dense populations for long periods. Control where necessary and limit their spread to other areas.
3	Moderately invasive species, but can become locally dominant when the proper conditions exist. Control where necessary and limit their spread to other areas.
4	Species that do not pose a serious threat to natural areas unless they are competing directly with more desirable vegetation. These plants are sometimes substituted for native plants, but may not reproduce aggressively once established.
5	Some of these species have the potential to become invasive exotics in Ontario. They can reproduce aggressively on occasion but have not been shown to be a serious threat to natural areas in Ontario. Some are very similar to indigenous species and could simply have been overlooked.

Overall, these four invasive species rank on the lower end of importance value compared to the more dominant native tree species found at the three sites, as depicted in Table 7. Importance Value is “an index made up of Relative Density, Relative Dominance and Relative Frequency that profiles the structural role of a species in a stand” (Roberts-Pichette, *et al.*, 1999). Importance values are highly dependent on the quantity of tree species within the plots, as well as the size and basal area. Tree health will be observed every five years as the plots are monitored.

Table 7: Tree Species by Importance Value

Tree Species		Importance Value
Latin Name	Common Name	
Thuja occidentalis	Eastern White Cedar	143.22
Fraxinus pennsylvanica	Green/Red Ash	32.12
Betula papyrifera	White Birch	26.98
Populus balsamifera	Balsam Poplar	15.64
*Acer negundo**	Manitoba Maple	15.22
*Pinus sylvestris**	Scot’s Pine	13.33
Rhamnus cathartica	Common Buckthorn	12.61
Populus tremuloides	Trembling Aspen	10.81
Prunus serotina	Black Cherry	10.66
*Acer platanoides**	Norway Maple	9.92
Cornus alternifolia	Pagoda Dogwood	9.48

**indicates non-native species*

2.1.2 Regeneration

Monitoring the regeneration of saplings is another important feature used to understand the structure and observe the success of the forest. All tree species and heights are recorded for saplings within 16cm to 200cm in height that lie within the subplot boundaries. Specimens less than 16cm are not recorded as the success rate is too unpredictable and they may not survive the growing season.

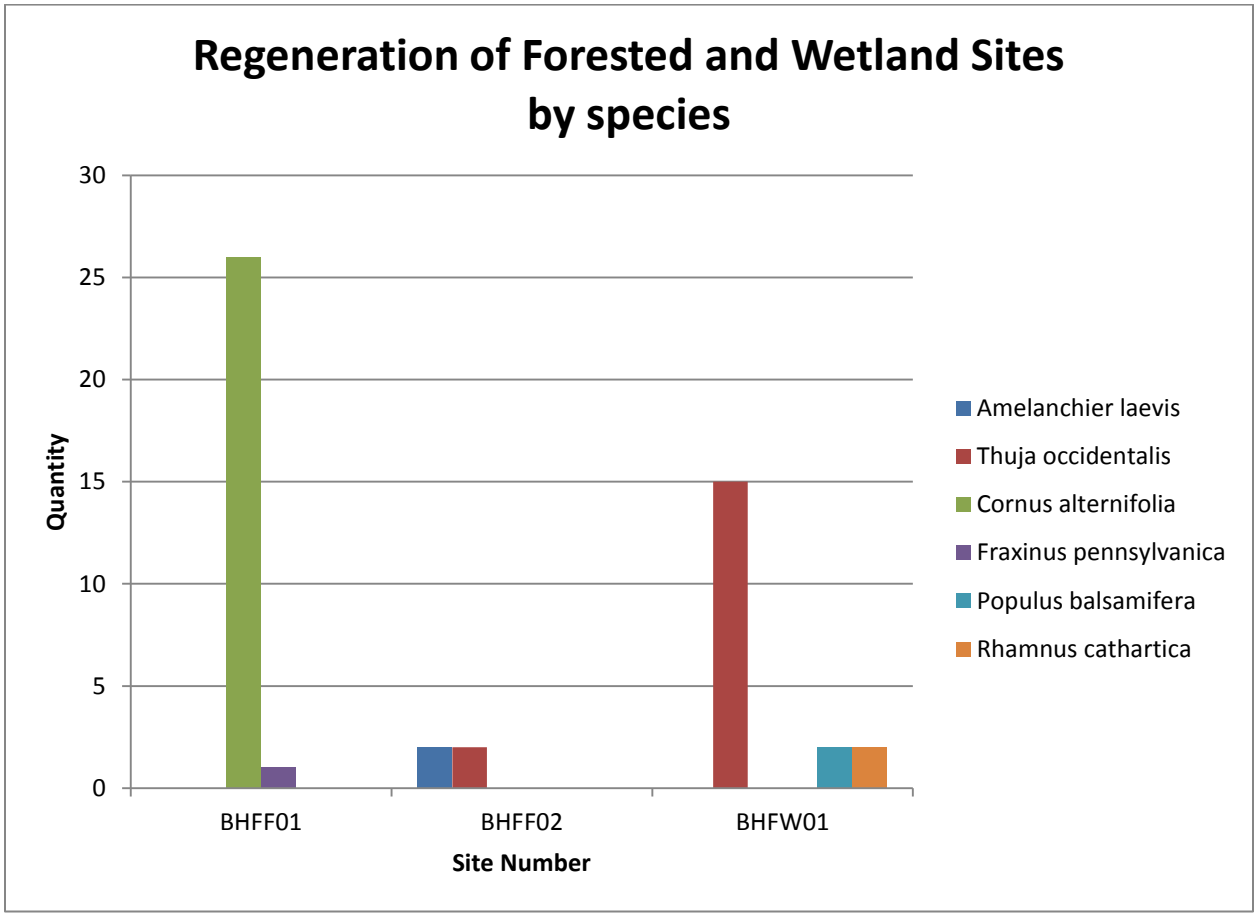


Figure 3: Regeneration by Site

There were six species of trees observed regenerating at the three sites; Figure 3 displays the species by site. Alternate-leaved dogwood (*Cornus alternifolia*), a small understory tree or large shrub, was most abundant of the regenerating species. This small tree is an important source of food for birds, and other wildlife. Eastern white cedar (*Thuja occidentalis*) was the second most observed species, and was found regenerating at two sites. Eastern white cedars are slow-growing small trees getting up to 15m in height, and can occasionally get up to 25m; they can be found in a variety of sites from swampy areas to dry shallow soils and are one of the dominant tree species along the Lake Iroquois Beach Shoreline. Red ash (*Fraxinus pennsylvanica*), balsam poplar (*Populus balsamifera*), smooth serviceberry (*Amelanchier laevis*) and common buckthorn were each found at one of the three sites in much smaller quantities; regeneration monitoring will occur once every five years.

2.1.3 Ground Vegetation

Monitoring ground vegetation within forested and wetland systems can provide information regarding the phenology (timing of biological events, such as flowering, in relation to changes in season and climate) of plants; the change in composition and species vulnerability to disturbed landscapes; as well as provide information on the quality of habitat. Ground vegetation can vary depending on many factors, including forest canopy cover, soil substrate, moisture variation and time of year.

Table 8 provides a summary of the species composition for each site, and is broken up between native and non-native and overall species richness.

Table 8: Ground Vegetation by Site

Site Name	Species Richness	Native Species Richness	Non-native Species Richness	% Non-Native	% Native
BHFF01	17	14	3	18%	82%
BHFF02	16	15	1	6%	94%
BHFW01	8	6	2	25%	75%
Overall	**31**	**28**	**3**	**10%**	**90%**

*Overall species richness counts only unique occurrences; totals have been adjusted for this duplication

Overall there were 31 species observed at the three plots, with 90% being native vegetation; none of the species present were provincially or regionally rare. Table 9 shows the list of non-native species present and their ranking according to Table 6: List of Invasive Exotic Species Ranking for Southern Ontario**.**

Table 9: Non-Native Species list

Latin Name	Common Name	Rank
Hesperis matronalis	Dames Rocket	1
Rhamnus cathartica	Common Buckthorn	1
Solanum dulcamara	Bittersweet Nightshade	3

All three invasive species were observed at BHFF01, while only common buckthorn and bittersweet nightshade (*Solanum dulcamara*) were observed at BHFW01, and only common buckthorn was observed at BHFF02. Dames rocket (*Hesperis matronalis*) and common buckthorn are ranked in the first category for invasiveness, while bittersweet nightshade is ranked as moderately invasive. Bittersweet nightshade is often observed as naturalized within natural settings, but can be quite aggressive in edge habitats. Dames rocket is in the mustard family and is a prolific seeder. It is often found in lowland forests and moist meadows, and creates dense monocultures, often outcompeting native vegetation for water, light and nutrients (Forest Invasive Plants Resource Centre, 2014). Ground vegetation will be observed every five years, and abundance variations in plant communities will be observed.

3.0 SPECIAL PROJECTS

3.1 Natural Heritage Systems Inventory Pilot Project

2013 saw the second year of the Natural Heritage Systems Inventory Pilot Project; this pilot project is intended to provide staff more detailed information on the functional Natural Heritage System that can be used to contribute to prioritizing the restoration of the Natural Heritage System. Since publicly owned lands are limited within the Black Harmony Farewell Creek watershed, the inventory was also used to augment the terrestrial data collected within the watershed.

Of the 40 landowners contacted, 23% (9) responded and of those 9 respondents 8 were positive and provided permission to enter their property. While numbers were low, the 8 properties visited covered over 185ha of the Black Harmony Farewell Creek watershed, of which approximately 70hectares were natural features and part of CLOCA's functional natural heritage system.

Sixty-two unique polygons were visited, ranging from a variety of eco-sites including treed swamps, forests, cultural sites and marshes. The portion of Black Harmony Farewell Creek watershed that was targeted is part of the remnant Lake Iroquois, and lies on the Lake Iroquois Beach (LIB). This physiographic feature is known for its extensive band of local ground water recharge. This significant fact results in the extensive forest cover running east/west along this band. As a result of shallow water tables, cedar and trembling aspen often dominate wetland forests, while in drier areas hemlock and hard maple are more common (Gartner Lee, 1978). Some of the sites surveyed include Fresh-Moist Sugar Maple-Yellow Birch deciduous forests (FOD6-3) which was dominated by sugar maple (*Acer saccharum ssp saccharum*), yellow birch (B*etula allegheniensis*), trembling aspen (*Populus tremuloides*) and eastern hemlock (*Tsuga canadensis*) in the canopy and subcanopy, while eastern white cedar and sugar maple dominates the understory, and Canadian yew (*Taxus canadensis*), a regionally uncommon shrub, Canada mayflower (*Maianthemum canadense*), jack-in-the-pulpit (*Arisaema triphyllum*) and wood ferns (*Dryopteris spp*) are abundant in the ground layer. Eastern White Cedar-Hardwood Mixed Swamps (SWM1-1) are a common occurrence along the LIB; and less common are deciduous swamps, some of which were surveyed and found to be dominated by swamp maple (*Acer freemani*), silver maple (*Acer saccharinum*), black ash (*Fraxinus nigra*) with the occasional eastern white cedar and white elm (*Ulmus americana*) in the canopy and subcanopy.

Table 10 summarizes the species richness of each system type, and Appendix 1 shows the entire species list, including provincial and regional commonality. Overall, 80% of the flora found was native, and 8% are ranked as taxa associated with a plant community in an advance successional stage that has undergone minor disturbances. While 44% of the plants were ranked as taxa that are typically associated with a specific plant community, but tolerate moderate disturbance (Oldham, 1995). Natural Heritage inventories will continue to be utilized as a tool to supplement CLOCA's Terrestrial Monitoring data.

Table 10: Ground Vegetation by System Type

System Type	Species Richness	Native Species Richness	Non-native Species Richness	% Non-Native	% Native
Forest	86	72	14	16%	84%

Wetland	121	106	15	12%	88%
Non-Forested	27	19	8	30%	70%
Other	131	99	32	24%	76%
Overall	**207**	**165**	**42**	**20%**	**80%**

3.2 Ground Levels at Heber Down CA

Since 2009 CLOCA has been monitoring groundwater levels in conjunction with wetland specific plants at four locations within Heber Down Provincially Significant Wetland at Heber Down Conservation Area.

Water levels are recorded on a monthly basis at the four locations using piezometers; vegetation inventories are also conducted at these sites along 4 transects which each contain 12 1mx1m plots. At each site the species composition is observed (Table 11), in addition to overall wetness index. Table 12 shows the average wetness for each transect, the maximum wetness value, minimum value and the mode.

Table 11: Ground Vegetation data by Transect

Site Name	Species Richness	Native Species Richness	Non-native Species Richness	% Non-native Species
Transect 1	38	32	6	16%
Transect 2	16	13	3	19%
Transect 3	24	20	4	17%
Transect 4	23	22	1	4%
Overall	**53**	**45**	**8**	**15%**

Table 12: Wetness Index by Transect

Site Name	Mean Wetness Index	Maximum Wetness Value	Minimum Wetness Value	Mode Wetness Value
Transect 1	-0.66	5	-5	-3
Transect 2	0.625	5	-4	5
Transect 3	-1.21	5	-5	-2
Transect 4	-1.35	5	-5	-3
Overall	**-0.57**	**5**	**-5**	**-3**

Figure 4 shows the water levels from the start of monitoring; each of the sites are observed monthly, on an annual basis. These sites will continue to be monitored through the construction and post-construction phase of the Highway 407 east extension. Figure 5 shows the rain gauge data that is collected at Transect 1 on a monthly basis. As expected there are dips during the mid-summer months as a result of high temperatures and increased evapotranspiration, but overall the levels have been fairly consistent across the five year monitoring period.

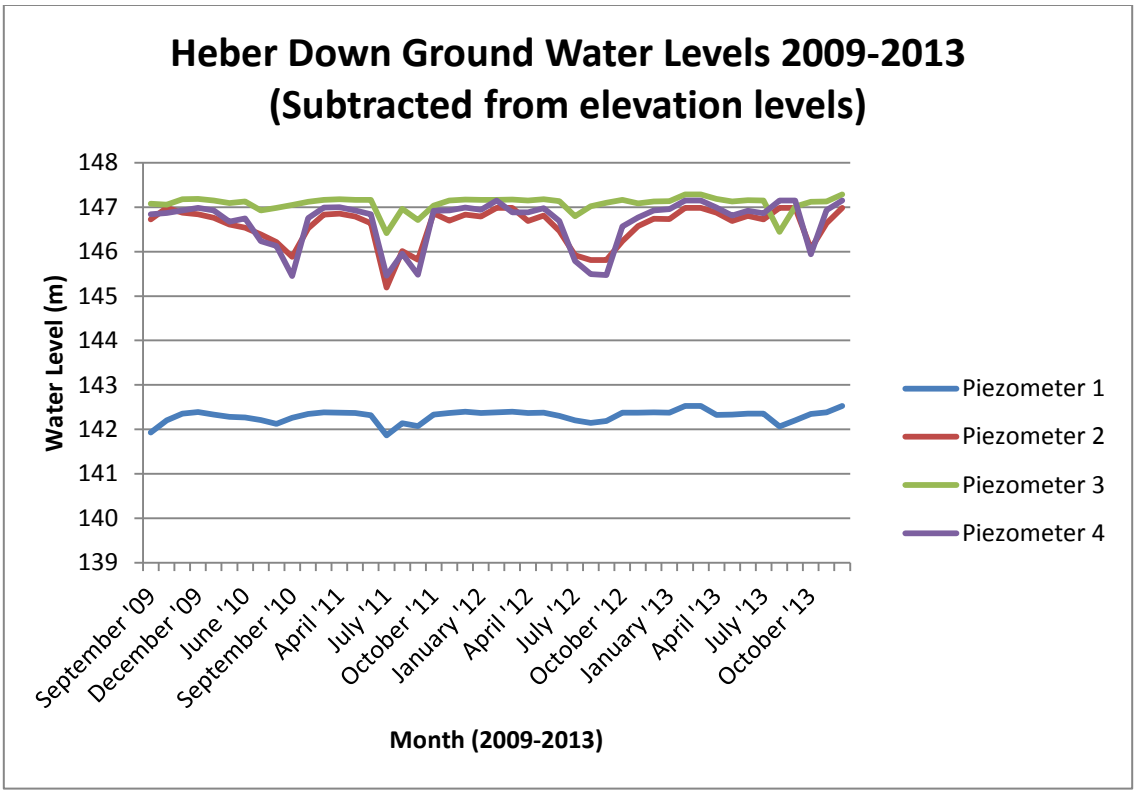


Figure 4: Piezometer Groundwater Levels

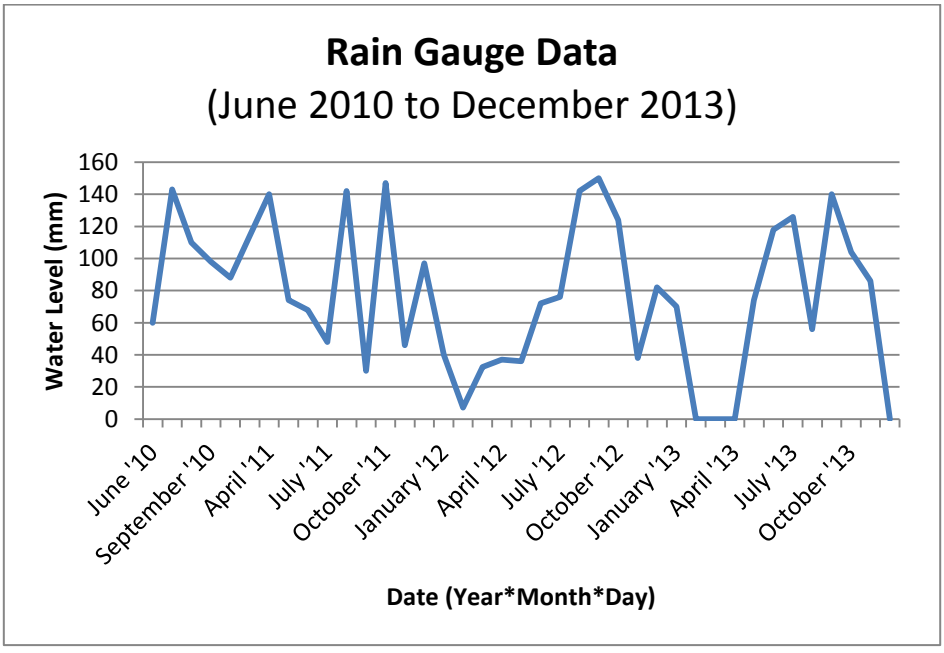


Figure 5: Rain Gauge Data

3.3 Invasive Species Management Strategy

For the past four years CLOCA has been implementing its Invasive Species Management Strategy, with the goal to help increase awareness and prevent the introduction and slow the spread of invasive species. The strategy focuses on prevention, education & outreach, best management practices and collaborating with a broad professional network that works on invasive species related issues. In 2013 CLOCA staff worked towards further implementing several Invasive Species pilot projects, assessing conservation area lands with a high abundance of ash populations, as well as engaging the public through a number of outreach initiatives and activities.

3.3.1 Pilot Project Implementation

As part of CLOCA's Garlic Mustard Management Pilot Project, staff in partnership with TD Friends of the Environment Foundation and a local high school program came together to increase human resources to manage Garlic Mustard. Both culinary and green industry students were targeted, and had the opportunity to learn about the diversity of the sugar maple woodlot, and participate in invasive species management. They also got the opportunity to learn how to dispose of garlic mustard in a sustainable way; overall 380kg of Garlic Mustard was removed in 2013.

In 2012 CLOCA initiated a Yellow Iris management pilot project at Lynde Shores Conservation Area, which consisted of testing a number of control options, including: cutting, temporary tarping and digging. As a result of limited resources and staff time, it was decided that tarping would be the most effective means of controlling Yellow Iris. In 2013 Natural Heritage staff and summer students visited the north end of Lynde Shores and installed tarps to smother the plant. The tarps will remain in place over a two to three year period, depending on the success of the control method, and the sites will continue to be monitored during this time.

Figure 6: Pre and Post tarping at Lynde Shores CA

Over the past four years CLOCA staff have been managing Common Buckthorn at Lynde Shores Conservation Area through manual control methods. While some of these methods are showing some success, they require substantial human resources and can create more disturbances than the invasive species itself. In 2013 field operation staff assisted Natural Heritage staff in applying herbicide to a select number of trees to determine if the use of herbicides were successful and worth pursuing as a control option. Only one application occurred in April, however in future years it is recommended that a fall application should complement the spring treatment. While most trees did not leaf out after the garlon application,

the few trees that did leaf out had burnt and damaged leaves. Below are photos of the post garlon management. Another spring application is expected in 2014 and photo monitoring will continue to take place to assess the herbicide treatments.

Figure 7: Post garlon treatment at LySCA - Chickadee Trail

2013 was the third consecutive year of executing CLOCA's Frog-bit management program at Enniskillen CA pond. A small crew of natural heritage and education staff came together to continue removing frog-bit from the pond. Frog-bit management and continued monitoring will occur in 2014.

Figure 8: Pre and Post management at ECA pond

3.3.2 Outreach Initiatives

CLOCA, in partnership with the Ontario Invasive Plant Council, hosted the Clean Equipment Workshop in mid spring. This half day workshop was designed to train public agency operations and works staff regarding the steps that can be taken to prevent the unintentional introduction and spread of invasive species from the use of heavy equipment and machinery on the job site. The workshop included a series of presentations and a demonstration activity that gave participants the opportunity to put the protocol into practice. The workshop was a great success with 22 people in attendance from a variety of public agencies.

Each summer CLOCA partners with the Ontario Federation of Angler's and Hunters Invading Species Awareness Program to hire an Invasive Species Hit Squad summer student. This student actively pursues opportunities to educate and engage the public about invasive species prevention and awareness. In 2013, the student engaged visitors at Darlington Provincial Park through presentation and tours. They also initiated the Grow Me Instead Nursery Recognition Program within Durham Region which is a program started by the Ontario Invasive Plant Council intended to promote nurseries and garden centres that sell native and non-invasive alternatives. In addition to this, the 2013 student also organized and implemented a Mighty Phragmites Road Rally. The Road Rally is a citizen scientist monitoring protocol that allows volunteers to collect data on invasive species along road ways. This event brought out 14 volunteers who paired up and mapped *Phragmites australis* ssp *australis* within the Black Harmony Farewell Creek watershed. This event also allowed participants the opportunity to learn about Common reed and other invasive species within Durham Region; overall it was very well received by the participants.

Figure 9: Group shot of Mighty Phragmites Road Rally event

3.3.3 Storm Water Management Pond Surveys

In 2012 CLOCA staff started surveying storm water management ponds (SWMP), to assess the presence/absence of invasive fish, and determine if invasive species could potentially be introduced into natural watercourses through SWMPs. This project was continued in 2013, and twelve ponds were surveyed in the Black Harmony Farewell Creek watershed. Of the twelve

ponds surveyed, only 2 had goldfish present, five had minnow species (fatheads and bluntnose species), one pond had a sunfish and one pond had a first year largemouth bass. The latter is suspected to have been introduced in the pond.

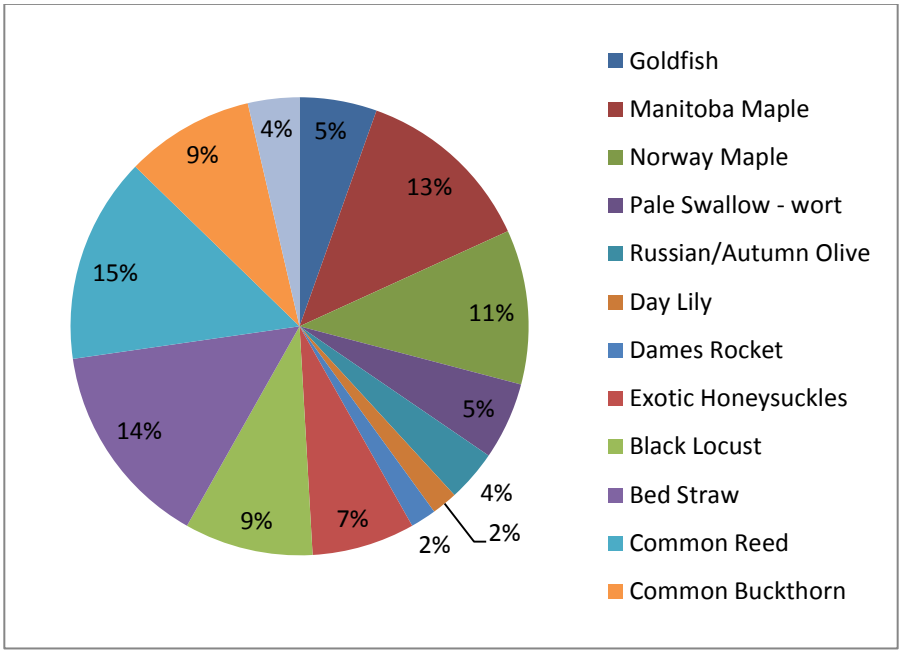


Figure 10: Percent of Invasive Species Found Overall

Invasive plant species were also recorded at the SWMPs and as shown in Figure 10, twelve of the twenty-five targeted invasive plant species were observed at the SWMPs (Figure 10). Table 13 lists the remaining thirteen species not observed at the storm water management facilities.

Table 13: List of Invasive Plant Species not found at any SWMP

Common Name	Latin Name
Garlic Mustard	*Alliaria petiolata*
Giant Hogweed	*Heracleum mantegazzianum*
Himalayan Balsam	*Impatiens glanulifera*
Wild Parsnip	*Pastinaca sativa*
Flowering Rush	*Butomus umbellatus*
Water Hyacinth	*Eichhornia crassipes*
European Frog-bit	*Hydrocharis morsus-ranae*
Yellow Iris	*Iris pseudacorus*
Floating Heart	*Nymphoides peltata*
Water Lettuce	*Pistia stratiotes*
Water Soldier	*Stratiotes aloides*
Water Chestnut	*Eleocharis dulcis*
Japanese Knotweed	*Fallopia japonica*

3.3.4 Emerald Ash Borer

Emerald Ash Borer (EAB), an invasive insect that attacks all species of Ash, was detected within CLOCA's jurisdiction in 2011. To better prepare for the impending threat of EAB, CLOCA developed a map depicting the distribution of abundant Ash populations within CLOCA's landholdings. In 2013 summer staff conducted surveys within several of these high-use areas to assess the health of these forests. During these surveys, signs and symptoms indicative of EAB were observed on several of CLOCA's landholdings.

Beyond the environmental impact of ash tree loss, dead and falling ash trees pose a risk to public safety and property. Ash trees often succumb to EAB within 4 years of becoming infested, and it is expected that decimation of ash trees in Durham will peak in approximately 6 years. Once a tree has succumb to EAB it usually falls within one to five years of dying, and dead ash trees are hazardous to climb past two years as they become weak and rot at the base of the bole, which results in ash trees being prone to falling over.

This past summer, staff went out and performed assessments within Ash dominant and Ash abundant polygons to determine if there were any signs of stress on ash trees, and more specifically any evidence of EAB. Signs of stress that were being observed include epicormic branching, yellowing of leaves, thinning crowns and heavy seed production. While these symptoms can signify the presence of EAB, they are general indicators of stress and can be caused by a number of other reasons.

The student also looked for emergence holes, bark cracks and where appropriate, s-shaped galleries which are more specific to EAB. Due to time limitations only a few of the ash dominant and ash abundant polygons within six CA's were visited. Overall, signs of stress were observed at the six CA's, S-shaped galleries were observed near the parking area of Heber Down CA and possible emergence holes were observed at Lynde Shores CA.

Bowmanville/Westside Marsh, Lynde Shores and Stephen's Gulch had a number of affected Ash trees showing overall thinned crowns, with heavy seed production and insect defoliation within the forested areas. While at Enniskillen CA and Heber Down CA, signs of stressed Ash were present near the parking and picnic areas and along the roadways. Long Sault had a lesser extent of ash showing signs of stress and decline.

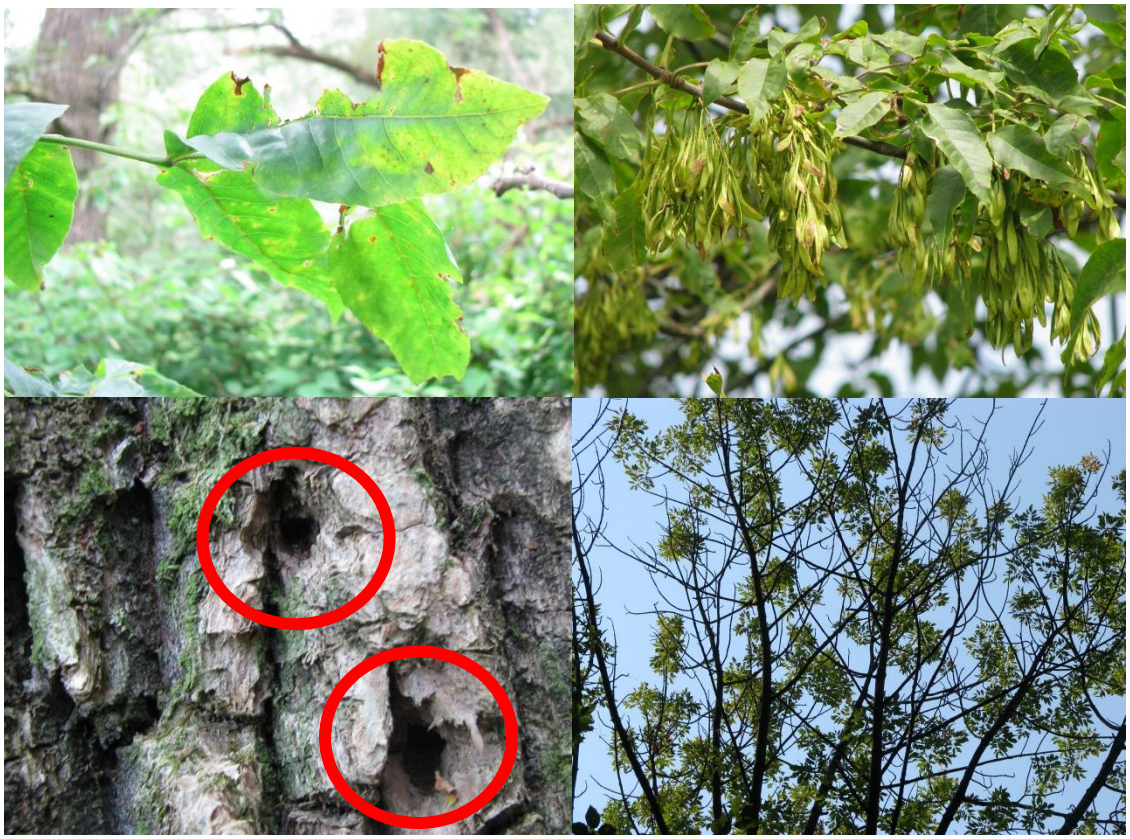


Figure 11: *from left to right, top to bottom* insect herbivory; heavy seed production; possible emergence holes; crown thinning at Stephen's Gulch CA

Figure 12: *from left to right* crown thinning at Enniskillen CA; crown thinning at Bowmanville/Westside Marsh CA

In 2013, CLOCA received funding from TD Friends of the Environment Foundation to do an under planting to mitigate for the loss of cover from the removed Buckthorn and the imminent declining ash population at the Chickadee Trail in Lynde Shores Conservation Area. Six hundred and fifty five trees were planted in partnership with a local high school; tree species included Red Oak, Hemlock, Hickory, White Pine, Sugar Maple, Elderberry and Nannyberry. On-going monitoring will take place to assess the success of the planting. Future restoration and tree plantings may be necessary, especially at CLOCA's high use Conservation Areas where the loss of trees could have an impact on the aesthetic value of the lands.

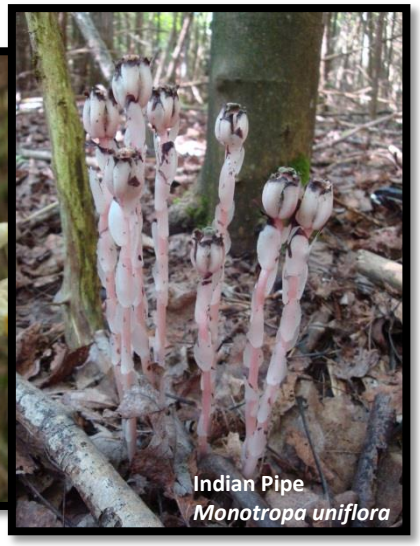
4.0 SUMMARY

2013 was yet another busy and successful field season; while only three monitoring plots were established, over 70ha of land was inventoried through the Natural Heritage System Inventory Pilot Project. In addition to this, two special projects were carried out, and will be continued into the 2014 field season. Several invasive species management pilot projects were implemented as well as educational events targeting not only the public, but municipal and public works staff.

This data will be used in conjunction with future existing condition reports for CLOCA's watersheds, CA management plans, and Invasive Species Management planning. Monitoring will occur within each watershed once every five years.


Cardinal Flower
Lobelia cardinalis


Pearly Everlasting
Anaphalis margaritacea


Indian Pipe
Monotropa uniflora

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Appendix 1: Natural Heritage System Inventory Plant Species List

Common Name	Scientific Name	Coefficient of Conservatism	Provincial Rank	Regional Status
Balsam Fir	*Abies balsamea*	5	5	C
Freeman's Maple	*Acer freemani*	*	NR	C
Manitoba Maple	*Acer negundo*	0	5	C
Red Maple	*Acer rubrum*	4	5	C
Sugar Maple	*Acer sacharum ssp. saccharum*	4	5	C
Mountain Maple	*Acer spicatum*	6	5	U
Common Yarrow	*Achillea millefolium*	*	SE	C
White Baneberry	*Actaea pachypoda*	6	5	C
Red Baneberry	*Actaea rubra*	5	5	C
Maidenhair Fern	*Adiantum pedatum*	7	5	U
Slender-leaved Gerardia	*Agalinis tenuifolia*	7	SU -	U
Tall Hairy Agrimony	*Agrimonia gryposepala*	2	5	C
Common Water Plantain	*Alisma plantago-aquatica*	3	5	C
Wild Leek	*Allium tricoccum*	7	5	U
Smooth serviceberry	*Amelanchier laevis*	5	5	U
Hog-peanut	*Amphicarpaea bracteata*	4	5	C
Pearly Everlasting	*Anaphalis margaritacea*	3	5	U
Canada Anemone	*Anemone canadensis*	3	5	C
Thimbleflower	*Anemone virginiana*	4	5	C
Spreading Dogbane	*Apocynum androsaemifolium*	3	5	C
Wild Sarsaparilla	*Aralia nudicaulis*	4	5	C
Common Burdock	*Arctium minus*	*	SE5	+
Jack-in-the-Pulpit	*Arisaema triphyllum*	5	5	C
Swamp Milkweed	*Asclepias incarnata*	6	5	C
Common Milkweed	*Asclepias syriaca*	0	5	C
Asparagus	*Asparagus officinalis*	*	SE5	C
Heath Aster	*Aster ericoides*	4	5	C
Tall White Aster	*Aster lanceolatus*	3	5	C
One-sided Aster	*Aster laterifolus*	3	S4?	C
New England Aster	*Aster novae-angliea*	2	5	C
Downy White Aster	*Aster pilosus*	4	5	R
Blue Marsh Aster	*Aster puniceus*	6	5	C
Lady Fern	*Athyrium filix-femina*	4	5	C
Yellow Birch	*Betula allegheniensis*	6	5	C
White Birch	*Betula papyrifera*	2	5	C
Nodding Beggarticks	*Bidens cernua*	2	5	C
False Nettle	*Boehmeria cylindrica*	4	5	C
Smooth Brome Grass	*Bromus inermis*	*	SE5	C

Common Name	Scientific Name	Coefficient of Conservatism	Provincial Rank	Regional Status
Bebb's Sedge	*Carex bebbii*	3	5	C
Slender Wood Sedge	*Carex digitalis*	7	3	R
Graceful Sedge	*Carex gracillima*	4	5	C
Bladder Sedge	*Carex intumescens*	6	5	U
Lake-bank Sedge	*Carex lacustris*	5	5	C
Loose-flowered Sedge	*Carex laxiflora*	5	5	U
Hop Sedge	*Carex lupulina*	6	5	C
Radiate Sedge	*Carex radiata*	4	5	C
Curly-styled Sedge	*Carex rosea*	5	5	R
Sedge spp.	*Carex stipata*	3	5	C
Blue Beech	*Carpinus caroliniana*	6	5	C
Blue Cohosh	*Caulophyllum thalictroides*	6	5	C
Oriental Bittersweet	*Celastrus orbiculata*	*	SE2	R
Spotted Knapweed	*Centaurea maculosa*	*	SE5	+
Water Hemlock	*Cicuta maculata*	6	5	U
Enchanter's Nightshade	*Circaea lutetiana*	3	5	C
Canada Thistle	*Cirsium arvense*	*	SE5	+
Field Thistle	*Cirsium discolor*	9	S3	R
Bull Thistle	*Cirsium vulgare*	*	SE5	C
Virgin's Bower	*Clematis virginiana*	3	5	C
Alternate-leaved Dogwood	*Cornus alternifolia*	6	5	U
Round-leaved Dogwood	*Cornus rugosa*	6	5	C
Red Osier Dogwood	*Cornus stolonifera*	2	5	C
Dodder	*Cuscuta gronovii*	4	5	C
Dog-strangling Vine	*Cynanchum rossicum*	*	SE5	C
Bulbet Fern	*Cystopteris bulbifera*	5	5	C
Orchard Grass	*Dactylis glomerata*	*	SE5	C
Wild Carrot	*Daucus carota*	*	SE5	C
Spinulose Shield Fern	*Dryopteris carthusiana*	5	5	C
Crested Shield Fern	*Dryopteris cristata*	7	5	C
Glandular Shield Fern	*Dryopteris intermedia*	5	5	R
Marginal Shield Fern	*Dryopteris marginalis*	5	5	C
Squirting Cucumber	*EchInocystis lobata*	3	5	C
Hairy Willowherb	*Epilobium hirsutum*	*	SE5	C
Narrow-leaved Willowherb	*Epilobium leptophyllum*	7	5	U
Helleborine	*Epipactis helleborine*	*	SE5	C
Field Horsetail	*Equisetum arvense*	0	5	C
Meadow Horsetail	*Equisetum pratense*	8	5	U
Dwarf Scouring-rush	*Equisetum scirpoides*	7	5	U
Daisy Fleabane	*Erigeron annuus*	0	5	C

Common Name	Scientific Name	Coefficient of Conservatism	Provincial Rank	Regional Status
Philadelphia Daisy	*Erigeron philadelphicus*	1	5	C
Joe-Pye-weed	*Eupatorium maculatum*	3	5	C
Boneset	*Eupatorium perfoliatum*	2	5	C
Grass-leaved Goldenrod	*Euthamia graminifolia*	2	5	C
American Beech	*Fagus grandifolia*	6	5	C
Wild Strawberry	*Fragaria virginiana*	2	SU	C
White Ash	*Fraxinus americana*	4	5	C
Black Ash	*Fraxinus nigra*	7	5	C
Red Ash	*Fraxinus pennsylvanica*	3	5	C
Rough Bedstraw	*Galium asprellum*	6	5	C
Wild Madder	*Galium mollugo*	*	SE5	C
Marsh Bedstraw	*Galium palustre*	5	5	C
Herb-Robert	*Geranium robertianum*	*	SE5	C
Yellow Avens	*Geum aleppicum*	2	5	C
Fowl Manna Grass	*Glyceria striata*	3	5	C
Oak Fern	*Gymnocarpium dryopteris*	7	5	C
King Devil	*Hieracium aurantiacum*	*	SE5	+
Common St. John's-wort	*Hypericum perforatum*	*	SE5	C
Touch-me-not	*Impatiens capensis*	4	5	C
Black Walnut	*Juglans nigra*	5	S4	U
Soft Rush	*Juncus effusus*	4	5	C
Wood Nettle	*Laportea canadensis*	6	5	C
Cut Grass	*Leersia oryzoides*	3	5	C
Common Duckweed	*Lemna minor*	2	5	C
Butter-and-eggs	*Linaria vulgaris*	*	SE5	C
Cardinal Flower	*Lobelia cardinalis*	7	5	R
Indian Tobacco	*Lobelia inflata*	3	5	C
Great Lobelia	*Lobelia siphilitica*	6	5	U
Canada Honeysuckle	*Lonicera canadensis*	6	5	U
Tatarian Honeysuckle	*Lonicera tatarica*	*	SE5	C
American Water-	*Lycopus americanus*	4	5	C
Bugleweed	*Lycopus uniflorus*	5	5	C
Fringed Loosestrife	*Lysimachia ciliata*	4	5	C
Purple Loosestrife	*Lythrum salicaria*	*	SE5	C
Canada Mayflower	*Maianthemum canadense*	5	5	C
False Solomon's-seal	*Maianthemum racemosum*	4	5	C
Ostrich Fern	*Matteucia struthiopteris*	5	5	C
Sweet White Clover	*Melilotus albus*	*	SE5	C
Wild Mint	*Mentha arvensis*	3	5	C

Common Name	Scientific Name	Coefficient of Conservatism	Provincial Rank	Regional Status
Square-stemmed	*Mimulus ringens*	6	5	C
Creeping Partridge-berry	*Mitchella repens*	6	5	C
Indian Pipe	*Monotropa uniflora*	6	5	U
Small-leaved Water-cress	*Nasturtium microphyllum*	*	SE5	C
Evening Primrose	*Oenothera biennis*	0	5	C
Sensitive Fern	*Onoclea sensibilis*	4	5	C
Royal Fern	*Osmunda regalis*	7	5	U
European Wood-sorrel	*Oxalis stricta*	0	5	C
Virginia Creeper	*Parthenocissus inserta*	3	5	C
Reed Canary Grass	*Phalaris arundinacea*	*	5	C
Timothy	*Phleum pratense*	*	SE5	C
Clearweed	*Pilea pumila*	5	5	C
Red Pine	*Pinus resinosa*	8	5	C
White Pine	*Pinus strobus*	4	5	C
Scotch Pine	*Pinus sylvestris*	*	SE5	C
Kentucky Bluegrass	*Poa pratensis*	*	5	C
Hairy Solomon's Seal	*Polygonatum pubescens*	5	5	C
Marshpepper Smartweed	*Polygonum hydropiper*	4	SE5	C
Christmas Fern	*Polystichum acrostichoides*	5	5	C
Balsam Poplar	*Populus balsamifera*	4	5	C
Large-toothed Aspen	*Populus grandidentata*	5	5	C
Trembling Aspen	*Populus tremuloides*	2	5	C
Sulphur Cinquefoil	*Potentilla recta*	*	SE5	+
Tall White Lettuce	*Prenanthes altissima*	6	5	R
Heal-all	*Prunella vulgaris*	*	SE5	C
Black Cherry	*Prunus serotina*	3	5	C
Chokecherry	*Prunus virginiana*	2	5	C
Bracken Fern	*Pteridium aquilinum*	2	5	C
Shinleaf	*Pyrola elliptica*	5	5	C
White Oak	*Quercus alba*	6	5	R
Kidney-leaved Buttercup	*Ranunculus abortivus*	2	5	C
Buttercup	*Ranunculus acris*	*	SE5	C
Swamp Buttercup	*Ranunculus hispidus var.*	5	5	C
Common Buckthorn	*Rhamnus cathartica*	*	SE5	C
Poison-ivy	*Rhus radicans*	5	5	C
Staghorn Sumac	*Rhus typhina*	1	5	C
Wild Gooseberry	*Ribes cynosbati*	4	5	C
Swamp Black Currant	*Ribes lacustre*	7	5	R
Red Currant	*Ribes rubrum*	*	5	C
Multiflora Rose	*Rosa multiflora*	*	SE4	C

Common Name	Scientific Name	Coefficient of Conservatism	Provincial Rank	Regional Status
High-bush Blackberry	*Rubus allegheniensis*	2	5	C
Wild Red Raspberry	*Rubus idaeus*	0	5	C
Purple-flowering Raspberry	*Rubus odoratus*	3	5	C
Dwarf Raspberry	*Rubus pubescens*	4	5	C
Black-eyed Susan	*Rudbeckia hirta*	0	5	C
Curly Dock	*Rumex crispus*	*	SE5	C
Common Arrowhead	*Sagittaria latifolia*	4	5	C
Bebb's Willow	*Salix bebbiana*	4	5	C
Hearth-leaved Willow	*Salix eriocephala*	4	5	C
Sandbar Willow	*Salix exigua*	3	5	C
Slender Willow	*Salix petiolaris*	3	5	C
Common Elderberry	*Sambucus canadensis*	5	5	C
Red Elderberry	*Sambucus racemosa*	5	5	C
Bloodroot	*Sanguinaria canadensis*	5	5	C
Black Bulrush	*Scirpus atrovirens*	3	5	C
Wool Grass	*Scirpus cyperinus*	4	5	C
Common Skullcap	*Scutellaria lateriflora*	5	5	C
Water-parsnip	*Sium suave*	4	5	C
Bittersweet Nightshade	*Solanum dulcamara*	*	SE5	C
Tall Goldenrod	*Solidago altissima*	1	5	C
Blue-stemmed Goldenrod	*Solidago caesia*	5	5	U
Canada Goldenrod	*Solidago canadensis*	1	5	U
Zig-zag Goldenrod	*Solidago flexicaulis*	6	5	C
Late Goldenrod	*Solidago gigantea*	4	5	C
Gray Goldenrod	*Solidago nemoralis*	2	5	C
European Mountain-ash	*Sorbus aucuparia*	*	SE4	C
Giant Bur-reed	*Sparganium eurycarpum*	3	5	C
Twisted Stalk	*Streptopus roseus*	7	5	C
Dandelion	*Taraxacum officinale*	*	SE5	C
Canadian Yew	*Taxus canadensis*	7	SE5	U
Marsh Fern	*Thelypteris palustris*	5	5	C
Eastern White Cedar	*Thuja occidentalis*	4	5	C
Foamflower	*Tiarella cordifolia*	6	5	C
Basswood	*Tilia americana*	4	5	C
Starflower	*Trientalis borealis*	6	5	C
Red Clover	*Trifolium pratense*	*	SE5	C
Trillium Spp	*Trillium grandiflorum*	5	5	C
Eastern Hemlock	*Tsuga canadensis*	7	5	C
Coltsfoot	*Tussilago farfara*	*	SE5	C

Common Name	Scientific Name	Coefficient of Conservatism	Provincial Rank	Regional Status
Narrow-leaved Cattail	*Typha angustifolia*	3	S5	C
Glaucus Cattail	*Typha glauca*	3	5	C
Broad-leaved Cattail	*Typha latifolia*	3	5	C
American Elm	*Ulmus americana*	3	5	C
Stinging Nettle	*Urtica dioica*	*	SE2	C
Blue Vervain	*Verbena hastata*	4	5	C
Maple-leaved Viburnum	*Viburnum acerifolium*	6	5	C
Nannyberry	*Viburnum lentago*	4	5	C
Highbush Cranberry	*Viburnum trilobum*	5	5	U
Cow Vetch	*Vicia cracca*	*	SE5	C
Wild Grape	*Vitis riparia*	0	5	C